

# Summer Training Report

By

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Through this report I have learnt a lot about Sustainable Development, Climate change and Individual responsibility and accountability. It has helped me identify some of the biggest problems faced globally and ways to adapt and mitigate them.

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## Acronyms/Abbreviations

**DALY** - *Disability-Adjusted Life Year*

**DCE** - Disease Control in Humanitarian Emergencies

**EPR** - Department of Epidemic & Pandemic Alert and Response

**GHG** – Green house gases

**IPCC** – Intergovernmental Panel on Climate Change

**LEDC** - Less Economically Developed Country

**LMIC** - Low and middle-income countries

**MDG** - Millennium Development Goals

**SDG** – Sustainable Development Goals

**UN** – United Nation

**WHO** –World Health Organization

**Global South / Global North:** These terms reflect the geographic and other divisions between countries that are generally found in the southern hemisphere of the earth – traditionally referred to as ‘developing’, and those generally found in the northern hemisphere – traditionally referred to as ‘developed’.

**Majority world / Minority world:** The term ‘Majority world’ highlights the fact that the majority of the world’s population lives in these parts of the world traditionally referred to as ‘developing’. The term ‘Minority world’ is similarly used to refer to those countries traditionally referred to as ‘developed’, where a minority of the world’s population resides.

**WEIRD:** Finally, in psychology, there is increasing recognition that most research is conducted with people from Western, Educated, Industrialized, Rich and Democratic (WEIRD) countries, which are only a small and biased sample of the world’s diversity.

Work-From Home  
(Assigned by Faculty)  
April 1, 2020- June 30, 2020

IS CLIMATE CHANGE A HARBINGER OF  
PANDEMICS?

A Narrative Review by  
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Under the Guidance of  
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MBA- Hospital and Health Management  
2019-2021



## **Abstract**

Climate change has traditionally been relegated to the backdrop as an insignificant glitch in the race to development. Major countries (developed and developing) around the world are not monitoring GHG emissions or promoting efforts to increase energy efficiency; hitherto transitioning into a carbon neutral economy is just an urban fantasy.

Gaps in research are present regarding climate change and its effects on various sectors, due to the assumption that it is not likely to act independently. Inter-relationship between causal factors takes precedence in explorations of outbreaks and health outcomes. The frame of analysis is at the collective rather than individual level making study of climate change impacts exacting.

The ramifications of its influences are being felt around the world with ever-increasing effects on human health and safety. In the face of a pandemic that has subjugated the entire human race; a question comes forth – Does climate change play a role in perpetuating pandemics.

The purpose of this paper is to review the effects of climate change, need for evidence based decision making in adaptation and mitigation of risks associated with climate change, in particular the health sector and to present suggestions to improve these practices.

## **Introduction**

This soon, on the heels of a pandemic that hasn't even ended, it might appear dispassionate to write about a vaguely threatening, ever looming problem that is too big to be solved without international coordination. But this review isn't just to make an academic point but a practical one; before it becomes cold news and is relegated to the sidelines. It is about how societies face and absorb calamities and how we can and should reconstruct afterwards. It is important in the heat of the moment to acknowledge some hard truths and rebuild a better, more sensitive society.

Climate change unfavorably affects the global south more, which also consists of the LMIC and LEDC countries (majority world), made more vulnerable by their topography and endemic climate sensitive diseases. An apt example would be India- Despite being one of the major economies; it is still struggling with third-world issues. If Pandemics become a norm, which they will if we don't cap the global temperature rise at 1.5C, it will bring economies to halt and disrupt trade and commerce. Preventive actions like

quarantining self don't take into account daily wage earners and people in the bottom two quintiles of wealth. "Additional negative impacts to economies and livelihoods threaten to stretch these countries to their breaking point, setting back decades of work to reduce poverty and improve human wellbeing."(T.V.Padma, 2020)

Does loss of life alone constitutes health outcomes or is it also the loss of quality of life. People leading a less than average quality of life (DALY) due to climate change consequences, contributes just about as much as the death toll. It strains the already burdened resources (via rehabilitation and medical expenses incurred by individuals or government). So the

**Research Question** to be answered here is:

What is the Role of Climate change in perpetuating future pandemics?

**Broad Objectives:-**

To study about correlational impact of Climate change on human health.

To find scientific studies that correlate climate change and their impacts.

**Specific Objectives:-**

To study the impact of climate change on health

To study the impact of climate change on extreme weather events.

To study the impact of climate change on disease transmission and propagation.

The rationale for this review is globally per year \$360 billion fund is used to mitigate the effects of climate change whether direct or indirect. It isn't heeded to by legislators and governments world-wide, as it not seen as an immediate threat, is only ever alluded to and is judged to have no scientific backing. Emphasis should be put on research, to change perception and practices regarding climate change mitigation. So that alternatives can be thought of at global and local level. This review collates the previous studies done on this topic, from books, journals, websites that have published relevant articles and shed light on this relation of not only distal but proximal causes.

## **Review of Literature:**

Impact of climate change on health has been slow to gain interest in the epidemiological and medical communities. Considerable controversy over attribution of these alterations to climate change has been observed. Another confounding finding is that regions at higher risks, exposure and lower adaptation capacity have even fewer studies to their name. Climate change and health is an area ripe for researchers due to theoretical, methodological gaps. There are many topics and subtopics that have not yet been explored or are underexplored.

“A significant proportion of studies in this field aim to detect changes in vector-borne disease, and assess whether these can be attributed wholly or in part to long-term anthropogenic climate change.” (Campbell-Lendrum et al. 2015) Use of existing knowledge, even for - climate sensitive disease malaria (a highly researched subject under this broad topic) has only recently started. Even then only a few countries like Bhutan are using it to actively inform the mitigation and adaptation policies. Establishing link and putting the information to practice in field has a huge gap that needs to be bridged.

There are countless speculations and extrapolations, in need of scientific evidence to become facts and be supported for their applicability in policy making. Health and diseases have various factors that predict and perpetuate them, one of them being climate change, but due to lack of foresight we are concerned with only proximal causes and not the distal risk factors which amplify and exaggerate the existing causes. There is a prominent gap in knowledge and literature which needs to be filled by auxiliary research on the relation between climate change and its health implications, area of study and population, types of studies, to present comprehensive knowledge of the issue at stake.

“Majority of studies contains only descriptive statistics; cross-national comparisons affected by differing notions of what constitutes ‘climate change.’”(Capstick et al. 2015) And even then direct empirical tests are difficult, requiring long time series data on the disease and relevant meteorological variables. Potential confounding factors like socioeconomic determinants, coverage of control programmes and resistance to insecticides or treatment (Wilkinson et al. 2003), effect modifiers and risk factors from other diseases are ever present.

## **Challenges in Climate change research:**

The WHO criterion for defining risks to health is “Availability of reasonably complete data on risk factor distributions and risk factor--disease relationships is required.” (WHO, 2002) Measuring changes in defined health impact and attributing it to climate change is difficult due to the following issues:

### **Box 1 – Challenges in Climate change research**

- Distinguishing apparent from real “climate change”.  
Seasonal and interannual fluctuation don’t provide direct evidence for disease-climate change relation, they just confirm that these diseases have climatic dependence. Evidence of change in baseline climate conditions is required to establish that the increase in incidence is due to climate change rather than random variation.
- Effect modification  
Modifying influences like population and environmental data need to be measured parallelly for effective monitoring. As other factors, along with climate change, alter the population’s vulnerability to meteorological influences. Our vulnerability to climate change depends on developmental factors – better housing, measures and land use will protect us from feeling the same impact others without the development would.
- Lack of valid and reliable health data.
- Need high quality, long-term prospective observational studies, as climate change has a roughly decadal exponential increase.
- Current methodology, epidemiological tools are often not applicable as exposed and control groups can’t be compared due to lack of control groups and pervasiveness of climate change.
- Varied pathways of action and health impacts
- Gradual changes have different impacts from extreme events.
- Climate change adds to the burden of existing climate-sensitive diseases, under nutrition and injuries, therefore the challenge is to “...aggregate both mortality and morbidity impacts of a single disease under study, or ideally of all climate sensitive-diseases into a comprehensive, population-based metric for health outcomes, such as DALYs or QALYs.” (Sauerborn R.,2017)
- Requires extensive intersectoral cooperation.

“Despite the challenges, there are now studies with relatively robust evidence of long-term (i.e. decadal) climate change that have contributed, at least in part, to increases in disease incidence or distribution in specific locations.” (Purse BV et al. 2005, Alonso D et al. 2011 as cited in Campbell-Lendrum et al. 2015)

What we need to understand is that when it comes to climate change, “Estimation of the potential impact can’t wait until perfect data is available, since that is unlikely to occur. Timeliness is essential. This area can be a source of tension between scientists and policy-makers. However, arguments are often clouded by the use of dichotomies -- assertions of uncertainty or certainty when, in fact, there are different degrees of uncertainty and disagreement about tolerable thresholds. Similarly, it may be asserted that there is no data when some indirect data is available, or at least the range of levels in other parts of the world is known.” (WHO, 2002)

### **Methodology:**

A narrative review of literature was conducted on role of climate change and various direct and indirect aspects as no paper has been written with Effect of climate change on Pandemics. To that end, Pubmed, Google Scholar and Scihub were searched for papers published from 1990-June 2020. The recent year findings were focused upon, taking support from established theories from books and papers published until 1990. Other publications were also identified during backward and forward reference searches. Theoretical considerations have been used to characterize approaches and empirical findings when available, have been noted.

### **Findings:**

#### **Attributable burden:**

Climate change and its related health effects are the biggest global health threat of this century. The estimates of attributable burden (current burden due to past exposure) related to climate change.

“It is estimated that global climate change causes approximately 150,000 human deaths annually. Climate change was estimated to be responsible for approximately 2.4% of worldwide diarrhea, 6% of malaria in some middle income countries, and 7% of dengue fever in industrialized countries. A recent study estimated that global climate change will cause approximately 250,000 additional human deaths annually between 2030 and 2050

(WHO, 2014). The total includes 38,000 due to heat exposure, 48,000 due to diarrhea, and 60,000 due to malaria. The study did not evaluate all environmental causes of death that could potentially be influenced by climate change, such as river flooding and water scarcity. It is estimated that the human welfare costs of global climate change will range between \$2 and \$4 billion per year by 2030 (WHO, 2018b).” (M.L. Brusseau, 2019)

In total, the attributable mortality was 154 000 (0.3%) deaths and the attributable burden was 5.5 million (0.4%) DALYs.

### **Direct and Indirect effects of Climate change on health outcomes.**

“Human-driven climatic changes will fundamentally influence patterns of human health, including infectious disease clusters and epidemics following extreme weather events...” (McMichael, 2015) The social and environmental determinants of health like air, water, food and ecosystem are being profoundly affected by human driven climate change. Decreasing Causal certainty, consistency and increasing complexity render health impacts by climate change questionable. The further we move from direct causes the more confounded we become. But distal causes have amplifying effects as they affect many proximal causes and can potentially make a huge difference. (Rose G. , 1992)

Over the years only distal risk factors were associated with this relation; which is acting via intermediary causes and having no direct relation to health. But recent studies point out that adverse health outcomes related to climate change include both proximal and distal causes which will be further elaborated.

For the ease of understanding the effects of climate change they have been divided into –

#### **A. Direct effects:**

- Climate change-related alterations in several dimensions of extreme weather events (e.g. heatwaves, cold waves, floods, droughts, and windstorms),
- Changing weather patterns (early summers/winters and prolongation of seasons),
- Bushfire, thawing glaciers and permafrost,
- Climate sensitive diseases.

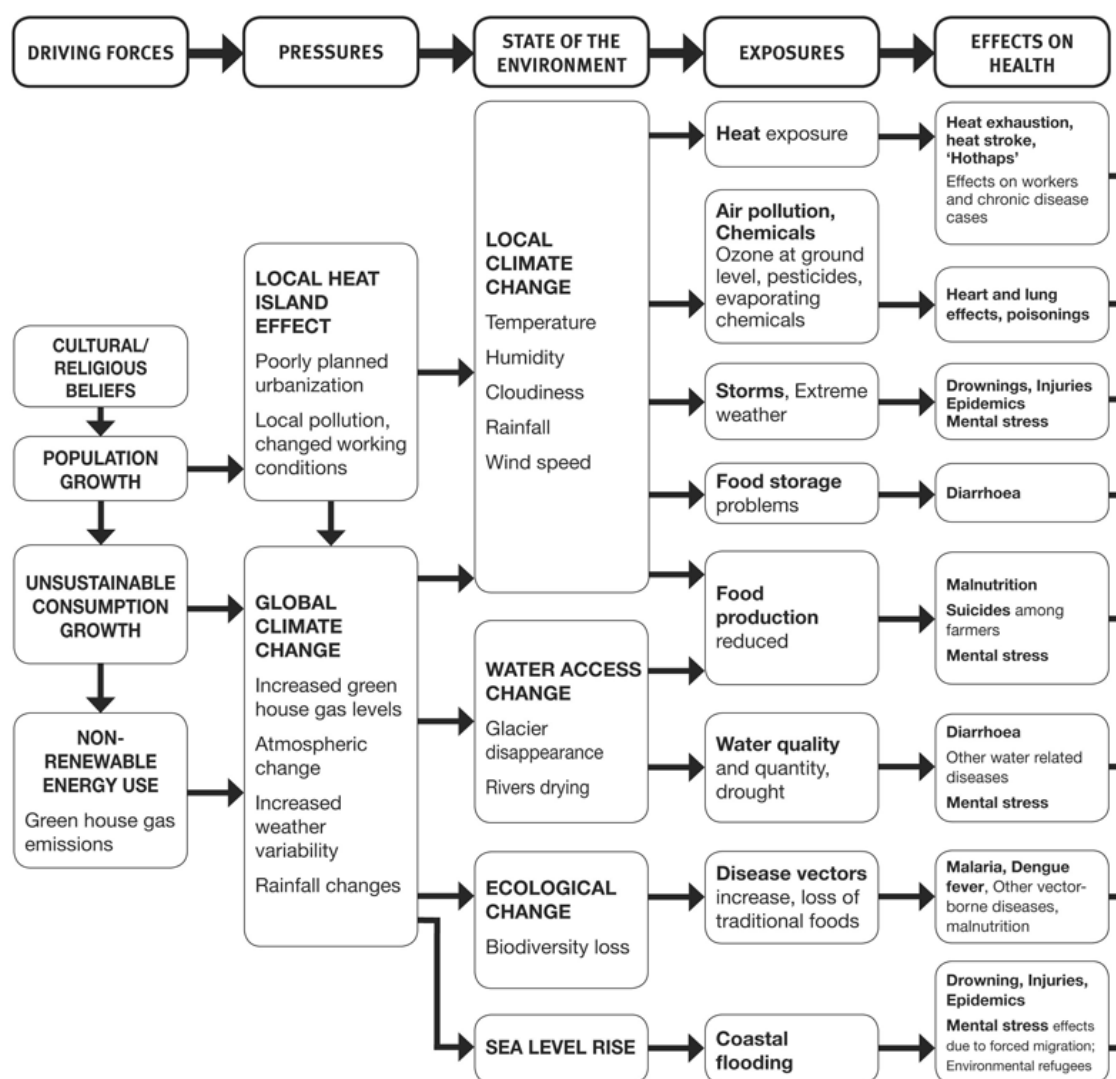
Though these events were occurring before anthropogenic climate change, they have amplified in frequency, intensity, and duration and are affecting places and people they wouldn't have before. Continuous increase is expected as a consequence of climate change (IPCC, 2012), which would lead to increase in associated health impacts without additional interventions.

**B. Indirect effects:**

- Climate change induced ecosystem changes and altered interactions of natural and physical systems by extending transmission season,
- Changing geographic range and incidence of communicable infectious diseases (vector-borne, food and waterborne, zoonotic diseases),
- Prevalence of select Non communicable diseases (cardiovascular, respiratory disease and those associated with aeroallergens, air pollutants and ozone depletion), Rise in number of people at risk of malnutrition.
- Effects on food production, yields of agricultural crops via climatic influences on plant and livestock pests and pathogens.
- Impacts on freshwater and food security, Salination of coastal lands.
- Economic and social disruption by climate induced economic dislocation, environmental decline, and developmental setbacks due to damage to public health infrastructure and livelihoods,
- Danger of conflict over depleted natural resources.

“...many distal risks to health, such as climate change or socioeconomic disparity, cannot appropriately be defined at the individual level.” (WHO, 2002) As the indirect routes diverge and get more complex, a number of other factors come into play, which leads to ‘climate determinism’ where climate is seen as only a contributor or amplifier but not a perpetrator.

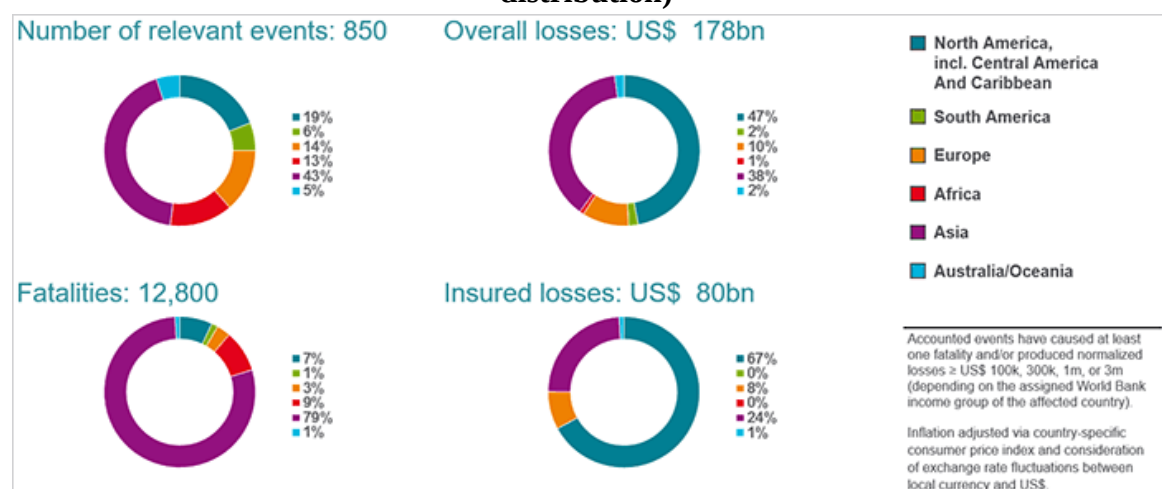
Figure 1.0 - Direct and Indirect effects of Climate change.



### Climate Change and Natural Disasters:

Climate change has influenced the prevalence of natural disasters. Extreme weather—such as floods, droughts, cyclones and heat waves—is the most apparent effect of climate change and are becoming more intense and frequent.

**Figure 2.0 – World Natural Catastrophes by Continent, 2018 (Percentage distribution)**



Source: © 2019 Munich Re, Geo Risks Research, NatCatSERVICE. As of March 2019.

600,000 deaths occur worldwide each year as a result of weather related natural disasters and are alarmingly increasing with each year. “Disasters - 90 per cent of which are classed as climate related— cost the world economy US\$520 billion per year and push 26 million people into poverty every year. It has been reported that an annual average of 21.5 million people have been forcibly internally displaced by sudden weather-related hazards since 2008.” (Ocean Conference, UN, 2017) Rising seawater temperatures present more energy for storms, leading to more intense tropical cyclones globally. Due to unprecedented glacier melting, increased flooding is being seen as Major River systems are fed by glacier melt. But it is a matter of years before it turns into drought, and scarcity of water.

The melting of permafrost and ice may also result in uncovering long dormant threats. In August 2016, a century old reindeer was uncovered due to permafrost melting and

multiple people contracted anthrax spore infection associated with it. Genetic fragments of the 1918 Spanish influenza and smallpox viruses have been found in graves (Alaska and Siberia), and might result in revival of some of humanity's greatest viral enemies. A heatwave in 2020 stoked permafrost thaw leading to the worst oil spill of its kind in the Russian Arctic, and about 55% of Russian territory is permafrost and home to some of world's major oil and gas fields. These abrupt thaws not only release dangerous gases but decrease Albedo effect causing snow to melt quicker.

From the tropics to the arctic, climate and weather have powerful direct and indirect impacts on human life. Weather extremes endanger health, destroy property and livelihoods. "Human impacts from natural disasters are not fully captured in mortality rates. Injury, homelessness, loss of livelihood and displacement can all have a significant impact on populations." (Ritchie, Natural Disasters, 2014)

#### **Box 2.0 - Climate change as a Risk multiplier.**

**Climate change is a Risk multiplier; it will exacerbate crises like the pandemic or any local disease.** Climate hazards collide with outbreaks and jeopardize public health work, positing compound risks. Examples are as follows:

- Zika Surveillance Programme of Puerto Rico stalled by Hurricane Maria (2017),
- Extreme bushfire in Australia and the resulting air pollution may further exacerbate COVID-19 spread,
- Disruption of healthcare services due to power outage, physical damage to roads and hospitals affecting people with pre-existing health conditions along with those in the eye of the hurricane.
- Season length has been growing worldwide and endemic diseases can also occur as seasonal outbreaks with varying number of cases depending on the length of transmission season.
- Increasing trends of heavy precipitation and extremes of heat or cold are also being seen.
- Refugees in Shelter homes are more at risk for infectious disease outbreak because of their overcrowded living condition and malnutrition risk due to food scarcity.
- Migration exposes refugees to locally endemic disease against which they have no immunity.

While the primary risks associated with extreme weather events are injury and death, Epidemics generally follow natural disasters as it provides the perfect conditions for the

microbes, vectors and reservoir animal host to thrive while humans are more vulnerable than usual. Ideal breeding sites, disruption of vector control programs and greater exposure due to lack of shelter aid in spread of malaria. Climate sensitive diseases like Diarrhea, Cholera, Dysentery and Typhoid prevail and result in higher mortality than the natural disaster.

Table 1.0 - Pandemics of the Past with established links to Climate change:

| Pandemic and Year                                  | Region                                                   | Extreme Weather Event                                                               | Causative Agent And Vector                                           |
|----------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| The Plague of Justinian, Mid-sixth century(541 CE) | Egypt, Constantinople, The greater Mediterranean region. | Massive volcanic eruption in Indonesia (536 CE), resulting in atmospheric shrouding | Yersinia pestis, Black rats                                          |
| The Black Death, From 1347 to the early 1360s      | Kazakhstan, China, Europe                                | Massive river floods                                                                | Yersinia pestis, Marmots                                             |
| The Cocoliztli infection, 1545 and 1576            | Mexican Highlands                                        | Severe droughts with intermittent years of intense rainfall                         | Salmonella enterica, spillover of indigenous rodent-borne infections |
| Cholera Outbreak, 1901-1940                        | India                                                    | Massive river floods                                                                | Vibrio cholerae                                                      |
| The Hanta virus pulmonary syndrome, 1993           | USA                                                      | Precipitation following El-Niño related drought                                     | Orthohantavirus, Deer Mice                                           |

### Indirect effects:

We might blame the wet market of Wuhan for the current pandemic but no matter where the viral spillover took place, it increased because of widespread trends. “Pandemic risk is driven by the combined effects of spark risk (*where* a pandemic is likely to arise) and spread risk (*how likely* it is to diffuse broadly through human populations).” (Madhav N et al., 2017)

It is implausible to solve some major global health problems like diarrhea, cholera, malnutrition and malaria with just economic development, as climate change undermines all efforts. The following sections outline climate change ramifications that have touched every part of society and thrown inequalities into sharp relief.

### Waterborne diseases:

Heavy rainfall increases risk of flooding, drainage back up and water collection which spread diarrheal diseases (contaminants like waste and faecal material), vector (mosquito) borne diseases (adequate breeding conditions like low lying water) respectively. Exposure to contaminated, untreated water can lead to eye infections, fungal skin infections and respiratory illnesses. Sediments and nutrients that overspill from the field cause eutrophication (algal blooms) diminishing the quality of water and upsetting aquatic life.

Diarrheas, Cholera, Cryptosporidiosis, Salmonella, Campylobacter, Giardiasis, Legionellosis, Shigellosis, E coli infection, Primary amebic meningoencephalitis (PAM) are some common waterborne diseases whose relation to climate change have been extensively studied and established. Furthermore, water contamination from sewage overflow makes seafood; fish and shellfish accumulate gastrointestinal viruses like norovirus and hepatitis A. Bioconcentration of algal toxins- ciguatoxins causes a pantropical illness Ciguatera fish poisoning (CFP).

#### **Food security & Malnutrition:**

“Most of the world’s poorest and most malnourished communities are almost entirely at the mercy of the weather. Agriculture is not only their main provider of food and nutrition, but also their source of income (Teague, 2017). Approximately 25 million additional children are projected to be malnourished by 2050. All aspects of food system are affected by Climate change, be it production, availability, stability, access, utilization or quality.”( HOW CLIMATE CHANGE THREATENS FOOD SECURITY — AND WHY WE’RE ALL AT RISK , 2019)

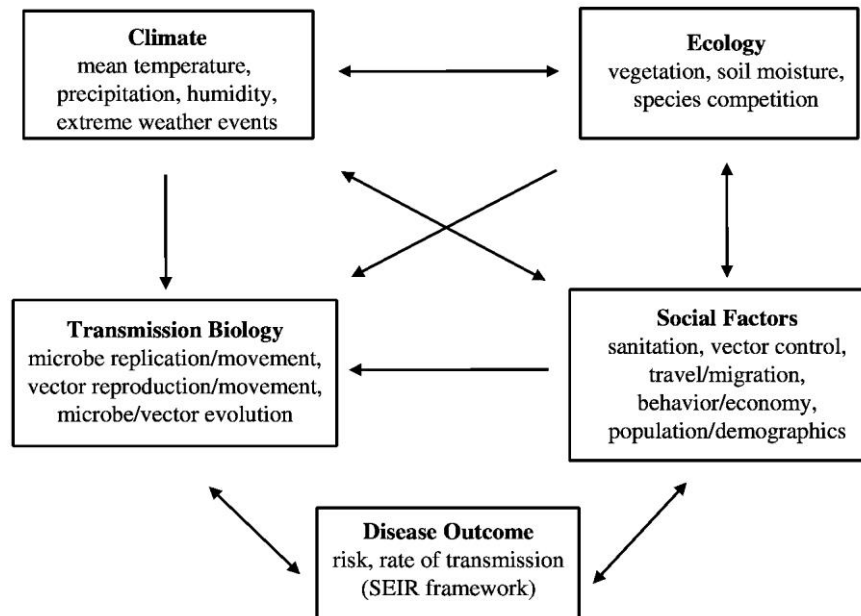
Spread of food borne pathogens - Countries producing 37% of the world wheat are being threatened by Wheat rust (UG99), Crop pests – Desert locusts are increasing due to changing weather pattern, reduced yield of major crops. Both droughts and excess moisture, encourage mold (mycotoxins, aflatoxins), blight and rot formation. Higher rainfalls, Dust storms, flooding can produce phycotoxins, increase bacterial storage and thereby food spoilage rates. Climate change also has an effect on the nutritional value of crops.

Hunger and under nutrition are major contributors to the global burden of disease and are the leading risk factors for death and morbidity in children under 5 years (IHME, 2013).

“Unsafe food creates a vicious cycle of diarrhea and malnutrition, threatening the nutritional status of the most vulnerable. Where food supplies are insecure, people tend to

shift to less healthy diets and consume more “unsafe foods” – in which chemical, microbiological and other hazards pose health risks”. WHO (2017)

**Figure 3.0 – Climate change influence on transmission of infectious disease agents.**



### **Vector Borne Diseases:**

Two out of the three internationally notifiable diseases are sensitive to variations in ambient temperature and meteorological factors (Li C et al. 2018, Li T et al. 2013). A sizable number of vector borne diseases are climate sensitive and an increasing trend has observed that these diseases are ever escalating.

“Various factors—population growth, increasing urbanization, greater demand for animal protein, greater travel and connectivity between population centers, habitat loss, climate change, and increased interactions at the human-animal interface— affect the likelihood of pandemic events by increasing either the probability of a spark event or the potential spread of a pathogen.” (Madhav N, 2017 as cited in Tilman & Clark 2014; Tyler 2016; Zell 2004)

Emergence of new diseases along with changing patterns of existing vector-borne diseases ensure that despite having a current estimated burden smaller than other major risk factors; climate change and its associated risks are increasing rather than decreasing over time.

**Table 2.0 – Altered disease exposure due to environmental change.**

| <b>Pathway of effect</b>                                                                                               | <b>Environmental Changes</b>                                                                                                              | <b>Diseases known to be impacted by this mechanism</b>                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Changes in density or identity of disease-related organisms                                                            | Deforestation<br>Irrigation projects (Dams, Canals)<br>Agricultural Intensification,<br>Crop insecticides and Increased vector resistance | Malaria, schistosomiasis, dengue, Japanese encephalitis, filariasis, trypanosomiasis, leishmaniasis, cholera, plague, Rift Valley fever, dracunculosis, onchocerciasis, hantavirus, hemorrhagic viruses, Chagas disease, Oropouche/Mayaro virus. |
|                                                                                                                        | Sea surface warming and nutrient loading                                                                                                  | harmful algal blooms, Red tide                                                                                                                                                                                                                   |
| Changes in exposure pathways                                                                                           | Incursions into wildlife habitat leading to new exposure, Consumption of Bush meat                                                        | Ebola, simian retroviruses, HIV-1, H5N1 avian flu, the H1N1 flu, Creutzfeldt-Jakob disease                                                                                                                                                       |
|                                                                                                                        | Floods, Droughts, Dense urban settlements with poor sanitation, waste disposal, or water treatment                                        | Cryptosporidiosis, giardiasis, dengue, filariasis, Chagas disease, plague, leptospirosis, typhus, diarrheal disease, food poisoning                                                                                                              |
| Changes in the environment in which organisms live create genetic alterations, which can increase disease transmission | Livestock management (extensive use of antibiotics)                                                                                       | Antibiotic-resistant bacteria, influenza, severe acute respiratory syndrome                                                                                                                                                                      |
|                                                                                                                        | Genetic rearrangements due to confinement of different animal species together (Mass rearing), Monoculture,                               | Increased virulence or altered infectivity.                                                                                                                                                                                                      |
| Changes in life cycle of vectors or pathogens                                                                          | Mosquito breeding sites,                                                                                                                  | Rift valley fever, Malaria, Oropouche                                                                                                                                                                                                            |
|                                                                                                                        | Rodent food abundance, natural disasters, overcrowding,                                                                                   | Hantavirus Pulmonary syndrome, Venezuelan Hemorrhagic fever                                                                                                                                                                                      |
|                                                                                                                        | Contact with sand fly vectors                                                                                                             | Visceral, Cutaneous leishmaniasis                                                                                                                                                                                                                |
| Changes in species composition of communities of organisms                                                             | Biodiversity loss increases exposure,<br>Altered species composition                                                                      | Lyme disease, West Nile virus, malaria, Guanarito virus, Junin virus, Machupo virus, bartonellosis, Nipah virus, St. Louis encephalitis                                                                                                          |

### **Why is there a gap: Due to Our Perception towards Climate Change?**

Despite heightened awareness and lack of skepticism about the reality and severity of climate change there is lack of action and fluctuation regarding importance. Climate change is on nobodies' agenda or priority list.

This section endeavor's to explain the perception we have towards climate change and how it is affecting research and policy making alike. Quite a few biases are applicable when it comes to climate change, its implications, and our perception towards it.

We employ a cognitive appeasement strategy regarding climate change, wherein we downplay the risks associated with our hedonistic, self serving behavior as being out of our control with risks being delayed since the benefits and comfort involved are high.

Potential consequences are ignored because we tend to be myopic, we don't see the value of immediate actions taken to abate future ramification. We aren't willing to leave status quo due to inertia and herding bias (choices being influenced by other people's behavior). We see climate change as a threat for future generations and for people at the other end of the world. We still often see the risk as distant in both time (a problem perhaps for future generations) and space (a problem for people somewhere else). When queried about important issues governments need to address , nothing is less popular than climate change. (Bostrom et al., 2020) We contest researches thinking that existing problems from climate change are more indirect and impersonal, when they are not.

One research pointed out that “due to the way we process information: the statistical data characterizing the future risks associated with climate change do not create feelings of concern.” (Kunreuther H. & Slovic P., 2020) Kunreuther adds that pseudo inefficacy exacerbates this lack of concern, as any contribution made is seen as unimportant and thus ineffective. We feel only moderately efficacious with regard to mitigating climate change, despite it being well known, controllable and moderately threatening.

The present pandemic can teach us that we can't risk delaying actions for climate change as it makes for loss of millions in terms of both life and economy. Studies say that people's receptiveness to change is highest following a mass casualty, disasters or severe loss to life, property or business interruption. Availability bias comes to play as wildfires, epidemics, destructive storms make people bethink about the impacts brought on by global warming and plan and take action for the long term consequences of climate change.

### **Approach towards Climate Change:**

The climate change disaster has been perpetrated at our own hands; it is a disaster by design whose roots lie in the choices we make as a society. Since we can't provide risk

protection to all the vulnerable population, we need to see where we are failing to assess and adopt the risk management strategies. Our current policies regarding climate change need to be altered and the most appropriate and effective mix of strategies that complements each other should to be given priority:

- “Population-based interventions rather than those aimed at high-risk individuals;
- Primary over secondary prevention;
- Controlling distal rather than proximal risks to health.”(WHO, 2002)

### **Mitigation and Adaptation:**

“The impacts of climate change are immediate, but they will also grow with time. For every year that we don't address the climate challenge, the impacts will be greater and will cost more to remedy in the future.” (Dr. Robert C. Orr)

Our vulnerability to climate change is a function of exposure, sensitivity, and adaptive capacity. (IPCC 2001) Now that we have established that climate change is a Nexus issue and the only solution is for humans to change their activity. Instead of responding to climate change on an ad hoc basis why not do pre-disaster preparedness. We need ancillary and complementary movements to intensify, heighten and reinforce efforts to deal with climate change at the local, regional, national and international levels. Climate change has influenced and reframed our concepts of health and we need to revamp our policies accordingly. Rethinking, renewing and adopting them with greater vigor is the way to go.

Climate change is a global issue, but adaptation and mitigation efforts need to be considered at all levels. Both are complementary strategies that can be taken to reduce and manage the risks of climate change.

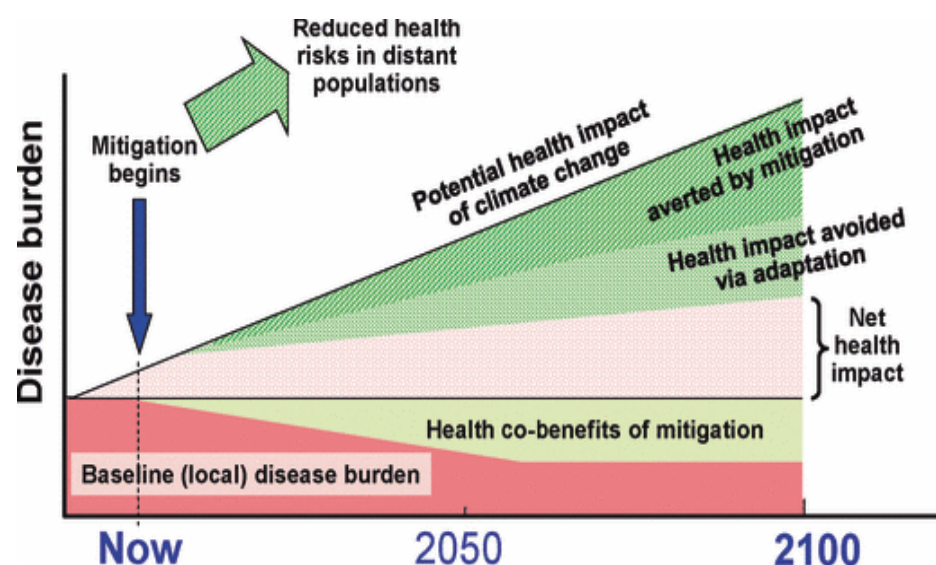
The process of adjustment to actual or expected climate change effects in order to lessen or avoid harm, or exploit beneficial opportunities is Adaptation and the process of reducing emissions, or enhancing sinks of GHG's to limit future climate change is Mitigation.(IPCC, 2014) “But current implementation efforts are insufficient to avoid increasingly negative social, environmental, and economic consequences.” (NOAA) The most vulnerable countries have made the least contribution to climate change and since they are developing economies they have made it clear that adaptation is their number one

priority and not mitigation. Discounted savings in energy cost are more than upfront cost of adopting such measures. The benefits far exceed the cost.

Managing increasingly extreme disasters and their associated risks (Early warning system network) , protecting coastlines, managing land and forests the best way possible, planning for reduced water availability, dealing with sea level encroachment, developing resilient crops, protecting public infrastructure and energy all come under adaptation measures. Here we have to focus on local communities building resilience even as they reduce their own emissions. The global community needs to take an irretrievable move toward decarbonization, using renewable, cleaner and greener energy, investing in alternative energy technology, Afforestation.

Breakthrough technologies for renewable energy, energy-intensive industries, energy storage, and carbon capture, use and storage will provide a boost to the green recovery by creating local future-proof jobs, paving the way to climate neutrality. We should invest in promising, market-ready projects such as clean hydrogen or other low-carbon solutions for energy-intensive industries like steel, cement and chemicals. Well-enforced regulations are the need of the hour, regulatory pressures and economic incentives while streaming climate change scenarios for the population.

**Figure 4.0- Reducing the health impacts of climate change via primary (mitigation) and secondary (adaptation) prevention.**



Source – Reprinted from Journal of Internal Medicine, Volume: 270, Issue: 5, Pages: 401-413

These outcomes have their roots in a complex chain of environmental events that may have begun years previously, which in turn were shaped by broader socioeconomic determinants. Mitigation occurs at multiple levels, the most important being individual contribution and accountability. Climate change is not an overnight phenomenon and neither would attenuating it be, it all narrows down to making the right choices every time.

**Conclusion:**

“There are concerns that the Corona virus pandemic has pushed climate change further down the list of concerns for governments. And although globally greenhouse gas emissions plummeted during the early months of 2020, when many nations were on strict lockdown, they have started to climb again in some places. According to figures from the Centre for Research on Energy and Clean Air, air pollution in China rebounded in May – overshooting concentrations seen during the same period last year.

In the past, countries have relied on highly polluting industries such as manufacturing and construction to help lift them out of a downturn. But the figures from the CREA underline the need for governments to focus on clean and environmentally friendly economic recoveries as lockdowns ease.” (Edmond, 2020)

We have always known the costs, we just chose to overlook them; a startling finding but true nevertheless. In the wake of this disaster, we have a chance to build the world that we want to see. Geoffrey Rose observed, like others before and since, that for the vast majority of diseases "nature presents us with a process or continuum, not a dichotomy". It is our choice, what steps we choose to take. (WHO, 2002)

We know what the problem is. We know the people who are being impacted by it. We know what the solutions are. We just need to put the health of people and the planet first. If there is anything we have learned from this pandemic, it is that we can switch to the best suited options when it suits us.

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Sustainable Development in the 21st Century with  
Ban Ki-moon

A Report by  
Madhubala Mundra

Under the Guidance of Dr. Sheenu Jain

MBA- Hospital and Health Management  
2019-2021



# Sustainable Development in the 21st Century with Ban Ki-moon

Yonsei University.

## **Course Description –**

The course on “Sustainable Development in the 21st Century with Ban Ki-moon” is a 7 week self paced course with flexible hours of study provided by the Yonsei University. It is a course designed to gain an in-depth understanding of the developmental agenda member states ratified to attain by 2030. The core concepts of Agenda 2030 along with the basis and foundation behind SDG’s are expounded upon. It introduces the five pillars of Agenda 2030 – people, prosperity, planet, peace and justice, and partnership and the interconnectedness of the pillars is stressed upon. It helps explore the way forward, seeking channels to help integrate SDG’s. The knowledge gained here can be integrated for practical policy making and implemented for development in both developed and developing country settings.

I chose to take up this course as it focuses on addressing the twin challenges of sustainability and development, where sustainability is seen as not just a qualifier for development but as a co-equal field that can help bridge gaps between applied sciences and humanities. The co benefits and synergy between the two are touched upon which is crucial for actionable knowledge and innovative solutions. As Ban Ki-moon said, “The 2030 Agenda for Sustainable Development is crucial to the survival of Earth. We don't have a plan B because there is no planet B.”

## **Key Course Objectives –**

- To spread message about Sustainable development and how each one of us is vital to achieving SDG’s.
- Learn about present global situations and short term goals and long term vision.
- To analyze SDG’s and their relationship to the world’s most pressing problems with specific focus on poverty and inequality, climate change, clean energy and youth’s role in SDG implementation.

## **Course Content -**

- Basic concept behind the 2030 Sustainable Development Agenda.
- Transition from Millennium Development Goals and Sustainable Development Goals
- Difference between Millennium Development Goals and Sustainable
- Key Characteristics of SDGs (Highlighted the complexity and interconnectedness of SDGs).
- Categorizing the 17 goals into the five Ps.
- First P- People (SDG 1, 2,3,4,5 – Their cyclical relation and reduction.)
- Second P – Planet (SDG 6, 12, 13, 14, 15 – Ecosystem services, Responsible Production and Consumption, Mitigating Anthropogenic Impact)
- Third P – Prosperity (Green Jobs, buildings & energy, Social Innovation)
- Fourth P – Peace & (Social Inclusion, Global Governance & Citizenship, Civil Empowerment
- Fifth P- Partnership (Corporate Governance & Corporate Social Responsibility)
- Youth and SDG Implementation ( Empowering youth, Lifelong learning)

**Learning Methodology used in course** – Lecture, Presentation, Cases, Assignment, Reading Material

### **Key principles of the new agenda:**

The SDGs are remarkable due to their complexity and comprehensive nature. They aren't merely 17 goals, 169 targets and 232 indicators that the nations must achieve, but:

- A symbol of cooperation – of all UN member states, local governments, private sector and civil society,
- A Universal, integrated, and transformative vision,
- More comprehensive, ambitious, action-oriented, collaborative and adapt to different development levels in different nations.
- More specific and broader range of goals, clearer and wider scope, more evidence-based, functionally realistic, and approachable.
- Leaving no one behind
- Participatory and inclusive approach, Integrated and Human rights based approach.

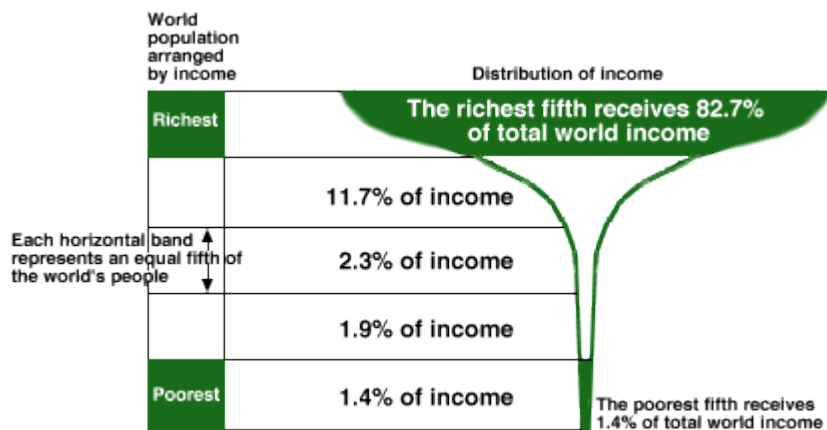
## Key Course Learning –

**Table 3.0 – Topic Covered, Corresponding Goals and Objectives.**

| Topic Covered                           | Corresponding Goals                                                                                                                                                                      | Objective                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2030 Agenda for Sustainable Development |                                                                                                                                                                                          | The first week of the course touched upon the general concept of sustainable development, learning about the core values of the 2030 Agenda, and the behind the scenes negotiations that brought it to reality.                                                                                                                                                                                                                |
| People                                  | 1 - No Poverty<br>2 – Zero Hunger<br>3 – Good Health and Wellbeing<br>4 – Quality Education<br>5 – Gender Equality                                                                       | People are foundational to the 2030 Sustainable Development Agenda. There are people around the world who are still in need of the most basic necessities of life. Everything from water to food, from literacy to primary education and beyond. The second week addressed the fundamental issues of poverty because eradication of poverty is the main driving force of the Millennium Development Goals and the 2030 Agenda. |
| Planet                                  | 6 – Clean water and Sanitation<br>12 – Responsible consumption and Production<br>13 – Climate Action<br>14- Life below Water<br>15- Life on Land                                         | After the Kyoto Protocol, the importance of preserving and protecting the environment was highlighted. This focus on the environment emphasized at a development agenda that meets the needs of the environment. In the third week focus was on the environmental aspect within our society, Ecosystems Services and Climate Change mitigations.                                                                               |
| Prosperity                              | 7 – Affordable and Clean Energy<br>8 – Decent work and Economic Growth<br>9 –Industry, Innovation & Infrastructure<br>10 – Reduced Inequality<br>11 –Sustainable Cities and Communities. | Like the Millennium Development Goals, economic development is also the key in the 2030 Sustainable Development Agenda.<br><br>The fourth week introduces the concept of the different development approaches including urbanization, green energy, and green jobs.                                                                                                                                                            |
| Peace and Partnership                   | 16 – Peace & Justice Strong Institutions<br>17 – Partnerships to achieve the Goal                                                                                                        | Fifth week explored the relationship of peace and partnership. Issues such as social inclusion, how peace can be achieved through interdependency of all sectors from public to private, and how the SDGs are planning to interconnect everyone were covered.                                                                                                                                                                  |
| Youth & SDG Implementation              |                                                                                                                                                                                          | Sixth week emphasized on youth and the implementations of SDGs. Youth are the agents of change. The current generation can be the first generation to eradicate poverty and to provide primary education for everyone. Its high potential was discussed.                                                                                                                                                                       |

## The first of 5Ps – People

**Figure 5.0: Global Income Distribution**



Source: UNDP, *Human Development Report 1992* (New York: Oxford University Press, 1992).

Half of the global poor might be concentrated in the LMIC countries but poverty deeply affects developed countries as well. Conventional measures of national income for instance, GDP per capita, fail to capture the overall progress of societies. A report from Oxfam states that “82.7% of the wealth generated goes to the richest 1% of the global population. While the 3.7 billion people who make up the poorest half of the world see no increase in their wealth. Billionaire wealth has risen by an annual average of 13% since 2010.” The inequality and wealth concentration need to be addressed not only because they are ethically desirable but because it is a necessary condition to resolve global macroeconomic fragility and to ensure more sustained growth. “Economic growth must be inclusive, providing sustainable jobs and promote equality.”

## Second P of 5Ps - Planet

Our Planet doesn't only provide us a place to live or livelihoods, it provides us with life itself. “Our planet and the diversity of life it supports, is however under a serious threat. Deforestation, pollution, greenhouse gas emissions, climate change, globalization and other factors of our modern daily life are wiping out species and damaging ecosystems at unprecedented rates.” (Kim Eungbin)

According to IUCN, the monetary value of ecosystem services provided by other inhabitants of the planet ( purification of air and water, detoxification and decomposition of waste, crop pollination, soil preservation, moderation of weather extremes, etc. ) is estimated to be some \$33 trillion per year. We don't treat things right, invaluable and

priceless assets like water are wasted because we can't be bothered to look around and notice. Roughly 2.7 billion people, which is 36% of the world population, currently face water shortages totaling at least a month every year. only less than 1% of the world water is fresh and accessible, thus putting the right price on water would encourage people to waste less, pollute less, and invest more in water infrastructure.

To mitigate anthropogenic impact we need to sustainably managing natural resources , have sustainable consumption and production, and most importantly, increase individual contribution and accountability.

### **Third P of 5Ps – Prosperity**



**Figure 6.0– Intersection of People, Planet and Profit.**

It might seem like profitability and welfare can't go hand in hand. Can you be a capitalist and a socialist? Hard as it might seem, a little bit of effort in the right direction can give us the best of both worlds. Sustainability is composed of three pillars: economic, environmental, and social (profits, planet, and people).

- Tackling lack of clean and affordable energy sources.
- Poverty eradication but through decent work for all. Economic growth but not a skewed GDP with concentration of wealth in one quintile.
- Economic development, Job creation (green jobs) and Self Reliance by building infrastructure, industry and use innovative technologies and strategies for both.
- Reducing inequalities (unfair opportunities and exploitation) in work, labour and economy by establishing free and fair economy.
- Building a sustainable, greener city, for people living in urban, as well as rural areas. Sustainable cities for Sustainable communities.

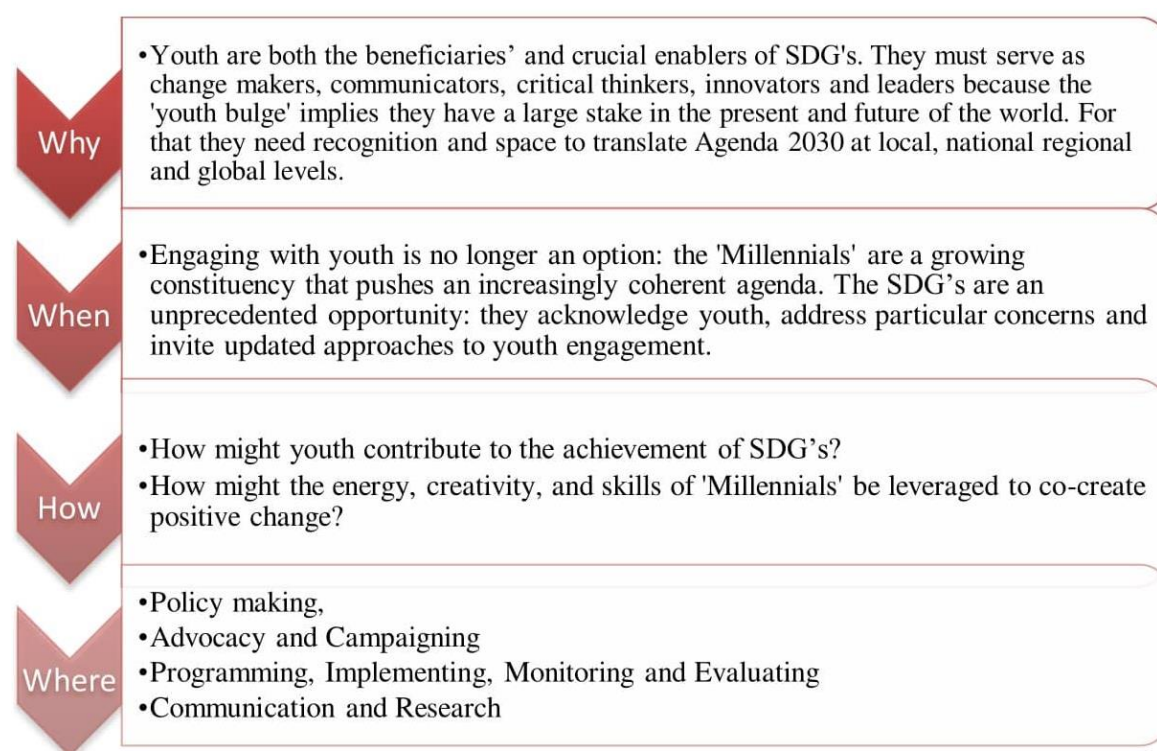
### **Fourth and Fifth P's – Peace and Partnership**

All inclusive cooperation is required for the realization of the 17 goals. In a world that is increasingly divided; Inclusive partnership with a shared vision, principles and values will

lead to better outcomes for all the other SDG's. Not just an absence of conflict but prevalence of justice and inclusiveness in society. Increased coherence, coordination and collective decision making at the global level ; that is peace.

Political, economic, social, scientific, cultural partnerships and feeling individual responsibility and accountability will make us realize all the SDG's. To realize these ambitious goals, making the world a fairer, safer, better place for all the people and the planet will take unparalleled effort from everyone. Doing what we have been doing (good) plus extra efforts. Not just incrementalism but additionality.

**Figure 7.0- Youth and SDG Implementation**



### **Conclusion:**

All SDG goals are interlinked, and none more so than hunger, health (child mortality, HIV prevalence, lack of sanitation, water), education (no elementary education, dropout rates, conflict has taken away teachers, schools, lacking basic literacy skills, un/under employed, lack of quality education), and gender equality (gender based discrimination, barrier to education, unequal division of labour, lack of opportunities, no source of income, fewer economic rights). While looking at the map of world that (illustrating the biggest population of people living under extreme poverty) and comparing it with maps

highlighting areas with the largest burden of healthcare issues, such as, HIV prevalence, maternal mortality and children mortality under the five years old, we'll see startling similarity. The same results would be gained on comparisons with maps for child labor, teenage pregnancy, school enrollment status of girls, and illiteracy of women.

What these maps and statistics highlight for us is the interconnectedness of all Sustainable development goals.

The interconnectedness of 2030 Agenda is a huge challenge, neither simple nor one dimensional, but at the same time, it is an opportunity to bring secure, sustainable future.

It ironically grants us multiple ways that we can solve the issues. The close interconnectedness means that successful dealing with one issue can affect and change others. It compels us to look beyond national boundaries and short-term interest and act in solidarity for the longer term. Inclusion for all human and social entities at all levels will lead to the empowerment of all individuals. It is an indispensable and inevitable element. The SDGs must be fulfilled not just by member states, but through the inclusion of parliaments, local governments, cities and rural areas, businesses, and entrepreneurs.

We must engage all actors. SDGs are about the power of each individual.

We need to have a comprehensive and holistic approach. The World Bank expresses the way as inclusive economic growth, investments in people, and ensuring measures against setbacks. And for the first time in history, we are the generation that can do more than simply envision a world free from extreme poverty, hunger, health for all; it is a reality that is fully within our capabilities.

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