DISASTER STUDIES

CODE - 18KP2GELG2

UNIT I: Disaster management – Meaning, Content and Scope-Types of disasters-Natural and Man-made.

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ASST.PROF.OF GEOGRAPHY

DISASTER STUDIES

UNIT-I

DISASTER-MEANING

Disasters are sudden, adverse, unfortunate extreme events or hazards which cause great damage to human beings as well as plants and animals. Disasters occur rapidly, instantaneously and indiscriminately. A disaster is an occurrence disrupting the normal conditions of existence and causing a level of suffering that exceeds the capacity of adjustment of the affected community

A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. A disaster is a serious disruption occurring over a short or long period of time that causes widespread human, material, economic or environmental loss.

Disasters are such uncontrollable extreme events that disrupt social structure and affect the essential functions which are necessary to support human life system. Disasters are always viewed in terms of human beings i.e., severe damages to human life and property. The intensity of disaster is weighed in terms of the quantum of damages done the human society.

DISASTER MANAGEMENT

Disaster management is how we deal with the human, material, economic or environmental impacts of disaster and it is the process of how we "prepare for, respond to and learn from the effects of major failures". Disaster management efforts aim to reduce or avoid the potential losses from hazards, assure prompt and appropriate assistance to the victims of a disaster, and achieve a rapid and effective recovery.

- Disaster education aims to provide knowledge among individuals and groups to take actions to reduce their vulnerability to disasters.
- Disaster management plans are multi-layered and are aimed to address such issues as floods, hurricanes, fires, bombings, and even mass failures of utilities or the rapid spread of disease. Disaster Management refers to the measures taken for the safety and protection of life and property from natural or man-made disasters.

  This means being prepared for disasters, fighting disasters effectively, ensuring the safety of life during disasters and helping in rebuilding society after the disaster.
- When a disaster strikes a society, external help is usually needed in the form of aid to cope with its impact.
- The four phases of disaster management are mitigation, preparation, response and recovery.

NATURE AND SCOPE

A disaster is an unplanned event in which the needs of the affected community outweigh the available resources. A disaster occurs somewhere in the world almost daily, but these events vary considerably in scope, size, and context. Large-scale disasters with numerous casualties are relatively unusual events.

Disaster Studies is emerging globally as a full-fledged academic discipline. As a field of practice it demands specialization to meet with the ever-dynamic challenges posed by disasters. It aims at generating critical discourse around the way disasters and their management is conceptualized and theorized.

It requires that the disaster risk reduction knowledge should be as a built-in component of knowledge block. Disaster awareness needs to be part of every individual's cultural heritage and the development of such attitudes should be encouraged in early childhood. As disaster risk management should be everybody's business, children of today must be appropriately educated and adequately trained to face the disaster risks that may be realized in the future in the wake of prevailing natural hazard potential. A new culture of disaster prevention will have to be created in the home, in school, in the workplace and in society in general.

Disaster research allows professionals in the field to advance existing preparedness, response, and recovery practices. It is important to study the impact of disasters on behavioral health to identify the emergence of psychopathology and to develop mental health interventions to prevent or mitigate the traumatic effects.

In recent years, as entities providing training have diversified, various sustainable disaster-prevention education programs, with potential of developing into a local network, are provided. The following tasks can be regarded as challenges for the future:

1) Creation of a network with a local community to implement disaster prevention education;

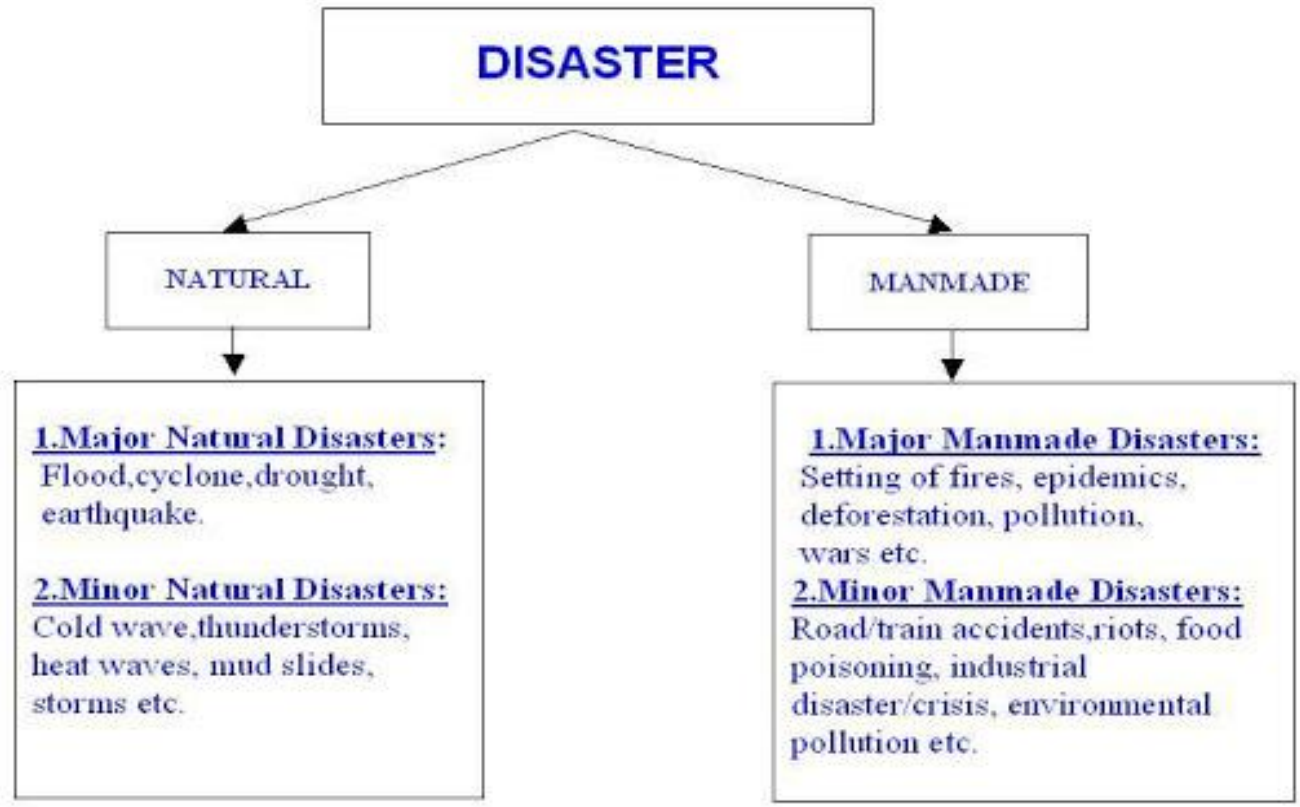
2) Sustainable framework that is suited to local characteristics;

3) Starting disaster prevention education at younger ages. It is also required to develop an educational scheme for communities and people wh0 are uninterested in disaster prevention.

TYPES OF DISASTERS

Disasters are as old as human history but the dramatic increase and the damage caused by them in the recent past have become a cause of national and international concern. By definition '**Disaster**' means a catastrophe, a mishap, a calamity or grave danger event occurred in an area and affected life and properties. It may be arising from natural or man- made causes, or by accident or due to negligence.

Disasters - natural or human-made are common throughout the world. Disasters continue to occur without warning and are perceived to be on an increase in their magnitude, complexity, frequency and economic impact. Hazards pose threats to people and assume serious proportions in the under developed countries with dense population. During the second half of the 20th century, more than 200 worst natural disasters occurred in the different parts of the world and claimed lives of around 1.4 million people. Losses due to natural disasters are 20 times greater (as % of GDP) in the developing countries than in industrialized one. Asia tops the list of casualties due to natural disasters.



The new classification distinguishes two generic disaster groups: Natural and Technological disasters.

NATURAL DISASTERS

A disaster can be natural or manmade. Regardless of their origin, disasters have occurred to mankind from the time immemorial and will continue to occur in the years ahead. A natural disaster is a natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption or environmental damage. Severe geo-physical or climatic

events, such as volcanic eruptions, floods, cyclones and fires that threaten people or property, are termed as natural disasters.

The natural disaster category being divided into six disaster groups:

- Biological
- Geophysical
- Meteorological
- Hydrological
- Climatological and
- Extra-Terrestrial

MAN MADE DISASTERS

When the disasters are due to carelessness of human or mishandling of dangerous equipment's they are called man-made disasters. Common examples of these disasters are train accidents, aero plane crashes, collapse of buildings, bridges, mines, tunnels, etc. Manmade hazards are hazards which are due to human negligence. Manmade hazards are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failure, wars or civil strife etc. Man-made disasters are events which are caused by human activities (e.g. industrial chemical accidents and oil spills).

Man-Made Disasters

A man-made disaster is a severe event caused by humans interacting with the Earth.

Examples:

Deforestation
Oil Spills
Global Warming
Nuclear Accident
Hazardous Waste

TYPES AND SUB TYPES OF DISASTERS

Natural disaster sub-group					
Climatological	Geophysical	Hydrological	Meterological	Biological*	Extraterrestrial*
Natural disaster types and sub-types					
Drought	Earthquake	Flood	Storm	Animal accident	Impact
Glacial Lake Outburst	Ground Shaking	Coastal food	Extra-tropical cyclone	Insect infestation	Airburst
Wildfire	Tsunami	Riverine flood	Tropical cyclone	Grasshoper	Space Weather
Forest fire	Mass movement	Flash flood	Convective Storm	Locust	Energetic particles
Land fire	Volcanic activity	Ice jam flood	Extreme temperature	Epidemic	Geomagnetic storm
	Ash fall	Landslide	Cold wave	Viral disease	Shockwave
	Lahar	Avalanche (snow, debris, mudflow, rockfall)	Heat wave	Bacterial disease	
	Pyroclastic flow	Wave action	Severe winter conditions	Parasitic disease	
	Lawa flow	Rogue wave	Fog	Fungal disease	
		Seiche		Prion disease	

Man-made disaster sub-group		
Industrial accident	Transport accident	Miscellaneous accident
Man-made disaster types		
Chemical spill	Air	Collapse
Collapse	Road	Explosion
Explosion	Rail	Fire
Fire	Water	Other
Gas leak		
Poisoning		
Radiation		
Other		

Source: https://www.intechopen.com

DISASTER SUB GROUP DEFINITION AND CLASSIFICATION

Geophysical Events - originating from solid earth Earthquake- Volcano, Mass Movement (dry)

Meteorological Events - caused by short-lived/small to meso scale atmospheric processes (in the spectrum from minutes to days) -Storm

Hydrological Events - caused by deviations in the normal water cycle and/or overflow of bodies of water caused by wind set-up - Flood, Mass Movement (wet)

Climatological Events - caused by long-lived/meso to macro scale processes (in the spectrum from intra-seasonal to multi-decadal climate variability) - Extreme Temperature, Drought, Wildfire

Biological Disaster-caused by the exposure of living organisms to germs and toxic substances - Epidemic, Insect Infestation, Animal Stampede

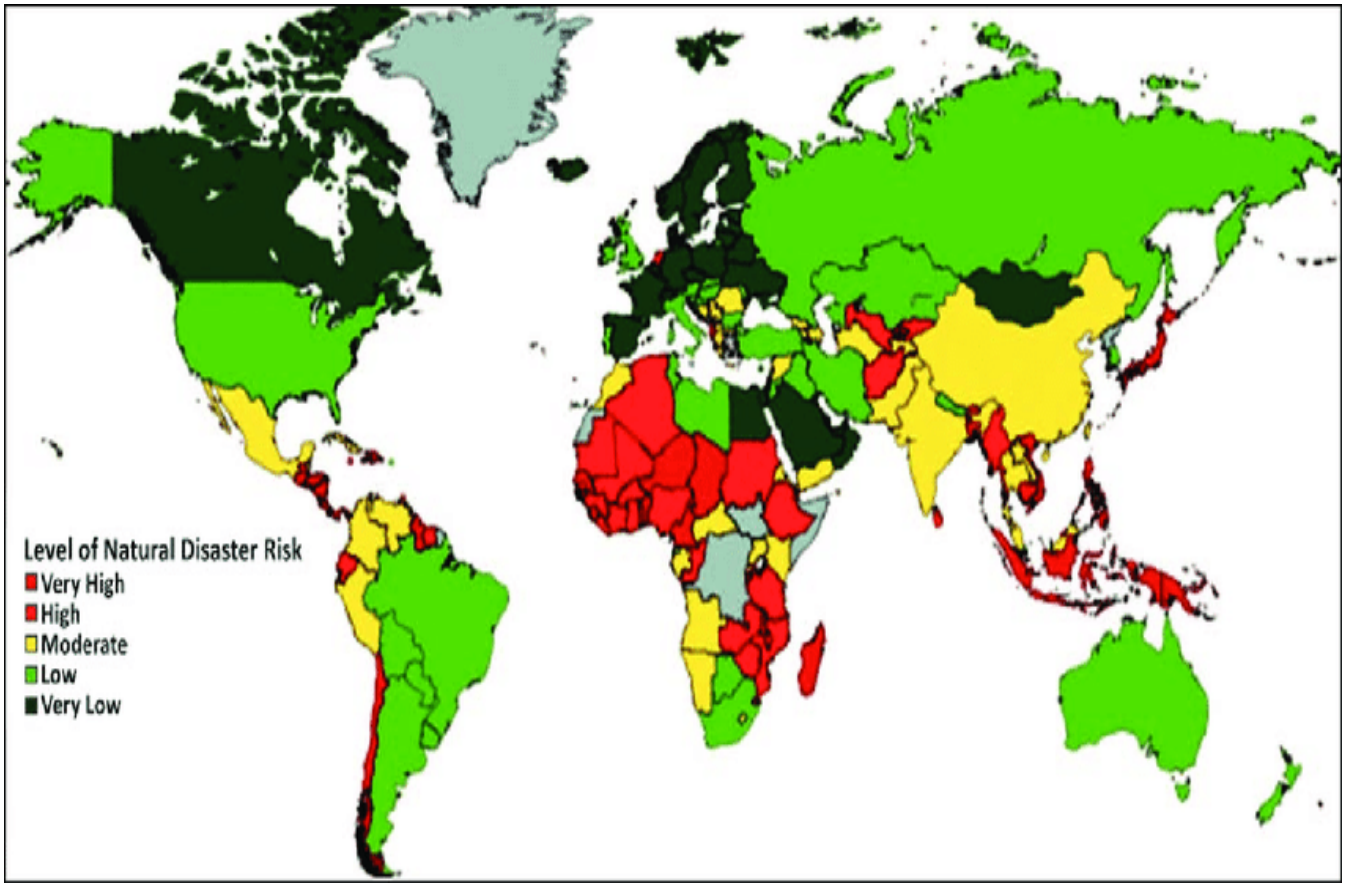
VULNERABILITY

Vulnerability may be defined as “The extent to which a community, structure, services or geographic area is likely to be damaged or disrupted by the impact of particular disaster. Vulnerabilities can be categorized into physical and socio-economic vulnerability.

Physical Vulnerability: It includes notions of ‘who’ and ‘what’ may be damaged or destroyed by natural hazard such as earthquakes or floods. It is based on the physical condition of people and elements at risk, such as buildings, infrastructure etc; and their proximity, location and nature of the hazard. It also relates to the technical capability of building and structures to resist the forces acting upon them during a hazard event.

Socio-economic Vulnerability: The degree to which a population is affected by a hazard. The socio-economic condition of the people also determines the intensity of the impact. For example, people who are poor and living in the sea coast don’t have the money to construct strong concrete houses. They are generally at risk and lose their shelters whenever there is strong wind or cyclone. Because of their poverty they too are not able to rebuild their houses.

LEVEL OF NATURAL DISASTER RISK (2017)



Source: https://www.researchgate.net

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UNIT -IV

BIOLOGICAL DISASTER

Biological disasters define the devastating effects caused by an enormous spread of a certain kind of living organism – that may the spread a disease, virus, or an epidemic. **Biological disasters** can also be simply, a sudden growth in the population of a certain kind of plants or animals, e.g., a locust plague.

Various Causes of Desertification

- **Overgrazing**. ...
- **Deforestation**. ...
- Farming Practices. ...
- Excessive Use of Fertilizers and Pesticides. ...
- Overdrafting of groundwater. ...
- **Urbanization** and Other Types of Land Development. ...
- **Climate Change**. ...
- Stripping the Land of Resources.

Desertification

Desertification is defined as a process of land degradation in arid, semi-arid and sub-humid areas due to various factors including climatic variations and human activities. Or, to put it in another way, desertification results in persistent degradation of dryland and fragile ecosystems due to man-made activities and variations in climate.

Desertification, in short, is when land that was of another type of biome turns into a desert biome because of changes of all sorts. A huge issue that many countries have is the fact that there are large pockets of land that are going through a process that is known as desertification.

Overgrazing is the major cause of desertification worldwide. Other factors that cause desertification include urbanization, climate change, overuse of groundwater, deforestation, natural disasters, and tillage practices in agriculture that make soils more vulnerable to wind.

Desertification affects topsoil, groundwater reserves, surface runoff, human, animal, and plant populations. Water scarcity in drylands limits the production of wood, crops, forage, and other services that ecosystems provide to our community.

Desertification is another major environmental concern and a significant barrier to meeting basic human needs in drylands and is being constantly threatened by increases in human pressures and climatic variability.

Desertification is a type of land degradation in which a relatively dry land region becomes increasingly arid, typically losing its bodies of water as well as vegetation and wildlife

It is caused by a variety of factors, such as climate change and human activities. Desertaification is a significant global ecological and environmental problem."

Various Causes of Desertification

1. Overgrazing

Animal grazing is a huge problem for many areas that are starting to become desert biomes. If there are too many animals that are overgrazing in certain spots, it makes it difficult for the plants to grow back, which hurts the biome and makes it lose its former green glory.

2. Deforestation

When people are looking to move into an area, or they need trees in order to make houses and do other tasks, then they are contributing to the problems related to desertification. Without the plants (especially the trees) around, the rest of the biome cannot thrive.

3. Farming Practices

Some farmers do not know how to use the land effectively. They may essentially strip the land of everything that it has before moving on to another plot of land. By stripping the soil of its nutrients, desertification becomes more of a reality for the area that is being used for farming.

4. Excessive Use of Fertilizers and Pesticides

The use of excessive amounts of fertilizers and pesticides to maximize their crop yields in the short term often leads to significant damages for the soil.

In the long run, this may turn from arable into arid land over time, and it will no longer be suitable for farming purposes after a few years of excessive farming since the soil has been damaged too much over time.

5. Overdrafting of groundwater

Groundwater is the freshwater found underground and also one of the largest water sources. Over drafting is the process in which groundwater is extracted in excess of the equilibrium yield of the aquifer that is pumping or the excessive pulling up of groundwater from underground aquifers. Its depletion causes desertification.

6. Urbanization and Other Types of Land Development

As mentioned above, development can cause people to go through and kill plant life. It can also cause issues with the soil due to chemicals and other things that may harm the ground. As areas become more urbanized, there are fewer places for plants to grow, thus causing desertification.

7. Climate Change

Climate change plays a huge role in desertification. As the days get warmer and periods of drought become more frequent, desertification becomes more and more eminent.

Unless climate change is slowed down, huge areas of land will become desert; some of those areas may even become uninhabitable as time goes on.

8. Stripping the Land of Resources

If an area of land has natural resources like natural gas, oil, or minerals, people will come and mine it or take it out. This usually strips the soil of nutrients, which in turn kills the plant life, and eventually leads to the process of becoming a desert biome as time goes on.

9. Natural Disasters

There are some cases where the land gets damaged because of natural disasters, including drought. In those cases, there isn't a lot that people can do except work to try and help rehabilitate the land after it has already been damaged by nature.

10. Soil Pollution

Soil pollution is a significant cause of desertification. Most plants are quite sensitive to their natural living conditions. When soil becomes polluted due to various human activities, the respective area of land may suffer from desertification in the long run. Higher the level of pollution more will be the degradation of soil over time.

11. Overpopulation and excessive consumption

Since our world population is continuously growing, the demand for food and material goods is also increasing at an alarming rate. Our overall level of consumption is also increasing at a steady rate.

Thus to fulfill our demand, we have to optimize our farming processes to harvest even higher crop yields. However, this excessive optimization of farming will hurt the soil and will eventually turn into the desertification of land in the long run.

12. Mining

Mining is another big reason for desertification. Large amounts of resources have to be extracted by industries to meet our demand for material goods. For mining, large areas of land have to be used, which causes deforestation as well as pollution of the nearby areas.

By the time most of the natural resources have been extracted, and mining practices are no more profitable, the soil gets damaged significantly, and the land becomes arid, which may not be recoverable, and desertification occurs.

Global warming

Here's a simple definition of global warming. (And yes, it's really happening.) Over the past 50 years, the average global temperature has increased at the fastest rate in recorded history. And experts see the trend is accelerating: All but one of the 16 hottest years in NASA's 134-year record have occurred since 2000.

Climate change deniers have argued that there has been a "pause" or a "slowdown" in rising global temperatures, but several recent studies, including a 2015 paper published in the journal Science, have disproved this claim. And scientists say that unless we curb global-warming emissions, average U.S. temperatures could increase by up to 10 degrees Fahrenheit over the next century.

Curbing dangerous climate change requires very deep cuts in emissions, as well as the use of alternatives to fossil fuels worldwide. The good news is that we've started a turnaround: CO2 emissions in the United States actually decreased from 2005 to 2014, thanks in part to new, energy-efficient technology and the use of cleaner fuels. And scientists continue to develop new ways to modernize power plants, generate cleaner electricity, and burn less gasoline while we drive. The challenge is to be sure these solutions are put to use and widely adopted.

Global warming linked to extreme weather

Scientists agree that the earth's rising temperatures are fueling longer and hotter heat waves, more frequent droughts, heavier rainfall, and more powerful hurricanes. In 2015, for example, scientists said that an ongoing drought in California—the state's worst water shortage in 1,200 years—had been intensified by 15 percent to 20 percent by global warming. They also said the odds of similar droughts happening in the future had roughly doubled over the past century. And in 2016, the National Academies of Science, Engineering, and Medicine announced that it's now possible to confidently attribute certain weather events, like some heat waves, directly to climate change.

The earth's ocean temperatures are getting warmer, too—which means that tropical storms can pick up more energy. So global warming could turn, say, a category 3 storm into a more dangerous category 4 storm. In fact, scientists have found that the frequency of North Atlantic hurricanes has increased since the early 1980s, as well as the number of storms that reach categories 4 and 5. In 2005, Hurricane Katrina—the costliest hurricane in U.S. history—struck New Orleans; the second-costliest, Hurricane Sandy, hit the East Coast in 2012.

The impacts of global warming are being felt across the globe. Extreme heat waves have caused tens of thousands of deaths around the world in recent years. And in an alarming sign of events to come, Antarctica has been losing about 134 billion metric tons of ice per year since 2002. This rate could speed up if we keep burning fossil fuels at our current pace, some experts say, causing sea levels to rise several meters over the next 50 to 150 years.

The other effects of global warming

Each year, scientists learn more about the consequences of global warming, and many agree that environmental, economic, and health consequences are likely to occur if current trends continue. Here's just a smattering of what we can look forward to:

- Melting glaciers, early snowmelt, and severe droughts will cause more dramatic water shortages and increase the risk of wildfires in the American West.
- Rising sea levels will lead to coastal flooding on the Eastern Seaboard, especially in Florida, and in other areas such as the Gulf of Mexico.
- Forests, farms, and cities will face troublesome new pests, heat waves, heavy downpours, and increased flooding. All those factors will damage or destroy agriculture and fisheries.
- Disruption of habitats such as coral reefs and Alpine meadows could drive many plant and animal species to extinction.
- Allergies, asthma, and infectious disease outbreaks will become more common due to increased growth of pollen-producing ragweed, higher levels of air pollution, and the spread of conditions favorable to pathogens and mosquitoes.

United States stand in terms of global-warming contributors

In recent years, China has taken the lead in global-warming pollution, producing about 28 percent of all CO2 emissions. The United States comes in second. Despite making up just 4 percent of the world's population, we produce a whopping 16 percent of all global CO2 emissions—as much as the European Union and India (third and fourth place) combined. And America is still number one, by far, in cumulative emissions over the past 150 years. Our responsibility matters to other countries, and it should matter to us, too.

Causes global warming

Global warming occurs when carbon dioxide (CO2) and other air pollutants and greenhouse gases collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface. Normally, this radiation would escape into space—but these pollutants, which can last for years to centuries in the atmosphere, trap the heat and cause the planet to get hotter. That's what's known as the greenhouse effect.

In the United States, the burning of fossil fuels to make electricity is the largest source of heat-trapping pollution, producing about two billion tons of CO2 every year. Coal-burning power plants are by far the biggest polluters. The country's second-largest source of carbon pollution is the transportation sector, which generates about 1.7 billion tons of CO2 emissions a year.

Greenhouse effect

By increasing the concentration of greenhouse gases in the atmosphere, we're amplifying the planet's natural greenhouse effect and turning up the dial on global warming.

he greenhouse effect is a good thing. It warms the planet to its comfortable average of 59 degrees Fahrenheit (15 degrees Celsius) and keeps life on earth, well, livable. Without it the world would be a frozen, uninhabitable place, more like Mars. The problem is, mankind's voracious burning of fossil fuels for energy is artificially amping up the natural greenhouse effect. The result? An increase in global warming that is altering the planet's climate systems in countless ways. Here's a look at what the greenhouse effect is, what causes it, and how we can temper its contributions to our changing climate.

Greenhouse Effect

Identified by scientists as far back as 1896, the greenhouse effect is the natural warming of the earth that results when gases in the atmosphere trap heat from the sun that would otherwise escape into space.

Causes the Greenhouse Effect

Sunlight makes the earth habitable. While 30 percent of the solar energy that reaches our world is reflected back to space, approximately 70 percent passes through the atmosphere to the earth's surface, where it is absorbed by the land, oceans, and atmosphere, and heats the planet. This heat is then radiated back up in the form of invisible infrared light. While some of this infrared light continues on into space, the vast majority—indeed, some 90 percent—gets absorbed by atmospheric gases, known as greenhouse gases, and redirected back toward the earth, causing further warming.

For most of the past 800,000 years—much longer than human civilization has existed—the concentration of greenhouse gases in our atmosphere was between about 200 and 280 parts per million. (In other words, there were 200 to 280 molecules of the gases per million molecules of air.) But in the past century, that concentration has jumped to more than 400 parts per million, driven up by human activities such as burning fossil fuels and deforestation. The higher concentrations of greenhouse gases—and carbon dioxide in particular—is causing extra heat to be trapped and global temperatures to rise.

Greenhouse Gases

Earth's greenhouse gases trap heat in the atmosphere and warm the planet. The main gases responsible for the greenhouse effect include carbon dioxide, methane, nitrous oxide, and water vapor (which all occur naturally), and fluorinated gases (which are synthetic). Greenhouse gases have different chemical properties and are removed from the atmosphere, over time, by different processes. Carbon dioxide, for example, is absorbed by so-called carbon sinks such as plants, soil, and the ocean. Fluorinated gases are destroyed only by sunlight in the far upper atmosphere.

How much any one greenhouse gas influences global warming depends on three key factors. The first is how much of it exists in the atmosphere. Concentrations are measured in parts per million (ppm), parts per billion (ppb), or parts per trillion (ppt); 1 ppm for a given gas means, for example, that there is one molecule of that gas in every 1 million molecules of air. The second is its lifetime—how long it remains in

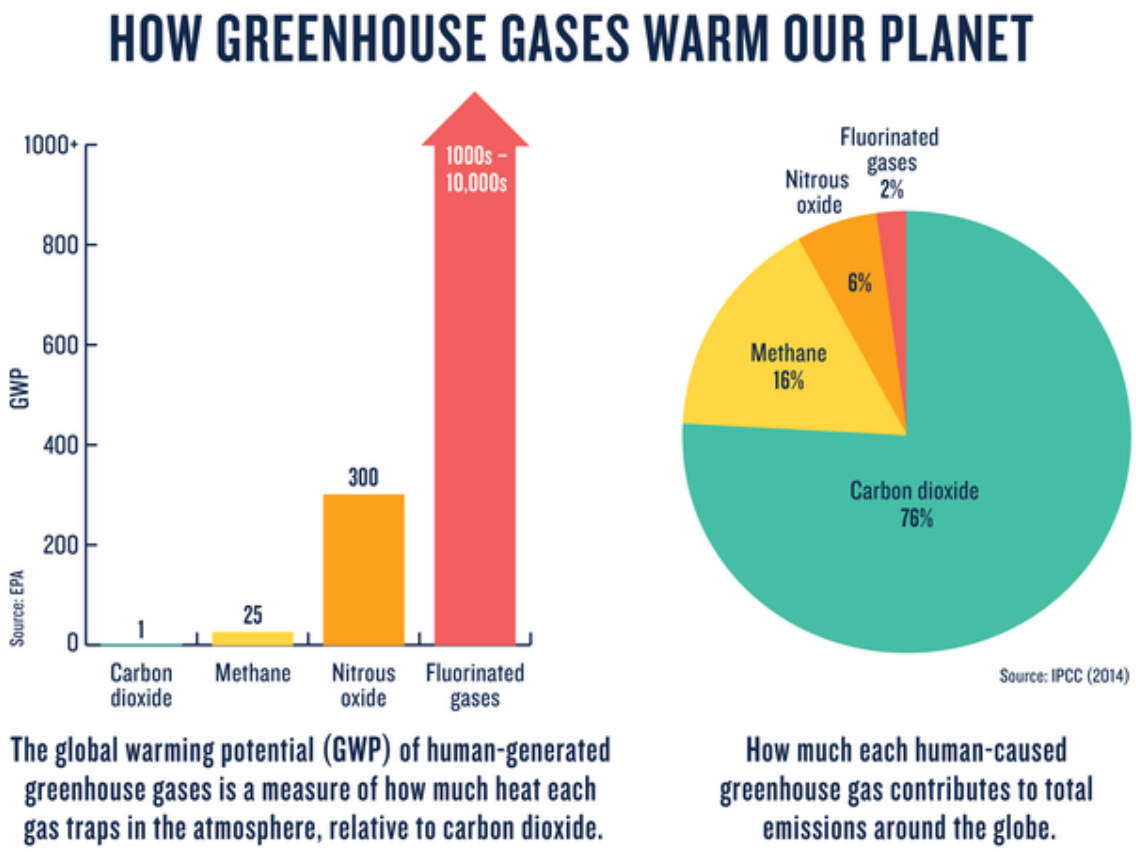
the atmosphere. The third is how effective it is at trapping heat. This is referred to as its global warming potential, or GWP, and is a measure of the total energy that a gas absorbs over a given period of time (usually 100 years) relative to the emissions of 1 ton of carbon dioxide.

Radiative forcing (RF) is another way to measure greenhouse gases (and other climate drivers, such as the sun's brightness and large volcanic eruptions). Also known as climate forcing, RF quantifies the difference between how much of the sun's energy gets absorbed by the earth and how much is released into space as a result of any one climate driver. A climate driver with a positive RF value indicates that it has a warming effect on the planet; a negative value represents cooling.

Greenhouse Gas Emissions

Since the start of the Industrial Revolution and the advent of coal-powered steam engines, human activities have vastly increased the volume of greenhouse gases emitted into the atmosphere. It is estimated that between 1750 and 2011, atmospheric concentrations of carbon dioxide increased by 40 percent, methane by 150 percent, and nitrous oxide by 20 percent. In the late 1920s, we started adding man-made fluorinated gases like chlorofluorocarbons, or CFCs, to the mix.

In recent decades we've only picked up the pace. Of all the man-made emissions of carbon dioxide—the most abundant greenhouse gas released by human activities, and one of the longest-lasting—from 1750 to 2010, approximately half were generated in the last 40 years alone, in large part due to fossil fuel combustion and industrial processes. And while global greenhouse gas emissions have occasionally plateaued or dropped from year to year (most recently between 2014 and 2016), they're accelerating once again. In 2017, carbon emissions rose by 1.6 percent; in 2018 they increased by an estimated 2.7 percent.



Five Major Greenhouse Gases

The most significant gases that cause global warming via the greenhouse effect are the following:

Carbon Dioxide

Accounting for about 76 percent of global human-caused emissions, carbon dioxide (CO_2) sticks around for quite a while. Once it's emitted into the atmosphere, 40 percent still remains after 100 years, 20 percent after 1,000 years, and 10 percent as long as 10,000 years later.

Methane

Although methane (CH_4) persists in the atmosphere for far less time than carbon dioxide (about a decade), it is much more potent in terms of the greenhouse effect. In fact, pound for pound, its global warming impact is 25 times greater than that of carbon dioxide over a 100-year period. Globally it accounts for approximately 16 percent of human-generated greenhouse gas emissions.

Nitrous Oxide

Nitrous oxide (N2O) is a powerful greenhouse gas: It has a GWP 300 times that of carbon dioxide on a 100-year time scale, and it remains in the atmosphere, on average, a little more than a century. It accounts for about 6 percent of human-caused greenhouse gas emissions worldwide.

Fluorinated Gases

Emitted from a variety of manufacturing and industrial processes, fluorinated gases are man-made. There are four main categories: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3).

Although fluorinated gases are emitted in smaller quantities than other greenhouse gases (they account for just 2 percent of man-made global greenhouse gas emissions), they trap substantially more heat. Indeed, the GWP for these gases can be in the thousands to tens of thousands, and they have long atmospheric lifetimes, in some cases lasting tens of thousands of years.

HFCs are used as a replacement for ozone-depleting chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), usually in air conditioners and refrigerators, but some are being phased out because of their high GWP. Replacing these HFCs and properly disposing of them is considered to be one of the most important climate actions the world can take.

Water Vapor

The most abundant greenhouse gas overall, water vapor differs from other greenhouse gases in that changes in its atmospheric concentrations are linked not to human activities directly, but rather to the warming that results from the other greenhouse gases we emit. Warmer air holds more water. And since water vapor is a greenhouse gas, more water absorbs more heat, inducing even greater warming and perpetuating a positive feedback loop. (It’s worth noting, however, that the net impact of this feedback loop is still uncertain, as increased water vapor also increases cloud cover that reflects the sun’s energy away from the earth.)

Big Bend Power Station, a coal-fired power plant in Tampa, Florida

Walter via Flickr

Greenhouse Gases Come From…

Population size, economic activity, lifestyle, energy use, land use patterns, technology, and climate policy: According to the Intergovernmental Panel on Climate Change (IPCC), these are the broad forcings that drive nearly all human-caused greenhouse gas emissions. Here's a closer look at greenhouse gas emissions by source.

Electricity and Heat Production

The burning of coal, oil, and natural gas to produce electricity and heat accounts for one-quarter of worldwide human-driven emissions, making it the largest single source. In the United States it's the second-largest (behind transportation), responsible for about 27.5 percent of U.S. emissions in 2017, with carbon dioxide the primary gas released (along with small amounts of methane and nitrous oxide), mainly from coal combustion.

Agriculture and Land Use Changes

About another quarter of global greenhouse gas emissions stem from agriculture and other land-use activities (such as deforestation). In the United States, agricultural activities—primarily the raising of livestock and crops for food—accounted for 8.4

percent of greenhouse gas emissions in 2017. Of those, the vast majority were methane (which is produced as manure decomposes and as beef and dairy cows belch and pass gas) and nitrous oxide (often released with the use of nitrogen-heavy fertilizers).

Trees, plants, and soil absorb carbon dioxide from the air. The plants and trees do it via photosynthesis (a process by which they turn carbon dioxide into glucose); the soil houses microbes that carbon binds to. So nonagricultural land-use changes such as deforestation, reforestation (replanting in existing forested areas), and afforestation (creating new forested areas) can either increase the amount of carbon in the atmosphere (as in the case of deforestation) or decrease it via absorption, removing more carbon dioxide from the air than they emit. (When trees or plants are cut down, they no longer absorb carbon dioxide, and when they are burned or decompose, they release carbon dioxide back into the atmosphere.) In the United States, land-use activities currently represent a net carbon sink, absorbing more carbon dioxide from the air than they emit.

Industry

About one-fifth of global human-driven emissions come from the industrial sector, which includes the manufacturing of goods and raw materials (like cement and steel), food processing, and construction. In 2017, industry accounted for 22.4 percent of U.S. man-made emissions, of which the majority was carbon dioxide, though methane, nitrous oxide, and fluorinated gases were also released.

Jingying Zhao/Getty

Transportation

The burning of petroleum-based fuels, namely gasoline and diesel, to power the world's transportation systems accounts for 14 percent of global greenhouse gas emissions. In the United States, with Americans buying larger cars and taking more flights and with low gas prices encouraging drivers to use their cars more, transportation is the largest contributor of greenhouse gases. (It accounted for 28.7 percent of U.S. emissions in 2017.) Carbon dioxide is the primary gas emitted, though fuel combustion also releases small amounts of methane and nitrous oxide, and vehicle air conditioning and refrigerated transport release fluorinated gases too.

Nationwide, cars and trucks are responsible for more than 80 percent of transportation-related carbon emissions.

Buildings

Operating buildings around the world generates 6.4 percent of global greenhouse gases. In the United States, homes and businesses accounted for about 11 percent of warming emissions. These emissions, made up mostly of carbon dioxide and methane, stem primarily from burning natural gas and oil for heating and cooking, though other sources include managing waste and wastewater and leaking refrigerants from air-conditioning and refrigeration systems.

Other Sources

This category includes emissions from energy-related activities other than fossil fuel combustion, such as the extraction, refining, processing, and transportation of oil, gas, and coal. Globally, this sector accounts for 9.6 percent of emissions.

Greenhouse Gas Emissions by Country

Since the start of the Industrial Revolution, more than 2,000 billion tons of carbon dioxide have been released into the atmosphere by human activities, according to the Global Carbon Project. North America and Europe are responsible for approximately half of that total, while the emerging economies of China and India have contributed another 14 percent. For the remainder, 150-plus countries share responsibility.

An analysis of carbon dioxide emissions by country today shows that China now leads the pack, responsible for 27 percent of all emissions. Next comes the United States (15 percent), the European Union's 28 member states including the United Kingdom (10 percent), and India (7 percent) next. Together, these global powers account for almost 60 percent of all emissions.

People receive water from a tanker on a hot day in Allahabad, India.

Sanjay Kanojia/AFP/Getty

The Consequences of the Greenhouse Effect

Today's human-caused greenhouse gas emissions are higher than ever, the concentration of greenhouse gases in the atmosphere is rising rapidly, and according to the IPCC, the planet is heating up. Between preindustrial times and now, the earth's average temperature has increased 1.8 degrees Fahrenheit (1.0 degrees Celsius), with approximately two-thirds of that warming occurring in the last handful of decades alone. According to the IPCC, 1983 to 2012 was likely the warmest 30-year period of the last 1,400 years (in the Northern Hemisphere, where assessment is possible). And all five of the years from 2014 to 2018 were the hottest on record globally. If warming trends continue at the current rate, it's estimated global warming will reach 2.7 degrees Fahrenheit (1.5 degrees Celsius) above preindustrial levels between 2030 and 2052.

Fueled by man-made greenhouse gas emissions, global warming is altering the earth's climate systems in many ways. It is:

- Causing more frequent and/or intense extreme weather events, including heat waves, hurricanes, droughts, and floods.
- Exacerbating precipitation extremes, making wet regions wetter and dry regions drier.
- Raising sea levels due to melting glaciers and sea ice and an increase in ocean temperatures (warmer water expands, which can contribute to sea level rise).
- Altering ecosystems and natural habitat, shifting the geographic ranges, seasonal activities, migration patterns, and abundance of land, freshwater, and marine species.

These changes pose threats not only to plants and wildlife, but directly to people. Warmer temperatures mean insects that spread diseases like dengue fever and Zika can thrive—and heat waves are getting hotter and more lethal to humans. People could go hungry when our food supply is diminished thanks to droughts and floods—a 2011 National Research Council study found that for every degree Celsius that the planet heats up, crop yields will go down 5 to 15 percent. Food insecurity can lead to mass human migration and political instability. And in January 2019, the Department of Defense released a report that described the threats to U.S. military installations and operations around the world due to flooding, droughts, and other impacts of climate change.

The Greenhouse Effect Solution

The earth has always experienced warm and cool phases, with natural forces—from the sun's intensity, volcanic eruptions, and natural changes in greenhouse gas concentrations—affecting how much energy from the sun our planet absorbs. Scientists say that as recently as a couple of centuries ago, the planet underwent a "Little Ice Age," caused by a decrease in solar activity and an increase in volcanic activity. But today's climatic warming—particularly the increase in temperatures since the mid-20th century—is occurring at a pace that can't be explained by natural causes alone. According to NASA, "natural causes are still in play today, but their influence is too small or they occur too slowly to explain the rapid warming seen in recent decades."

In other words, humans are the problem. But we may also be the solution. We have the ability to rein in greenhouse gas emissions, though doing so certainly won't be easy. Overhauling our energy systems will require transformative, aggressive global

action—and now. According to the IPCC, we must decrease greenhouse gas pollution by 45 percent from 2010 levels by 2030 and reach net zero emissions by 2050. To allow global warming to exceed 1.5 degrees Celsius (which the IPCC has identified as the threshold for avoiding climate change's worst impacts) would mean more intense drought, extreme heat, flooding, and poverty, the decline of species (including a mass die-off of the world's coral reefs), and the worsening of food shortages and wildfires.

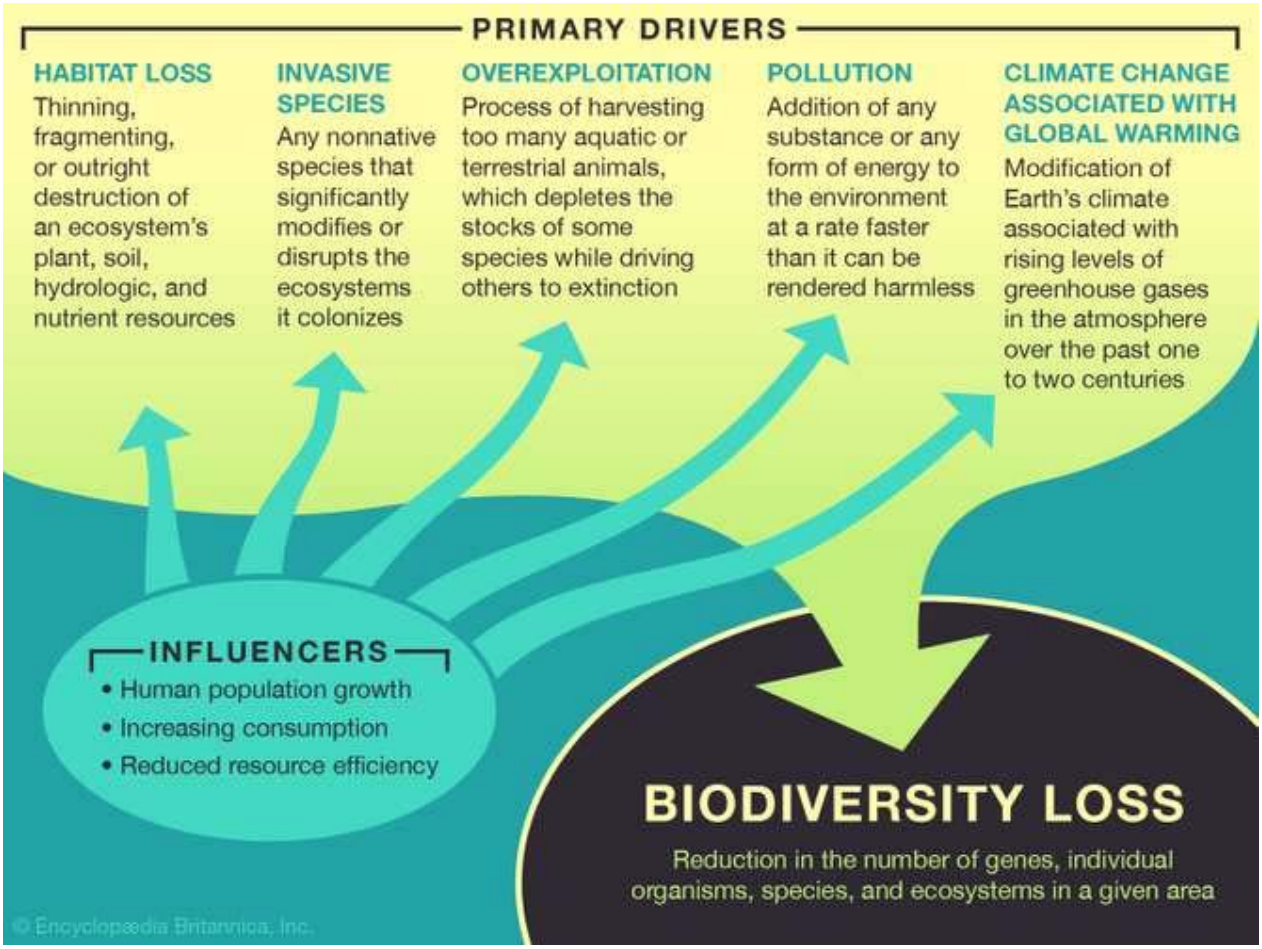
Reducing our greenhouse gas emissions will require significant effort at the international, national, and local levels. First and foremost, we must slash fossil fuel production, consumption, and pollution by ramping up our use of clean, renewable energy and energy-efficient technologies and by investing in fuel-efficient and electric vehicles. We must end fossil fuel subsidies and better leverage "cap and invest" programs, carbon pricing, and carbon capture, storage, and utilization technologies (which catch the carbon dioxide from emissions sources like power plants or directly from the air and permanently bury it underground or convert it into other materials). We must protect our carbon-storing forests and reduce food waste and the emissions that go with it. And as individuals, we must commit to taking carbon-cutting actions in our daily lives.

Currently the United States faces the additional hurdle of an administration doubling down on fossil fuel use by rolling back standards aimed at reducing emissions from dirty power plants and cars and trucks (in other words, from the electricity and transportation sectors, the nation's two largest sources of greenhouse gas emissions). President Trump is also working to withdraw the nation from the landmark 2015 Paris climate agreement even though nearly two-thirds of Americans believe we should do more to tackle climate change, not less.

Still, decision makers, companies, leaders, and activists across the country and around the world staunchly believe we must act on climate change. For just as the emissions of man-made greenhouse gases long ago are inducing the climate change we see now, the emissions we release today will impact us long into the future.

Why is biodiversity an issue?

Biological diversity, or **biodiversity**, is the term given to describe the variety of life on Earth. **Biodiversity** loss disrupts the functioning of ecosystems, making them more vulnerable to perturbations and less able to supply humans with needed services. ...



Major causes of biodiversity are as follows:

1. Habitat Loss and Fragmentation 2. Over-exploitation for Commercialization 3. Invasive Species 4. Pollution 5. Global Climate Change 6. Population Growth and Over-consumption 7. Illegal Wildlife Trade 8. Species extinction.

1. Habitat Loss and Fragmentation:

A habitat is the place where a plant or animal naturally lives. Habitat loss is identified as main threat to 85% of all species described as threatened or endangered. Factors responsible for this are deforestation, fire and over-use and urbanization.

2. Over-exploitation for Commercialization:

Over-exploitation of resources has coasted more environmental degradation than earning. For example; shrimp farming in India, Thailand, Ecuador and Indonesia results in Wetland destruction, pollution of coastal waters and degradation of coastal fisheries. Scientific studies have concluded that cost of environmental degradation resulting from shrimp farming was costing more than the earning through shrimp exports.

3. Invasive Species:

Invasive species are ‘alien’ or ‘exotic’ species which are introduced accidentally or intentionally by human. These species become established in their new environment and spread unchecked, threatening the local biodiversity. These invasive alien species have been identified as the second greatest threat to biodiversity after habitat loss.

4. Pollution:

Pollution is a major threat to biodiversity, and one of the most difficult problems to overcome; Pollutants do not recognize international boundaries. For example, agricultural run-off, which contains a variety of fertilizers and pesticides, may seep into ground water and rivers before ending up in the ocean. Atmospheric pollutants drift with prevailing air currents and are deposited far from their original source.

5. Global Climate Change:

Many climatologists believe that the greenhouse effect is likely to raise world temperatures by about 2°C by 2030, meaning that sea levels will rise by around 30-50 cm by this time. Global warming, coupled with human population growth and accelerating rates of resource use will bring further losses in biological diversity. Vast areas of the world will be inundated causing loss of human life as well as ecosystems.

6. Population Growth and Over-consumption:

From a population of one billion at the beginning of the 19th century, our species now numbers more than six billion people. Such rapid population growth has meant a rapid growth in the exploitation of natural resources— water, foods and minerals. Although there is evidence that our population growth rate is beginning to slow down, it is clear that the exploitation of natural resources is currently not sustainable. Added to this is the fact that 25 per cent of the population consumes about 75 per cent of the world’s natural resources. This problem of over-consumption is one part of the broader issue of unsustainable use.

7. Illegal Wildlife Trade:

The international trade in wild plants and animals is enormous. Live animals are taken for the pet trade, or their parts exported for medicines or food. Plants are also taken from the wild for their horticultural or medicinal value.

8. Species extinction:

Extinction is a natural process. The geological record indicates that many hundreds of thousands of plant and animal species have disappeared over the eras as they have failed to adapt to changing conditions. Recent findings however indicate that the current rate of species extinction is at least a hundred to a thousand times higher than the natural rate.