Causes of Climate Change-Impacts on human communities, biodiversity, global economy, and agriculture

Climate Change-Causes, Impact, Global & India's Initiatives

Since August 2018, when Greta Thunberg initiated a protest in front of the Swedish Parliament, there have been hundreds of similar "climate strikes" across the world. This, along with extreme weather conditions like unpredictable monsoons, extended droughts and frequent cyclones are doing little to make the global leaders undertake measures to address this issue. At the UNFCCC's 25th COP that was held in Madrid last year, global leaders were unable to move forward to fulfil the commitments they made in the 2016 Paris Agreement. Although India has been more proactive than many other nations in dealing with the global climate crisis, it too has fallen short on the implementation. If the necessary steps are not taken soon, the decade we are going to embark on is going to be a lot more dangerous due to the rapid, out of control climate change.

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What is climate change?

- Climate Change is a periodic modification of Earth's climate brought about due to the changes in the atmosphere as well as the interactions between the atmosphere and various other geological, chemical, biological and geographical factors within the Earth's system.
- Climate change can make weather patterns less predictable. These unforeseen weather patterns can make it difficult to maintain and grow crops, making agriculture-dependent countries like India vulnerable.
- It is also causing damaging weather events like more frequent and intense hurricanes, floods, cyclones, flooding etc.
- Due to the rising temperature caused by climate change, the ice in the polar regions is melting at an accelerated rate, causing sea levels to rise. This is damaging the coastlines due to the increased flooding and erosion.
- The cause of the current rapid climate change is due to human activities and threatening the very survival of humankind.

What are the factors that cause climate change?

Climate change is caused by natural factors as well as anthropogenic factors. However, anthropogenic factors create a higher impact on contemporary climate change.

Natural Factors:

There are numerous natural factors that cause the Earth's climate to change. They affect the climate over a period of thousands to millions of years.

Continental Drift:

- The present-day continents were not the same prior to 200 million years.
- They have formed millions of years ago when the landmass began to drift apart due to plate displacement.
- This movement had an impact on climate change due to the change on the landmass's physical features and position and the change in water bodies' position like the change in the follow of ocean currents and winds.
- The drifting of the landmass is continued today. The Himalayan range is rising approximately 1 millimetre every year as the Indian landmass is moving towards the Asian landmass.

Variation of the Earth's orbit:

- The Earth's orbit has an impact on the sunlight's seasonal distribution that is reaching the Earth's surface.
- A slight change in the Earth's orbit can lead to variation in distribution across the world.
- There are very few changes to the average sunshine. However, it causes a high impact on the geographical and seasonal distribution.
- There are three types of orbital variations – variations in Earth's electricity, variations in the tilt angle of the Earth's axis of rotation and precession of Earth's axis.
- These together can cause Milankovitch cycles, which have a huge impact on climate and are well-known for their connection to the glacial and interglacial periods.
- The Intergovernmental Panel on Climate Change finding showed that the Milankovitch cycles had influenced the behaviour of ice formation

Plate tectonics:

- Due to the change in the temperature in the core of the Earth, the mantle plumes and convection currents forced the Earth's Plates to adjust leading to the rearrangement of the Earth Plate.
- This can influence the global and local patterns of climate and atmosphere.
- The oceans' geometry is determined by the continents' position. Therefore, the position of the continents influences the pattern of the ocean.
- The location of the sea also plays a crucial role in controlling the transfer of heat and moisture across the globe and determines the global climate.
- The recent example of the tectonic control on ocean circulation is the formation of the Isthmus of Panama about 5 million years ago, leading to the prevention of direct mixing of the Atlantic and Pacific oceans.

Volcanic Activity:

- When a volcano erupts, it emits gases and dust particles, causing a partial block of the Sunrays. This can lead to the cooling of the weather.
- Though the volcanic activities last only for a few days, the gases and ashes released by it can last for a long period, leading to it influencing climate patterns.
- Sulphur oxide emitted by the volcanic activities can combine with water to form tiny droplets of sulphuric acid. These droplets are so small that many of them can stay in the air for several years.

Ocean Currents:

- Ocean current is one of the major components of the climate system.
- It is driven by horizontal winds causing the movement of the water against the sea surface.
- The temperature differences of the water influence the climate of the region.

Anthropogenic Factors:

Scientists, since the beginning of the 20^{th} century, have studied the impact of climate change caused by human activities. Global warming, the long-term rise in the average temperature of the Earth's climate system, is a major aspect of climate change. It is mainly a human-caused increase in global surface temperature. The anthropogenic factors causing climate change are as follows:

Greenhouse Gases:

- The greenhouse gases absorb heat radiation from the sun. Following the initiation of the Industrial Revolution, the emission of greenhouse gases into the atmosphere has increased exponentially.
- This has led to more absorption and retaining the heat in the atmosphere. This resulted in an increase in Global Temperature.
- The greenhouse gases mostly do not absorb the solar radiation but absorb most of the infrared emitted by the Earth's surface.
- The main greenhouse gases include
  - **water vapour** (the majority of the GHG in the atmosphere but the impact is less)
- **Carbon dioxide** released due to natural and anthropogenic factors spends more time in the atmosphere, leading to an increase in its impact. There has been a 30% increase in the concentration of CO_2 since the start of the industrial revolution. Apart from the industrial revolution, deforestation also contributes to the increase in the CO

- **Chlorofluorocarbons**, used for industrial purposes, especially in refrigerants and air conditioning, is a man-made compound regulated under the Montreal Protocol due to their adverse effects on the Ozone layers.
- **Methane** is released due to decomposition of organic matter. It is stronger than CO_2 because of its capacity to absorb more heat.
- **Nitrous oxide** is produced by the agricultural sector, especially in the production and use of organic fertilizers and while burning fossil fuels.

Change in the land use pattern:

- Half of the land-use change is said to have happened during the industrial era.
- Most of the forests were replaced by agricultural cropping and grazing of lands.
- The increased albedo (reflectivity of an object in space) in the snow-covered high altitude regions due to deforestation led to the cooling of the planet's surface. The lower the albedo, the more of the Sun's radiation gets absorbed by the planet and the temperatures will rise. If the albedo is higher and the Earth is more reflective, the more of the radiation is returned to space, leading to the cooling of the planet.
- The tropical deforestation changes the evapotranspiration rates (the amount of water vapour put in the atmosphere through evaporation and transpiration from trees), causes desertification and affects soil moisture characteristics.
- From the satellite imagery, it is seen that the clearing of forest cover for agriculture and irrigated farming in arid and semi-arid lands can increase solar energy absorption and the amount of moisture evaporated into the atmosphere.

Atmospheric aerosols:

- Atmospheric aerosol can:
- scatter and absorb the solar and infrared radiation
- change microphysical and chemical properties of the clouds
- Solar radiation, when scattered, cools the planet. On the other hand, when the aerosols absorb solar radiation, it causes an increase in the temperature of the air instead of allowing the sunlight to be absorbed by the Earth's surface.
- Aerosols can directly affect climate change by absorbing or reflecting solar radiation. They can also produce indirect effects by modifying the cloud's formation and properties.
- They can even be transported thousands of kilometres away from its source through wind and upper-level circulation in the atmosphere.
- There are two types of aerosols – Natural aerosols and Anthropogenic aerosols.
- The sources of natural aerosols include volcanic eruptions (produces sulphate aerosols) and biogenic sources like planktons (can produce dimethyl sulphide).
- The anthropogenic aerosols include:
- The ammonia used for fertilizers or released by the burning of plants and other organic materials forms a major source for Nitrate aerosols.
- Burning of coal and oil produces sulphur dioxide that forms a major source of sulphate aerosols
- Burning of biomass can release a combination of organic droplets and soot particles.
- Industrial activities cause the release of wide-ranging aerosols into the atmosphere.
- Vehicle emissions can produce numerous pollutants that are aerosol from the beginning or becomes one due to chemical reactions in the atmosphere.
- It is found that the concentration of aerosols is about three times higher in the Northern Hemisphere than in the Southern Hemisphere, leading to Northern Hemisphere's radiation concentration being 50% higher than that of the Southern Hemisphere.

What are the effects of climate change?

Global warming has caused a change in the climatic and weather conditions like change in the rainfall pattern, increased flooding, drought, heatwaves, etc. The planet's ocean and glaciers have felt some significant changes. Oceans are currently warming and becoming more acidic. The ice caps are melting, causing the sea levels to rise. These changes are predicted to be more prominent in the coming decades, threatening our environment and existence. Some of the current impacts of rapid climate change are as follows:

A rise in atmospheric temperature:

- The greenhouse gases released due to human activities are increasing the temperature of the Earth.
- The last 6 years topped the list of hottest years ever recorded.
- The increase in temperature is the major cause of the current increase in heat-related deaths and illnesses, rise in sea levels and an increase in the intensity of natural disasters.
- The 20^{th} century saw an increase in the Earth's average temperature by 1°F. This is believed to be the fastest rise in a thousand years.
- Research estimates predict that if the GHGs are not reduced, the average surface temperature could increase to 3-5°F by the end of this century.

Change in landscapes:

- Increasing temperature and changing climate and weather patterns across the globe led to the shift of trees and plants towards Polar Regions and mountains.
- As the vegetation tries to adapt to climate change by moving towards colder regions, the animals that are dependent on them will be forced to follow them for survival. While some survive, many perish in the attempt.
- Other species like polar bears dependent on cold terrains will not have any habitat due to the melting of ice, causing a risk to their survival.
- Thus, the current hasty change in the landscape causes a considerable risk to the survival of many species, including the human population.

A risk to the ecosystem:

- An increase in the temperature across the globe is changing the weather and vegetation patterns, making the species to migrate to cooler areas for survival.
- This poses a threat to the survival of numerous species. It is projected that by 2050, one-fourth of the Earth's species may become extinct if the current trend continues.

Rising sea levels:

- An increase in the temperature of the Earth leads to a rise in sea level due to the thermal expansion (a condition wherein the warm water takes up more area than cooler water). The melting of glaciers adds to this problem.
- The population living in under-lying areas, islands and coasts are threatened by the rising sea levels.
- It erodes shorelines, damage properties and destroys ecosystems like mangroves and wetlands that protect coasts from storms.
- In the last 100 years, the sea level has risen to 4-8 inches and will continue to rise between 4 and 36 inches in the next 100 years.

Ocean Acidification:

- The increase in the CO_2 concentration in the atmosphere has increased the CO_2 absorption in the ocean. This makes the ocean acidic.
- The increase in the acidification of the ocean can be harmful to many marine species like plankton, molluscs, etc. The corals are especially susceptible to this as they find it difficult to create and maintain the skeletal structures needed for their survival.

Increase in the risk of natural and manmade disasters:

- The moisture from land and water is rapidly evaporating due to the high atmospheric temperature.
- This causes drought. Those areas that are affected by drought are highly susceptible to the negative effects of flooding.
- As this current condition, the droughts may become more frequent and more severe. This may lead to distressing consequences for agriculture, water security, and health.
- Countries in Asia and Africa are already facing this phenomenon, with droughts becoming longer and more intense.
- The increased temperature is not only causing droughts but also increasing the cases of forest fires across the globe.
- Climate change is also causing increased and intensified hurricanes and tropical storms, causing a devastating impact on human societies and the environment.
- The cause of this is the rise in the ocean temperature as warm waters influence the hurricanes and tropical storms energies.
- The other factors that cause intensified hurricane and tropical storms are raising sea levels, disappearing wetlands and increased coastal development.

Health issues:

- The high temperature across the globe can pose health risks and deaths.
- The increased heat waves caused by climate change have led to the deaths of many globally.
- For instance, in 2003, the extreme heatwaves led to the death of more than 20,000 people in Europe and caused more than 1,500 deaths in India.
- Climate change increases the spreading of contagious diseases as the long-term warm weather allows disease-carrying insects, animals and microbes to survive longer.
- Disease and pests that were once confined to the tropics may find it habitable in the colder regions that were previously inhospitable.
- Currently, there is an increase in death due to extreme heat, natural disasters and diseases due to climate change.
- World Health Organisation estimates that between 2030 and 2050, climate change may cause approximately 250,000 additional deaths per year due to malnutrition, malaria, diarrhoea and extreme heat.

Economic impacts:

- It is estimated that if action is not taken to address the carbon emissions, climate change could cost about 5 to 20% of the annual global GDP.
- In contrast, the cost to lessen the most damaging effects of climate change is just 1% of the GDP.
- Climate change can alter shoreline habitats. This may lead to the need for relocation of ports and near-shore infrastructures and habitats, costing about millions of dollars.
- The increased hurricanes and other related natural disasters can bring forth extreme economic losses caused by damaged properties and infrastructures.
- Declining crop yields due to the lengthy droughts and high temperatures can lead to a risk of starvation of thousands of people.
- Coral reefs generate approximately $375 billion each year in goods and services. Their very survival is currently under threat.

Agriculture productivity and food security:

- The crop cultivation is dependent on solar radiation, favourable temperature and precipitation.
- Hence, agriculture has always been dependent on climate patterns.
- The current climate change
- has affected agricultural productivity, food supply and food security.
- These effects are biophysical, ecological and economic.
- They resulted in:
- Climate and agricultural zones are moving towards poles
- There is a change in the agricultural production pattern due to increased atmospheric temperature
- Agricultural productivity has increased due to the rise in CO_2 in the atmosphere.
- Unpredictable precipitation patterns
- The vulnerability of the landless and the poor has increased.

How is climate change affecting India?

- One of the major areas that will be extremely vulnerable to climate change in the future is South Asia.
- India especially will be vulnerable to climate change due to its diverse terrain, rapid use of natural resources due to the current trend of precipitous urbanisation, industrialisation and economic growth.
- Currently, India, in its effort to protect its fast diminishing natural resources, is facing environmental and socio-economic challenges.
- Water and air quality are worsening each day due to environmental pollution.
- Those that are especially susceptible to climate change are the country's coastal ecosystems, biodiversity and agricultural productivity.
- The natural disasters' increasing frequency and intensity are causing negative effects to the already struggling Indian economy.
- The adverse effects of such disasters range from poverty, vulnerability to diseases, loss of income and livelihoods.
- According to the World Bank, an increase of 2°C in the world's average temperature in the next few decades will only make India's monsoon more unpredictable.
- The changing rain patterns in India are predicted to leave many areas flooded and others without water scarcity.
- More than 60% of India's agriculture is dependent on rain and the majority of the population are dependent on the agriculture sector for survival. This makes India more vulnerable to climate change.

- It is estimated that by the 2050s, with a temperature increase of 2-2.5°C, water in the river basins of Indus, Ganges and Brahmaputra will be reduced. This may threaten the food security of about 63 million people.
- The poverty reduction rate will also be slowed down due to the rise in the atmospheric temperature.
- Poor will be more vulnerable to climate change since many of them are dependent on the rain-dependent agriculture.
- An increase of 2°C by the 2040s is going to affect crop production and will reduce the crop output by 12%, requiring more imports to meet the domestic demands.
- Furthermore, the decreasing availability of food can give rise to considerable health issues especially among women and children.
- The melting glaciers and loss of snow can pose a risk to reliable water resources in India.
- Main rivers like Ganges, Indus, and Brahmaputra mostly depend on snow and glacial meltwater. This makes them vulnerable to global warming.
- Climate change can further increase the risk of flooding of low areas and threatens agriculture.

Government measures' limitations:

- From the recent cases of natural disasters like the Chennai Floods, 2015, 2016 drought, 2019 Kerala floods, etc., it is evident that there are no adequate arrangements made to mitigate them.
- For instance, in the case of Uttarakhand or the Chennai rains, the arrangements weren't adequate to allow the flow of rainwater due to the illegal constructions.
- From the 2016 drought, there were increased deaths, most of them were economically poor and the underprivileged.
- The government failed to ensure long-term mitigation and the big corporate houses that contribute to large-scale pollution of air and water escape with a mere "corporate social liability" clauses. These are some of the major causes of the devastating impact of these natural disasters.
- India does not have stringent laws to ensure protection against climate change.
- The authorities will not be prosecuted for their negligence of duty and the cases that manage to reach the Supreme Court through the public interest litigation were only able to bring about small changes in averting the future crisis.
- Each year, India is facing the negative impact of climate change and the government is taking measures to address it. Yet the measures taken will not be enough to solve the issue due to poor implementation and lack of accountability.

What are the efforts taken at the international level to combat climate change?

Intergovernmental Panel on Climate Change (IPCC)

- The World Meteorological Organisation (WMO) and the UN Environment Programme (UNEP) founded the IPCC to provide for a mechanism to study the effects of global warming at a governmental level.
- IPCC is a UN body that assesses the science related to climate change.
- It provides the policymakers with regular scientific assessments on climate change, its implications and potential future risks while also providing adaptation and mitigation options.
- It complements UNFCCC and vice versa.

United Nations Framework Convention on Climate Change (UNFCCC):

- It came to force on 21st March 1994.
- The 195 countries that have ratified it are called the Parties to the Convention.
- The UNFCC is a Rio Convention, one of the three adopted at the Rio Earth Summit in 1992. The others include the UN Convention on Biological Diversity and the UN Convention to Combat Desertification.
- The Joint Liaison Group was established to ensure cooperation among the three Conventions.
- Currently, it also consists of the Ramsar Convention on Wetlands.
- The ultimate aim of the Convention is to stabilize the greenhouse gas concentration "at a level that would prevent dangerous anthropogenic interference with the climate system".
- It also aims to achieve the said level within a specific period so that the ecosystem is allowed to adapt naturally to climate change while also ensuring food security and sustainable economic development.
- Following its establishment, the COP1 (first Conference of Parties) was held in Berlin, COP2 was held in Geneva and the COP3 was held in Kyoto to adopt the "Kyoto Protocol" that ensures the implementation of the UNFCCC's objective.

Kyoto Protocol:

- Kyoto Protocols was adopted in Kyoto, Japan on 11th December 1997 and came to force on 16th February 2005
- Its signatories are committed towards the achievement of emission reduction targets.
- COP 7 held in Morocco in 2001 saw the adoption of the detailed rules for the implementation of the protocol. These are referred to as "Marrakesh Accords".
- This protocol holds the developed countries are accountable for the current high levels of GHG emissions into the atmosphere due to their role in the industrial revolution.
- Kyoto Mechanism, also known as Flexible Mechanism, is defined under the Kyoto Protocol to lower the overall cost of achieving the emission targets. It includes Emission Trading, the Clean Development Mechanism and Joint Implementation.
- On December 2012, the Doha Amendment to the Kyoto Protocol was adopted. The changes made include:
- New commitments were made by Annex I Parties (developed nations and Economies in Transition) to be implemented between the period of 1st January 2013 and 31st December 2020.
- A revised list of GHG that is to be reported by the Parties during the second commitment period
- Amendments were made to update several articles of the Kyoto Protocol to be on par with the second commitment period.
- The Kyoto Protocol is a significant step towards the reduction of global emission regime that will allow the stabilisation of GHG emissions.

Paris Agreement:

- Signed in 2016, it is considered to be the world's first comprehensive climate agreement.
- It aims to:
- Keep the global temperature well below 2°C above preindustrial times and endeavour to limit them even more to 1.5°C.
- Strengthen the nations' ability to combat the adverse impacts of climate change.
- The Paris Accord calls for a reduction of the GHGs emitted due to human activities equal to that of the trees, soil and oceans so that they can be absorbed naturally.
- As per the Agreement, each country's contribution towards cutting emission must be reviewed every 5 years.
- It also states that rich countries must help the poorer nations by providing them with "Climate finances" to make them shift towards renewable energy usage.
- The agreement is binding in some elements like reporting requirements. Other elements of the agreement are non-binding like the emission targets of the individual nations.
- The Paris Agreement necessitates all Parties to put forth their best efforts through Nationally Determined Contributions (NDCs) and to strengthen these efforts in the future.
- This also includes the need for regular reporting emissions and implementation by the parties.
- India's Intended Nationally Determined Contribution (INDC) includes the reduction in the intensity of its GDP by 33 to 35% by 2030 from 2005 level. Additionally, it has pledged to increase the share of non-fossil fuel-based electricity by 40% by 2030. It has also agreed to enhance its forest cover, which will absorb 2.5 to 3 billion tonnes of CO_2 by 2030.

REDD+

- Reducing Emissions from Deforestation and Forest Degradation (REDD+) is a mechanism developed by Parties of the UNFCCC.
- It creates financial value for the carbon stored in forests to offer incentives for the developing nations to reduce emissions from forested lands and invest in low-carbon paths.
- The developing nations will receive results-based payments for results-based actions.
- The REDD+ goes beyond simply deforestation and forest degradation by including the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.
- It is estimated that the financial flows for the GHG emission reduction from REDD+ could reach up to $30 billion per year.
- This improved North-South flow of funds can ensure a significant reduction of carbon emissions and the promotion of inclusive development. It could also improve biodiversity conservation and secure vital ecosystem services.
- Forests are vital carbon sink and thus, it is vital to increase its resilience to climate change.

What are the measures taken by the Indian government to combat climate change?

- India is this fifth-largest emitter of GHG, accounting for approximately 5% of global emission.
- Emissions from India have increased by 65% during 1990-2005 and are estimated to increase by another 70% by 2020.
- As previously mentioned India is especially vulnerable to climate change because of the increased natural disasters, depleting natural resources and high dependence on agriculture and rain.
- Regardless of the resource limitations, India is taking numerous measures to adapt and mitigate climate change by increasing energy efficiency, promoting circular economic model, promoting the use of renewable energy
- India is among the few countries that have increased the Clean Energy Cess on coal.
- Clean Energy Fund worth approximately $3 billion is used to promote the use of clean technologies.
- The government is also increasing the investments for afforestation to increase the carbon sink.
- India has set a target of 33% of its geographical area under forest cover. According to the biennial State of India's Forest Report 2019 (SoFR 2019), India's total forest cover is 21.67% of the total geographical area of the country.
- India has allocated about $200 million for the National Adaptation Fund for Climate Change (NAFCC).
- It aims to support adaptation activities that can mitigate the adverse impact of climate change.
- The scheme's activities are implemented in the project mode and the projects are related to adaptation in sectors like agriculture, animal husbandry, water, forestry, tourism, etc.
- Other initiatives include 100 smart cities, National Mission for Clean Ganga, National Air Quality Scheme, etc. Other major government measures are as follows:

National Action Plan on Climate Change (NAPCC)

- As a part of the NAPCC, the Indian government had launched 8 missions on focused areas. They are:
- National Solar Mission
- National Mission for Enhanced Energy Efficiency
- National Mission on Sustainable Habitat
- National Water Mission
- National Mission for Sustaining the Himalayan Ecosystem
- National Mission for a "Green India" Goals
- National Mission for Sustainable Agriculture
- National Mission on Strategic Knowledge for Climate Change

National Action Programme to Combat Desertification:

- India is one of the parties of UNCCD.
- The Ministry of Environment, Forest and Climate Change is the National Coordination Agency for the implementation of the UNCCD at the national level.
- India has framed the 20-year comprehensive National Action Programme (NAP) to address the problem of desertification within the nation. The objectives include:
- Drought management, preparedness, and mitigation
- Development based on a community approach
- Promote the improvement of local communities' quality of life
- Promote awareness
- Promote suitable research and development initiatives and interventions.
- Promoting self-governance to empower local communities so that they can deal with issues pertaining to climate change.

India in the international forums on climate change:

- India is currently setting up voluntary targets in the international forums to commit itself to the mission to combat climate change. It is also playing a major role in climate change mitigation.
- India's proactive role in mitigating climate change is due to the domestic compulsion of tackling issues like the need for poverty eradication, food and nutritional security, universalization of health and education, water security, sustainable energy, employment
- India is of the opinion that the developing countries' need for inclusive growth, sustainable development, poverty eradication and universal access to energy must be made the fundamental differentiation between them and the developed nations. Currently, the Conventions recognise that the historical emissions of the developed nations as the basis for differentiation between the developed and developing nations.

What is stopping us from mitigating climate change?

The numerous decision-making barriers that currently exist are preventing the desired level of adaptation. The 5th Assessment Report of the IPCC has comprehensively identified the economic barriers that are preventing government decision on adaption to climate change. They are:

- **Transitional costs:** These are broadly divided into information and adjustment costs. The former refers to the costs that occur while acquiring information and the latter are the costs for replacing the long-lived capital.
- **Market failures and missing markets**: These include externalities, information asymmetries, and moral hazards. These cases are especially seen when one economic unit harms another unit. It also occurs when there aren't sufficient incentives for the change.
- **Behaviour obstacles to adaption**: Irrational decisions, social norms, and cultural factors also pose as obstacles to adaption decision making.
- **Ethical and distributional issues**: These issues connect to the differences in vulnerability and adaptive capacity. Though sometimes a decision could ensure cost-effective and sustainable solutions, ethical constraints hinder these decisions.
- **Coordination, government failures and politics**: Though the governments must ensure the removal of the aforementioned barriers, they themselves face similar barriers like limited knowledge or resources. Also, coordination among various departments, though important, is highly difficult to obtain. Politics on whether or not climate change is real is also preventing the governments from undertaking adaption decision-making.
- **Uncertainty** is the largest barrier to adaptation as it expands to different dimensions like future developments of demographics, technologies and economics and the future of climate change.

Conclusion

Climate change is happening. This should be accepted and not politicised. International cooperation to address climate change is vital to mitigate the adverse impact. Additionally, mitigation must be complemented with climate change-related adaption since mitigation alone cannot address the adverse effects we are facing right now. An international level comprehensive plan of action is necessary for inclusive and sustainable growth of the global community.

Global Warming- Impacts on human communities, biodiversity, global economy, and agriculture

Global Warming is the increase in Earth's mean surface temperature because of the effect of greenhouse gases. These gases absorb longwave radiations and warm the atmosphere, and this process is called a Greenhouse effect.

It had led to many changes on the planet, such as a rise in sea level; massive melting of snow and land ice, elevated heat content of the oceans, increased humidity, change in the timings of seasonal events, and many others.

For both land and ocean, the global mean surface temperature indicates warming of 0.85°C from 1880 to 2012. During the period 1906-2005, the Earth's mean surface temperature had increased by 0.74±0.18°C. Hence, it is seen that the rate of warming approximately doubled for the last half of that duration (0.13±0.03°C per decade, as compared to 0.07±0.02°C per decade).

Effects of Greenhouse Gases (GHGs) on Global Warming

The main greenhouse gases, namely: **Carbon dioxide (CO_2); Methane (CH_4); Nitrous oxide (N_2O); Hydrofluorocarbons (HFCs); Perfluorocarbons (PFCs); and Sulphur hexafluoride (SF_6)**. The impact of any GHG is based on the magnitude of the rise in its concentration, its duration in the atmosphere and the wavelength of radiation that is absorbed.

1. Carbon dioxide is the GHG which is present in the largest concentration in the atmosphere. Its emission chiefly comes from fossil fuel combustion. It is showing a rise of about 0.5% per annum.

2. Chlorofluorocarbons (CFCs) are produced due to anthropogenic activity. Ozone is present in the stratosphere where ultraviolet (UV) radiations convert oxygen into ozone. Hence, the UV rays do not reach the Earth's surface. The CFCs which goes into the stratosphere destroys the ozone, which is evidently seen over Antarctica. The reduction of ozone concentration in the stratosphere is known as the ozone hole. This permits the UV rays to pass through the troposphere.

3. Nitrous oxide is naturally produced by oceans and rainforests. Man-made sources of nitrous oxide include nylon and nitric acid production, the use of

fertilisers in agriculture, cars with catalytic converters and the burning of organic matter.

4. Hydrofluorocarbons (HFCs) are used as refrigerants, especially after the ozone-destroying CFCs had been under the Montreal Protocol.

5. Perfluorocarbons (PFCs): Emitted as a result of production of flourites, they have an atmospheric lifetime of more than 1,000 years.

6. Sulphur hexafluoride (SF_6): The most powerful greenhouse gas yet discovered, it is emitted as result of production of flourites.

What is Green Muffler & its relation with pollution?

Global efforts have been started for decreasing the emission of GHGs into the atmosphere. Of the many initiatives, the most important one is the *Kyoto protocol* declared in 1997, and came into effect in 2005, authorized by 141 countries. Kyoto protocol controlled 35 industrialised nations to reduce the emission of GHGs by the year 2012 to 5% less than the levels present in the year 1990.

The concentrations of greenhouse gases are not larger than oxygen and nitrogen, because neither has more than two atoms per molecule, and so they lack the internal vibrational modes that molecules with more than two atoms possess. Both water and CO_2 have these "internal vibrational modes", and these modes of vibrations can consume and resend infrared radiation, which causes the greenhouse effect.

Impacts of Global Warming

1. **Rising Sea level:** Flooding of fresh water marshlands, low-lying cities, and islands with marine water is one of the major effects of global warming.

2. **Changes in rainfall patterns:** In some areas, droughts and fires happen, whereas in other areas, flooding takes place. This all is due to changes in rainfall pattern.

3. **Melting of the ice peaks:** Due to melting of the ice peaks, there is loss of habitat near the poles. Now the polar bears are considered to be greatly endangered by the shortening of their feeding season because of declining ice packs.
4. **Melting glaciers:** There is a significant melting of old glaciers.
5. **Spread of disease:** There is spread of diseases like malaria due to migration to newer and currently warmer regions.
6. **Thinning of Coral Reefs** due to warming seas as well as acidification because of carbonic acid formation: Almost one-third of coral reefs are now severely damaged by warming seas.
7. **Loss of Plankton** owing to warming seas: The large (900 miles long) Aleutian island ecosystems consisting of whales, sea lions, sea urchins, kelp beds, fish, and other aquatic animals, has now reduced due to loss of plankton.

Ozone Layer Depletion-Impacts on human communities, biodiversity, global economy, and agriculture

Ozone layer depletion, is simply the wearing out (reduction) of the amount of ozone in the stratosphere. Depletion begins when CFC's get into the stratosphere. Ultra violet radiation from the sun breaks up these CFCs. The breaking up action releases Chlorine atoms. Chlorine atoms react with Ozone, starting a chemical cycle that destroys the good ozone in that area.

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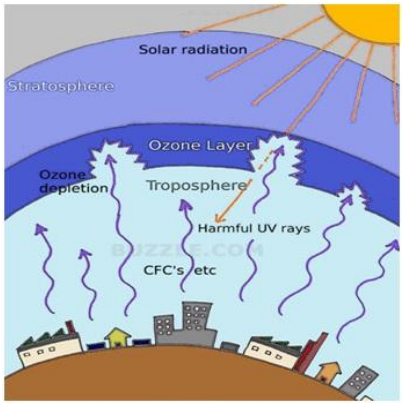


Ozone depletion describes two distinct but related phenomena observed since the late 1970s: a steady decline of about 4% per decade in the total volume of ozone in Earth's stratosphere (the ozone layer), and a much larger springtime decrease in stratospheric ozone over Earth's Polar Regions. The latter phenomenon is referred to as the ozone hole. In addition to these well-known stratospheric phenomena, there are also springtime polar troposphere ozone depletion events.

The details of polar ozone hole formation differ from that of mid-latitude thinning, but the most important process in both is catalytic destruction of ozone by atomic halogens. The main source of these halogen atoms in the stratosphere is photo dissociation of man-made halocarbon refrigerants (CFCs, Freon, and Halons). These compounds are transported into the stratosphere after being emitted at the surface. Both types of ozone depletion were observed to increase as emissions of halo-carbons increased.

CFCs and other contributory substances are referred to as ozone-depleting substances (ODS). Since the ozone layer prevents most harmful UVB wavelengths (280–315 nm) of ultraviolet light (UV light) from passing through the Earth's atmosphere, observed and projected decreases in ozone have generated worldwide concern leading to adoption of the Montreal Protocol that bans the production of CFCs, halons, and other ozone-depleting chemicals such as carbon tetrachloride and trichloro ethane. It is suspected that a variety of biological consequences such as increases in skin cancer, cataracts, damage to plants, and reduction of plankton populations in the ocean's photic zone may result from the increased UV exposure due to ozone depletion.

CFCs were invented by Thomas Midgley, Jr. in the 1920s. They were used in air conditioning and cooling units, as aerosol spray propellants prior to the 1970s, and in the cleaning processes of delicate electronic equipment. They also occur as by-products of some chemical processes. No significant natural sources have ever been identified for these compounds — their presence in the atmosphere is due almost entirely to human manufacture. As mentioned above, when such ozone-depleting chemicals reach the stratosphere, they are dissociated by ultraviolet light to release chlorine atoms. The chlorine atoms act as a catalyst, and each can break down tens of thousands of ozone molecules before being removed from the stratosphere. Given the longevity of CFC molecules, recovery times are measured in decades. It is calculated that a CFC molecule takes an average of about five to seven years to go from the

ground level up to the upper atmosphere, and it can stay there for about a century, destroying up to one hundred thousand ozone molecules during that time

The **Antarctic ozone hole** is an area of the Antarctic stratosphere in which the recent ozone levels have dropped to as low as 33% of their pre-1975 values. The ozone hole occurs during the Antarctic spring, from September to early December, as strong westerly winds start to circulate around the continent and create an atmospheric container. Within this polar vortex, over 50% of the lower stratospheric ozone is destroyed during the Antarctic spring.
As explained above, the **primary cause of ozone depletion** is the presence of chlorine-containing source gases (primarily CFCs and related halocarbons). In the presence of UV light, these gases dissociate, releasing chlorine atoms, which then go on to catalyze ozone destruction. The Cl-catalyzed ozone depletion can take place in the gas phase, but it is dramatically enhanced in the presence of polar stratospheric clouds (PSCs).
These **polar stratospheric clouds** (PSC) form during winter, in the extreme cold. Polar winters are dark, consisting of 3 months without solar radiation (sunlight). The lack of sunlight contributes to a decrease in temperature and the polar vortex traps and chills air. And when the spring comes the sunshine acts as a catalyst and helps in the chemical reaction which leads to Ozone Hole formation.
Consequences of ozone layer depletion:

- Increased UV
- Basal and squamous cell carcinomas- he most common forms of skin cancer in humans
- Malignant melanoma-Another form of skin cancer
- Cortical cataracts
- An increase of UV radiation would be expected to affect crops. A number of economically important species of plants, such as rice, depend on

Cyanobacteria residing on their roots for the retention of nitrogen. Cyanobacteria are sensitive to UV radiation and would be affected by its increase.

Effects on the skin

Although fair-skinned, fair-haired individuals are at highest risk for skin cancer, the risk for all skin types increases with exposure to UV-B radiation. The effects of UV-B on the human immune system have been observed in people with all types of skin. There are three main types of skin cancer, basal cell carcinoma, squamous cell carcinoma, and malignant melanoma. Most cases of skin cancer in Canada are either basal or squamous cell carcinoma. Basal and squamous cell carcinomas progress slowly and rarely cause death because they usually don't spread to other parts of the body. These cancers are easily removed by surgery. Melanoma is the most serious and fortunately the least common form of skin cancer. Scientists strongly suspect that malignant melanoma, which can be fatal, is caused by exposure to UV light.

Scientists have confirmed that non-melanoma skin cancer is caused by UV-B radiation, and further believe that a sustained 10% depletion of the ozone layer would lead to a 26% percent increase in non-melanoma skin cancer. This could mean an additional 300,000 cases per year world wide.

Effects on the eyes

UV-B radiation can damage several parts of the eye, including the lens, the cornea, and the membrane covering the eye (conjunctiva). "Snow blindness" is the result of overexposure to UV-B and occurs in areas of the world with high levels of UV exposure, including snowy regions at high altitudes. Snow blindness is not unlike a sunburn, and if repeated, can cause damage to eye over the long term.

Cataracts are a clouding of the eye's lens and are the leading cause of permanent blindness world wide. They are a result of overexposure to UV. A sustained 10% thinning of the ozone layer is expected to result in nearly two million new cases of cataracts per year globally.

Effects on the immune system

UV affects our ability to fight disease. The body's immune system is its first line of defense against invading germs. Recent research has shown that some viruses can be activated by increased exposure to UV.

Effects on the environment

Ultraviolet radiation not only affects humans, but wildlife as well. Excessive UV-B inhibits the growth processes of almost all green plants. There is concern that ozone depletion may lead to a loss of plant species and reduce global food supply. Any change in the balance of plant species can have serious effects, since all life is interconnected. Plants form the basis of the food web, prevent soil erosion and water loss, and are the primary producers of oxygen and a primary sink (storage site) for carbon dioxide.

UV-B causes cancer in domestic animals similar to those observed in humans. Although most animals have greater protection from UV-B because of their heavy coats and skin pigmentation, they cannot be artificially protected from UV-B on a large scale. Eyes and exposed parts of the body are most at risk.

Effects on Plants

UVB radiation affects the physiological and developmental processes of plants. Despite mechanisms to reduce or repair these effects and an ability to adapt to increased levels of UVB, plant growth can be directly affected by UVB radiation.

Indirect changes caused by UVB (such as changes in plant form, how nutrients are distributed within the plant, timing of developmental phases and secondary metabolism) may be equally or sometimes more important than damaging effects of UVB. These changes can have important implications for plant competitive balance, herbivory, plant diseases, and biogeochemical cycles.

Effects on Marine Ecosystems

Phytoplankton form the foundation of aquatic food webs. Phytoplankton productivity is limited to the euphotic zone, the upper layer of the water column in which there is

sufficient sunlight to support net productivity. Exposure to solar UVB radiation has been shown to affect both orientation and motility in phytoplankton, resulting in reduced survival rates for these organisms. Scientists have demonstrated a direct reduction in phytoplankton production due to ozone depletion-related increases in UVB.

UVB radiation has been found to cause damage to early developmental stages of fish, shrimp, crab, amphibians, and other marine animals. The most severe effects are decreased reproductive capacity and impaired larval development. Small increases in UVB exposure could result in population reductions for small marine organisms with implications for the whole marine food chain.

Effects on Biogeochemical Cycles

Increases in UVB radiation could affect terrestrial and aquatic biogeochemical cycles, thus altering both sources and sinks of greenhouse and chemically important trace gases (e.g., carbon dioxide, carbon monoxide, carbonyl sulfide, ozone, and possibly other gases). These potential changes would contribute to biosphere-atmosphere feedbacks that mitigate or amplify the atmospheric concentrations of these gases.

Effects on Materials

Synthetic polymers, naturally occurring biopolymers, as well as some other materials of commercial interest are adversely affected by UVB radiation. Today's materials are somewhat protected from UVB by special additives. Yet, increases in UVB levels will accelerate their breakdown, limiting the length of time for which they are useful outdoors.

Acid Rain

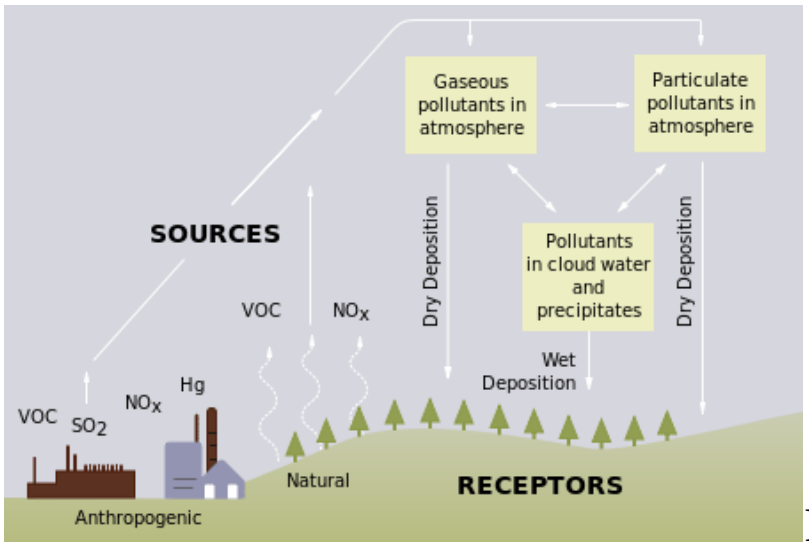


Figure 1. Processes involved in acid deposition.

Acid rain is a term referring to a mixture of wet and dry deposition (deposited material) from the atmosphere containing higher than normal amounts of nitric and sulfuric acids. The precursors, or chemical forerunners, of acid rain formation result from both natural sources, such as volcanoes and decaying vegetation, and man-made sources, primarily emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) resulting from fossil fuel combustion. Acid rain occurs when these gases react in the atmosphere with water, oxygen,

and other chemicals to form various acidic compounds. The result is a mild solution of sulfuric acid and nitric acid. When sulfur dioxide and nitrogen oxides are released from power plants and other sources, prevailing winds blow these compounds across state and national borders, sometimes over hundreds of miles.

Acid rain is measured using a scale called “pH.” The lower a substance’s pH, the more acidic it is. Pure water has a pH of 7.0. However, normal rain is slightly acidic because carbon dioxide (CO_2) dissolves into it forming weak carbonic acid, giving the resulting mixture a pH of approximately 5.6 at typical atmospheric concentrations of CO_2. As of 2000, the most acidic rain falling in the U.S. has a pH of about 4.3.

Effects of Acid Rain

Acid rain causes **acidification** of lakes and streams and contributes to the damage of trees at high elevations (for

example, red spruce trees above 2,000 feet) and many sensitive forest soils. In addition, acid rain accelerates the decay of building materials and paints, including irreplaceable buildings, statues, and sculptures that are part of our nation's cultural heritage. Prior to falling to the earth, sulfur dioxide (SO_2) and nitrogen oxide (NO_x) gases and their particulate matter derivatives—sulfates and nitrates—contribute to visibility degradation and harm public health.

The ecological effects of acid rain are most clearly seen in the aquatic, or water, environments, such as streams, lakes, and marshes. Most lakes and streams have a pH between 6 and 8, although some lakes are naturally acidic even without the effects of acid rain. Acid rain primarily affects sensitive bodies of water, which are located in watersheds whose soils have a limited ability to neutralize acidic compounds (called "buffering capacity"). Lakes and streams become acidic (i.e., the pH value goes down) when the water itself and its

surrounding soil cannot buffer the acid rain enough to neutralize it. In areas where buffering capacity is low, acid rain releases aluminum from soils into lakes and streams; aluminum is highly toxic to many species of aquatic organisms. Acid rain causes slower growth, injury, or death of **forests**. Of course, acid rain is not the only cause of such conditions. Other factors contribute to the overall stress of these areas, including air pollutants, insects, disease, drought, or very cold weather. In most cases, in fact, the impacts of acid rain on trees are due to the combined effects of acid rain and these other environmental stressors.

Figure 2. A gargoyle that has been damaged by acid rain.

Acid rain and the dry deposition of acidic particles contribute to the corrosion of **metals** (such as bronze) and the deterioration of paint and stone (such as marble and limestone). These effects significantly reduce the societal value of buildings, bridges, cultural objects (such as statues, monuments, and tombstones), and cars (Figure 2).

Sulfates and nitrates that form in the atmosphere from sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emissions contribute to **visibility impairment,** meaning we cannot see as far or as clearly through the air. The pollutants that cause acid rain—sulfur dioxide (SO_2) and nitrogen oxides (NO_x)—damage **human health**. These gases interact in the atmosphere to form fine sulfate and nitrate particles that can be transported long distances by winds and inhaled deep into people's lungs. Fine particles can also penetrate indoors. Many scientific studies have identified a relationship between elevated levels of fine particles and increased illness and

premature death from heart and lung disorders, such as asthma and bronchitis.

International agreements and programmes: Earth Summit

The **United Nations Conference on Environment and Development** (**UNCED**), also known as the **Rio de Janeiro Earth Summit**, the **Rio Summit**, the **Rio Conference**, and the **Earth Summit** (Portuguese: ECO92), was a major **United Nations conference** held in **Rio de Janeiro** from 3 to 14 June in 1992.

Earth Summit was created as a response for **Member States** to cooperate together internationally on development issues after the **Cold War**. Due to issues relating to **sustainability** being too big for individual member states to handle, Earth Summit was held as a platform for other Member States to collaborate. Since the creation, many others in the field of sustainability show a similar development to the issues discussed in these conferences, including **non-governmental organizations** (NGOs).

In 2012, the **United Nations Conference on Sustainable Development** was also held in Rio, and is also commonly called Rio+20 or Rio Earth Summit 2012. It was held from 13 to 22 June.

The issues addressed included:

- systematic scrutiny of patterns of production — particularly the production of toxic components, such as **lead** in **gasoline**, or poisonous waste including radioactive chemicals
- alternative sources of energy to replace the use of **fossil fuels** which delegates linked to global **climate change**

- new reliance on **public transportation** systems in order to reduce vehicle emissions, congestion in cities and the health problems caused by polluted air and smoke
- the growing usage and limited supply of **water**

An important achievement of the summit was an agreement on the **Climate Change Convention** which in turn led to the **Kyoto Protocol** and the **Paris Agreement.** Another agreement was to "not to carry out any activities on the lands of **indigenous peoples** that would cause **environmental degradation** or that would be culturally inappropriate".

The **Convention on Biological Diversity** was opened for signature at the Earth Summit, and made a start towards redefinition of measures that did not inherently encourage destruction of natural **ecoregions** and so-called **uneconomic growth.**

Although President **George H.W. Bush** signed the Earth Summit's Convention on Climate, his EPA Administrator William K. Reilly acknowledges that U.S. goals at the conference were difficult to negotiate and the agency's international results were mixed, including the U.S. failure to sign the proposed Convention on Biological Diversity.

Twelve cities were also honoured by the Local Government Honours Award for innovative local environmental programs. These included **Sudbury** in **Canada** for its ambitious program to rehabilitate environmental damage from the local mining industry, **Austin** in the **United States** for its **green building** strategy, and **Kitakyūshū** in **Japan** for incorporating an international education and training component into its municipal **pollution control** program.

The Earth Summit resulted in the following documents:

- ***Rio Declaration on Environment and Development:-*** The **Rio Declaration on Environment and Development**, often shortened to **Rio Declaration**, was a short document produced at the 1992 **United Nations** "Conference on Environment and Development" (UNCED), informally known as the **Earth Summit.** The Rio Declaration consisted of 27 principles intended to guide countries in future **sustainable development.** It was signed by over 175 countries.
- ***Agenda 21*:-** is a non-binding **action plan** of the **United Nations** with regard to **sustainable development**. It is a product of the **Earth Summit** (UN Conference on Environment and Development) held in **Rio de Janeiro**, Brazil, in 1992. It is an action agenda for the UN, other **multilateral** organizations, and individual governments around the world that can be executed at local, national, and global levels.The "21" in Agenda 21 refers to the original target year of 2021 where they were hoping to achieve their development goals by then. It has been affirmed and had a few modifications at subsequent UN conferences. Since it found 2021 was an overly optimistic date, its new timeline is targeting 2030. Its aim is to achieve global sustainable development. One major objective of the Agenda 21 initiative is that every local government should draw its own local Agenda 21. Since 2015, **Sustainable Development Goals** or also known as the **Millennium Development Goals** are included in the newer **Agenda 2030**.

- ***Forest Principles:***- The **Forest Principles** (also **Rio Forest Principles**, formally the **Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests**) is a 1992 document produced at the **United Nations** Conference on Environment and Development (the "**Earth Summit**"). It is a **non-legally binding** document that makes several recommendations for conservation and sustainable development **forestry**. At the Earth Summit, the negotiation of the document was complicated by demands by **developing nations** in the **Group of 77** for increased **foreign aid** in order to pay for the setting aside of forest reserves.[2] Developed nations resisted those demands, and the final document was a compromise. The **FOREST EUROPE** process (**Ministerial Conference on the Protection of Forests in Europe**, MCPFE) was started by Strasbourg Conference in 1990 and the Forest Principles were adopted and incorporated into the agenda by Helsinki Conference in 1993. The process covers Pan-European region consisting of 47 signatories (46 European countries and the European Union) that partially overlaps with **Montréal Process** region (Russia is a signatory of both processes). The Montréal Process, also known as the *Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests*, was started in 1994 as a result of the Forest Principles

Moreover, important legally binding agreements (**Rio Convention**) were opened for signature:

- ***Convention on Biological Diversity***
- ***Framework Convention on Climate Change*** *(UNFCCC)*
- ***United Nations Convention to Combat Desertification:-*** The **United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa** (**UNCCD**) is a Convention to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements. The Convention, the only convention stemming from a direct recommendation of the Rio Conference's **Agenda 21**, was adopted in **Paris, France** on 17 June 1994 and entered into force in December 1996. It is the only internationally legally binding framework set up to address the problem of desertification. The Convention is based on the principles of participation, partnership and decentralization—the backbone of **Good Governance** and **Sustainable Development**. It has 197 parties, making it near universal in reach. To help publicise the Convention, 2006 was declared "**International Year of Deserts and Desertification**" but debates have ensued regarding how effective the International Year was in practice.

In order to ensure compliance to the agreements at Rio (particularly the ***Rio Declaration on Environment and Development*** and ***Agenda 21***), delegates to the Earth Summit established the ***Commission on Sustainable Development*** (CSD). In 2013, the CSD was replaced by the ***High-level Political Forum on Sustainable Development*** that meets every year as part of the ECOSOC meetings, and every fourth year as part of the General Assembly meetings.

Critics point out that many of the agreements made in Rio have not been realized regarding such fundamental issues as fighting **poverty** and cleaning up the **environment**.

Green Cross International was founded to build upon the work of the Summit.

The first edition of Water Quality Assessments, published by WHO/**Chapman & Hall,** was launched at the Rio Global Forum.

International agreements and programmes: UNFCCC

Recently, 24th meeting of the **Conference of the Parties (COP24) to the United Nations Framework Convention on Climate Change (UNFCCC)** concluded in Katowice, Poland.

Origin

- The UNFCCC, signed in 1992 at the United Nations Conference on Environment and Development also known as the Earth Summit, the Rio Summit or the Rio Conference
- The UNFCCC entered into force on March 21, 1994, and has been ratified by 197 countries.

The WMO and UNEP established the Intergovernmental Panel on Climate Change (IPCC) in 1988, to assess the magnitude and timing of changes, estimate their impacts, present strategies for how to respond and to provide an authoritative source of up-to-date interdisciplinary knowledge on climate change.

Objective

- According to Article 2, the Convention's ultimate objective is "to achieve, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system".
- This objective is qualified in that it "should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner".

Institutional Arrangements

- **The Conference of the Parties (COP)**
    - Article 7.2 defines the COP as the "supreme body" of the Convention, as it is its highest decision-making authority. The climate change process revolves around the annual sessions of the COP.
- **COP President and Bureau**
    - The office of the COP President normally rotates among the five United Nations regional groups. The President is usually the environment minister of his or her home country. S/he is elected by acclamation immediately after the opening of a COP session. Their role is to facilitate the work of the COP and promote agreements among Parties.
    - The work of the COP and each subsidiary body is guided by an elected Bureau. To ensure continuity, it serves not only during sessions, but between sessions as well.

- **Subsidiary Bodies (SBs)**

  - The Convention establishes **two permanent subsidiary bodies (SBs),** namely the **Subsidiary Body for Scientific and Technological Advice (SBSTA),** by Article 9, and the **Subsidiary Body for Implementation (SBI),** by Article 10. These bodies advise the COP.
  - The SBSTA's task is to provide the COP "with timely advice on scientific and technological matters relating to the Convention".
  - The SBI's task is to assist the COP "in the assessment and review of the effective implementation of the Convention"

- **The Secretariat**

  - The secretariat, also known as the Climate Change Secretariat, services the COP, the SBs, the Bureau and other bodies established by the COP.

- **Other Bodies**

  - Other bodies have been set up by the COP to undertake specific tasks. These bodies report back to the COP when they complete their work
  - COP 1 established two ad hoc groups to conduct negotiations on specific issues.
  - COP 11 established the "Dialogue" to exchange experiences and analyse strategic approaches for long-term cooperative action to address climate change.

Timeline of Important Events	
1979	First World Climate Conference (WCC)
1988	IPCC established
1990	In November IPCC and second WCC call for global treaty on climate change and in December UN General Assembly Negotiations on a Framework Convention Begin.
1992	The text of the United Nations Framework Convention on Climate Change is adopted at the United Nations Headquarters in New York.
1994	UNFCCC enters into force
1995	COP 1 (Berlin, Germany)
1996	August ▪ The UNFCCC secretariat relocates from Geneva to its current home in Bonn(Germany), paving the way for the city to become an international sustainability hub and home to 18 UN organizations.

1997	COP 3 (Kyoto, Japan) ▪ Kyoto Protocol adopted- The Protocol legally binds developed countries to emission reduction targets.
1998	Buenos Aires Plan of Action
2001	COP 6-2(second part of 6th COP) ▪ The COP 6-2 took place from 16 to 27 July 2001 in Bonn, Germany. ▪ A major breakthrough is achieved at the second part of the sixth Conference of the Parties meeting in Bonn, with governments reaching a broad political agreement on the operational rulebook for the 1997 Kyoto Protocol.
2001	COP 7 (Marrakesh, Morocco) ▪ Resulted in the Marrakesh Accords, setting the stage for ratification of the Kyoto Protocol. This formalized the agreement on operational rules for International Emissions Trading, the Clean Development Mechanism and Joint Implementation along with a compliance regime and accounting procedures.
2002	COP 8 (New Delhi, India) Delhi Declaration. The Delhi Declaration focuses on the development needs of the poorest countries and the need for technology transfer for mitigating climate change.

2005	(February 16) Entry of Kyoto Protocol into force with the Russian Federation ratification to the Kyoto Protocol, sealing its entry into force.
2005	COP11/CMP1 (December) ▪ The first Meeting of the Parties to the Kyoto Protocol (MOP 1) takes place in Montreal.
2006	In January the Clean Development Mechanism, a key mechanism under the Kyoto Protocol, opens for business. ▪ The CDM is one of the Flexible Mechanisms defined in the Kyoto Protocol that provides for emissions reduction projects which generate Certified Emission Reduction units (CERs) which may be traded in emissions trading schemes.
2007	COP13 ▪ Parties agreed on the Bali Road Map and Bali action plan, which charted the way towards a post-2012 outcome. The Plan has five main categories: shared vision, mitigation, adaptation, technology and financing.
2008	COP 14, Poznan (Poland) ▪ The launch of the Adaptation Fund under the Kyoto Protocol and ▪ The Poznan Strategic Programme on Technology Transfer.

2009	COP15 (Copenhagen) ▪ Copenhagen Accord drafted. Developed countries pledge up to USD 30 billion in fast-start finance for the period 2010-2012.
2010	COP 16 (Cancun) ▪ Resulted in the Cancun Agreements, a comprehensive package by governments to assist developing nations in dealing with climate change. ▪ The Green Climate Fund, the Technology Mechanism and the Cancun Adaptation Framework are established.
2011	COP 17 (Durban) ▪ Governments commit to a new universal climate change agreement by 2015 for the period beyond 2020.(Resulted in the Paris Agreement of 2015)
2012	COP18/CMP8 (Doha) ▪ The Doha Amendment to the Kyoto Protocol is adopted. ▪ COP18 also launched a second commitment period of the Kyoto Protocol.
2013	COP19/CMP9 (Warsaw) ▪ Key decisions adopted include:

	○ Further advancing the Green Climate Fund and Long-Term Finance, ○ The Warsaw Framework for REDD Plus and the Warsaw International Mechanism for Loss and Damage.
2015	COP 21 (Paris) ▪ Paris Agreement adopted. It aims: ○ To keep global temperatures "well below" 2.0C (3.6F) above pre-industrial times and "endeavor to limit" them even more, to 1.5C ○ Rich countries should help poorer nations by providing "climate finance" to adapt to climate change and switch to renewable energy. ○ The agreement requires rich nations to maintain a $100bn a year funding pledge beyond 2020.
2016	COP22 (Marrakech) ▪ A crucial outcome of the Marrakech climate conference was ○ To move forward on writing the rule book of the Paris Agreement. ○ Launched the Marrakech Partnership for Climate Action.

2017	COP23, Bonn (Germany) ▪ Countries continued to negotiate the finer details of how the agreement will work from 2020 onwards. ▪ First set of negotiations since the US, under the presidency of Donald Trump, announced its intention earlier this year to withdraw from the Paris deal. ▪ It was the first COP to be hosted by a small-island developing state with Fiji taking up the presidency, even though it was being held in Bonn.
2018	COP 24, Katowice (Poland)

Shortcomings

- **Non-inclusive:** Most scientists agree the most dangerous environmental air pollutants today are microscopic particulates that come from car engines and combustion-based power plants, but these pollutants are largely ignored by the Kyoto Protocol.
- **Slow progress:** It took a long time for COP to bring Russia to agree into participating in the Kyoto Protocol. (until 2005)
- UNFCCC failed to persuade USA to ratify the Kyoto protocol thereby keeping one of the largest emitter of greenhouse gases away from commitments.
- **Unsustainable targets:** The world reached at almost 1degree Celsius warming post industrialization and the Paris contributions are not enough to maintain 2 degree Celsius levels.

- **Unsatisfactory Response:** Many countries argued for a tougher target of 1.5C - including leaders of low-lying countries that face unsustainable sea levels rises in a warming world.
- **Financial Constraints:** The agreement requires rich nations to maintain a $100bn a year funding pledge beyond 2020, which is not enough as highlighted by several pacific island countries.
- **Non-binding agreement:** The US withdrawal from the 2015 Paris climate agreement, citing, that the deal punished" the US and would cost millions of American jobs", has created new barriers and more pressure on rest of the nations in achieving the targets of Paris agreement.

    - As part of the US withdrawal, USA has stopped the payment of the extra $2bn that had been promised in to the Green Climate Fund.

- **No enforcement mechanism:** Under the Paris agreement, each country determines, plans, and reports its own efforts to mitigate global warming. The only penalty for non-compliance is a so-called "name and shame" — or "name and encourage" — system whereby countries that fall out of compliance are called out and encouraged to improve.

Achievements

- Kyoto protocol only required wealthy nations to cut emissions, which was a bone of contention; however this anomaly was corrected with the signing of Paris agreement in 2015.
- UNFCCC initiatives helped create Public awareness regarding climate change, which is much higher today than in the late 90s.

- Although climate science in the late 90s was certainly strong enough—to negotiate an international treaty, it is hard to deny that the scientific understanding of the climate crisis has improved considerably over the past two decades in which UNFCCC played a significant role.
- UNFCCC has enabled planning and implementation of concrete adaptation activities under the National Adaptations Programme of Action (NAPAs) and the Nairobi work programme.
- UNFCCC helped create innovative ideas in mitigating climate change like the Clean Development mechanism (CDM) under which developing country's projects that reduce emissions earn credits that can be sold to countries or companies with a commitment to reduce emissions.
- Since the establishment of UNFCCC national governments have encouraged and increased cooperation on the development and transfer of technology.
- UNFCCC efforts support the developing countries in combating climate change by providing a platform for finance, technology transfers, discussions, global partnerships, etc.

The Montreal Protocol on Substances that Deplete the Ozone Layer is an important multilateral agreement regulating the production, consumption and emissions of ozone-depleting substances (ODSs).

Montreal Protocol – Background

By the late 1970s, scientists were able to prove that chemical substances that were used in air conditioners, refrigerators and aerosol cans were causing damage to the ozone layer. In 1985, a huge hole was discovered in the ozone layer over Antarctica. This hole allowed hazardous levels of ultraviolet (UV) radiation to reach the earth's surface.

The **Vienna Convention** for the Protection of the Ozone Layer was signed in 1985 under which UN member countries recognized the importance of curbing damage to the ozone layer. As per the Convention's provisions, countries agreed to adopt the Montreal Protocol to further the goals of the Vienna Convention.

What is the Ozone Layer?

- It is a layer in the earth's stratosphere that contains high levels of ozone.
- This layer protects the earth from the Sun's harmful UV radiation. It absorbs 97 – 99% of the UV radiation from the Sun.
- In the absence of the ozone layer, millions of people would be affected by skin diseases including cancer and weakened immune systems.
- UV radiation would also affect the environment adversely leading to decreased productivity.
- Fauna on earth is also adversely affected by the ozone layer depletion.

Ozone Layer Depletion

- This refers to the thinning of the protective ozone layer in the atmosphere.
- This happens when certain chemicals come into contact with ozone and destroy it.
- Chemical compounds that cause ozone layer depletion are called **Ozone Depleting Substances (ODSs).**
- Examples of ODSs are chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), carbon tetrachloride, methyl chloroform, hydrobromofluorocarbons, halons, etc.
- Chlorofluorocarbons are the most abundant ODSs.
- The indiscriminate use of these chemicals causes ozone layer depletion.
- These ODSs are also powerful greenhouse gases (GHGs) and have a long life as well.
- There are a few natural causes also which cause ozone depletion such as volcanic eruptions, sunspots and stratospheric winds. However, these do not cause more than 1 – 2% of the ozone depletion.

Montreal Protocol

The Protocol was signed in 1987 and entered into force in January 1989. The protocol gives provisions to reduce the production and consumption of ODSs in order to protect the ozone layer.

- It phases down the use of ODSs in a stepwise, time-bound manner.

- It gives different timetables for developing and developed countries.
- All member parties have specific responsibilities related to the phasing out of various groups of ozone depleting substances, controlling ODS trade, reporting of data annually, controlling export and import of ODs, etc.
- Developing and developed countries have **equal but differentiated responsibilities**.
- However, both groups of nations have time-bound, binding and measurable commitments under the protocol, making it really effective.
- Under the protocol, there is a provision for it to be amended and adjusted according to the new scientific, economic and technological advancements made.
- The Protocol has undergone nine amendments or revisions.
- The governance body for the protocol is the Meeting of the Parties. Technical support is given by the Open-ended Working Group. Both meet once every year.
- The Parties are aided by the Ozone Secretariat, which is based at the headquarters of the UN Environment Programme (UNEP) at Nairobi.
- It has been ratified by 197 Parties (196 member states of the UN plus the EU) making it the first United Nations treaty to be ratified by every country in the world.
- The Montreal Protocol's provisions relate to the following:
    - Article 2: Control measures
    - Article 3: Calculation of control levels
    - Article 4: Control of trade with non-Parties
    - Article 5: Special situation of developing countries
    - Article 7: Reporting of data
    - Article 8: Non-compliance
    - Article 10: Technical assistance
    - And, other topics
- The ODSs regulated by the Protocol are listed in:
    - Annex A: CFCs, halons
    - Annex B: other fully halogenated CFCs, carbon tetrachloride, methyl chloroform
    - Annex C: HCFCs
    - Annex E: Methyl bromide
    - Annex F: HFCs
- **Multilateral Fund:** The Multilateral Fund for the Implementation of the Montreal Protocol was set up in 1991 to help developing countries to comply with the provision of the Protocol. This is under Article 10 mentioned above.
    - It provides financial and technical assistance to developing member countries whose yearly per capita consumption and production of ODSs is less than 0.3 kg.
    - The activities of the Fund are implemented by four bodies:
        - UNEP
        - UN Development Programme (UNDP)

- UN Industrial Development Organisation (UNIDO)
- World Bank

Success of the Montreal Protocol

- With universal ratification and a time-bound binding framework, the Montreal Protocol has been largely successful in setting out to achieving its mission of reversing the damage done to the ozone layer.
- It has been considered the most successful international environmental action taken by countries.
- The Protocol has been successful in leveling off or decreasing the atmospheric concentrations of the most important chlorofluorocarbons and related chlorinated hydrocarbons.
- Although halon concentrations have gone up, their rate of increase has come down, and their concentration is expected to decline by 2020.
- The Protocol has successfully sent clear signals to the global market.
- The full implementation of the Montreal Protocol is expected to help in the avoidance of over 280 million skin cancer incidents, almost 1.6 million deaths due to skin cancer, and millions of cases of cataracts.
- With the Protocol, the ozone layer is expected to recover by the year 2050.
- Parties to the Protocol have been able to phase out 98% of ODSs compared to levels in 1990.
- The Protocol is also helping fight climate change because most of the ODSs are also greenhouse gases.
- It is estimated that from 1990 to 2010, the protocol has helped reduce greenhouse gas emissions by the equivalent of 135 gigatons of carbon dioxide, the equivalent of 11 gigatons a year.
- The Kigali Amendment, an amendment to the Protocol, has helped reduce HFC emission and decrease global temperature rise.

World Ozone Day

- September 16th is observed as the World Ozone Day. It is the day that marks the signing of the Montreal Protocol.

India and the Montreal Protocol

India became a signatory to the Montreal Protocol in 1992.

- India is an **Article 5 country** and is entitled to assistance from the Multilateral Fund in its efforts to phase out ODSs and switch over to non-ODS technologies.
- India mainly manufactured and utilised 7 of the 20 substances controlled under the Protocol. These are CFC-11, CFC113, CFC-12, Halon-1301, Halon-1211, Carbon tetrachloride, Methyl Bromide and Methyl Chloroform.
- In India, the implementation of the Montreal Protocol comes within the ambit of the Ministry of Environment, Forests and Climate Change.

- The Ministry has established an Ozone Cell for the purpose of implementing the Protocol.
- As per the National Strategy for ODS Phaseout, the Ministry has notified the Ozone Depleting Substances (Regulation and Control) Rules 2000.
    - The Rules prohibit the use of CFCs in manufacturing various products.
    - They provide for the mandatory registration of ODS producers, sellers, importers and stockists.

Kyoto Protocol

Kyoto Protocol

- It is an international treaty
- Negotiated under UNFCC
- Adopted in **1997 in Kyoto, Japan**
- Came into force in **2005**
- Parties : **192 (Canada withdrew)**
- It gave **binding targets to Annex I countries**
- The Kyoto Protocol implemented the objective of the UNFCCC to fight global warming by reducing greenhouse gas concentrations

- The Protocol is based on the principle of common but differentiated responsibilities: it puts the obligation to reduce current emissions on developed countries on the basis that they are historically responsible for the current levels of greenhouse gases in the atmosphere.
- The Protocol's first commitment period started in **2008** and ended in **2012**
- By 2008-2012, Annex 1 countries have to reduce their GHG emissions by an average of **5%** below their 1990 levels (for many countries, such as the EU member states, this corresponds to some 15% below their expected GHG emissions in 2008).

- A second commitment period was agreed on in 2012, known as the **Doha Amendment** to the protocol.
- The amendment includes new commitments for parties to the Protocol who agreed to take on commitments in a second commitment period and a revised list of GHGs to be reported on by Parties.
- **India has ratified** the second commitment period of Kyoto Protocol.
- Paris agreement (2015) is not an amendment to Kyoto Protocol but a separate instrument altogether.

Target under this protocol applies to following GHGs:

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (NO_2)
- Sulphur Hexafluoride (SF_6)
- Two groups of gases :
  - Hydrofluorocarbons (HFCs)
  - Perfluorocarbons (PFCs)

- Kyoto Protocol includes “flexible mechanisms” which allow Annex 1 economies to meet their GHG targets by purchasing GHG emission reductions from elsewhere. These can be bought either from :financial exchanges (**International Emissions Trading Scheme**) or
- from projects which reduce emissions in **non-Annex 1** economies under the **Clean Development Mechanism (CDM)**,
- or in other **Annex-1** countries under the **Joint Implementation (JI)**

- Only CDM Executive Board-accredited Certified Emission Reductions (CER) can be bought and sold in this manner.

Kyoto mechanisms

- Kyoto Mechanisms are also known as **Flexible Mechanisms** and they include Emissions Trading, the Clean Development Mechanism and Joint Implementation to lower the cost of achieving emission targets.
- Please note that **Flexible Mechanisms and Carbon Sink** were included at the COP 6 at Bon in Germany.

1. **Emission Trading:** Emissions Trading-mechanism allows parties to the Kyoto Protocol to buy 'Kyoto units'(emission permits for greenhouse gas) from other countries to help meet their domestic emission reduction targets.
2. **Joint Implementation**: Any Annex I country can invest in emission reduction projects (referred to as "Joint Implementation Projects") in any other Annex I country as an alternative to reducing emissions domestically.
3. **Clean Development Mechanism (CDM):** Countries can meet their domestic emission reduction targets by buying greenhouse gas reduction units from (projects in) non Annex I countries to the Kyoto protocol.

International agreements and programmes-Convention on Biological Diversity (CBD)

It was created and adopted by governments at the 1992 Earth Summit in Rio de Janeiro, when world leaders agreed on a comprehensive strategy for sustainable development – to meet current needs while ensuring a living planet for future generations. Signed by 193 governments the CBD sets out commitments for maintaining the world's biodiversity which directly supports the livelihoods of billions and underpins global economic development.

It is known informally as the Biodiversity Convention, is an international legally binding treaty. The Convention has **three main goals:**

- Conservation of biological diversity (or biodiversity);
- Sustainable use of its components; and
- Fair and equitable sharing of benefits arising from genetic resources

In other words, its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development.

The Convention was opened for signature at the Earth Summit in Rio de Janeiro on 5 June 1992 and entered into force on 29 December 1993.

2010 was the International Year of Biodiversity. The Secretariat of the Convention on Biological Diversity is the focal point for the International Year of Biodiversity. At the 2010 10th Conference of Parties (COP) to the Convention on Biological Diversity in October in Nagoya, Japan, the Nagoya Protocol was adopted. On 22 December 2010, the UN declared the period from 2011 to 2020 as the UN-Decade on Biodiversity. They, hence, followed a recommendation of the CBD signatories during COP10 at Nagoya in October 2010.

How does the CBD work?

The Conference of the Parties (COP) meets every 2 years to look at new issues and adopt targets and work programmes to address biodiversity loss.

Signatory governments to the CBD are required to develop national strategies and action plans based on COP decisions and report back on implementation

2020 Target

In 2010, governments gathered in Japan at the 10th Conference of the Parties to CBD and set a new strategy to save the world's valuable nature. A 20-point plan was adopted, to be implemented by governments in the next 10 years, to help tackle the mass extinction of species and the loss of vital habitats around the world. As part of the biodiversity rescue plan, governments agreed to boost the area of protected land in the world to 17%, and strive for marine protected areas covering 10% of our oceans by 2020.

WWF and the CBD

WWF supported the development of the CBD in the 1980s and works at global and national level to advocate the adoption of strong targets and work plans by the COP and their implementation by national governments.

Nagoya Protocol

The Nagoya Protocol on Access & Benefit Sharing (ABS) was adopted on 29 October 2010 in Nagoya, Japan and will enter into force 90 days after the fiftieth instrument of ratification. Its objective is the fair and equitable sharing of benefits arising from the utilization of genetic resources, thereby contributing to the conservation and sustainable use of biodiversity.

Objectives

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity is a supplementary agreement to the Convention on Biological Diversity. It provides a transparent legal framework for the effective implementation of one of the three objectives of the CBD: the fair and equitable sharing of benefits arising out of the utilization of genetic resources.

International agreements and programmes: Ramsar convention

Introduction

- The Ramsar Convention is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources.
- The Convention was adopted on 2nd February 1971 in Ramsar, Iran.
- The Convention came into force from 21st December, 1975.
- Presently 170 Contracting Parties, with 2,326 wetland sites, covering a total of 249,579,562 hectares of the earth surface area.

Fig. The Serene Beauty of Wetland

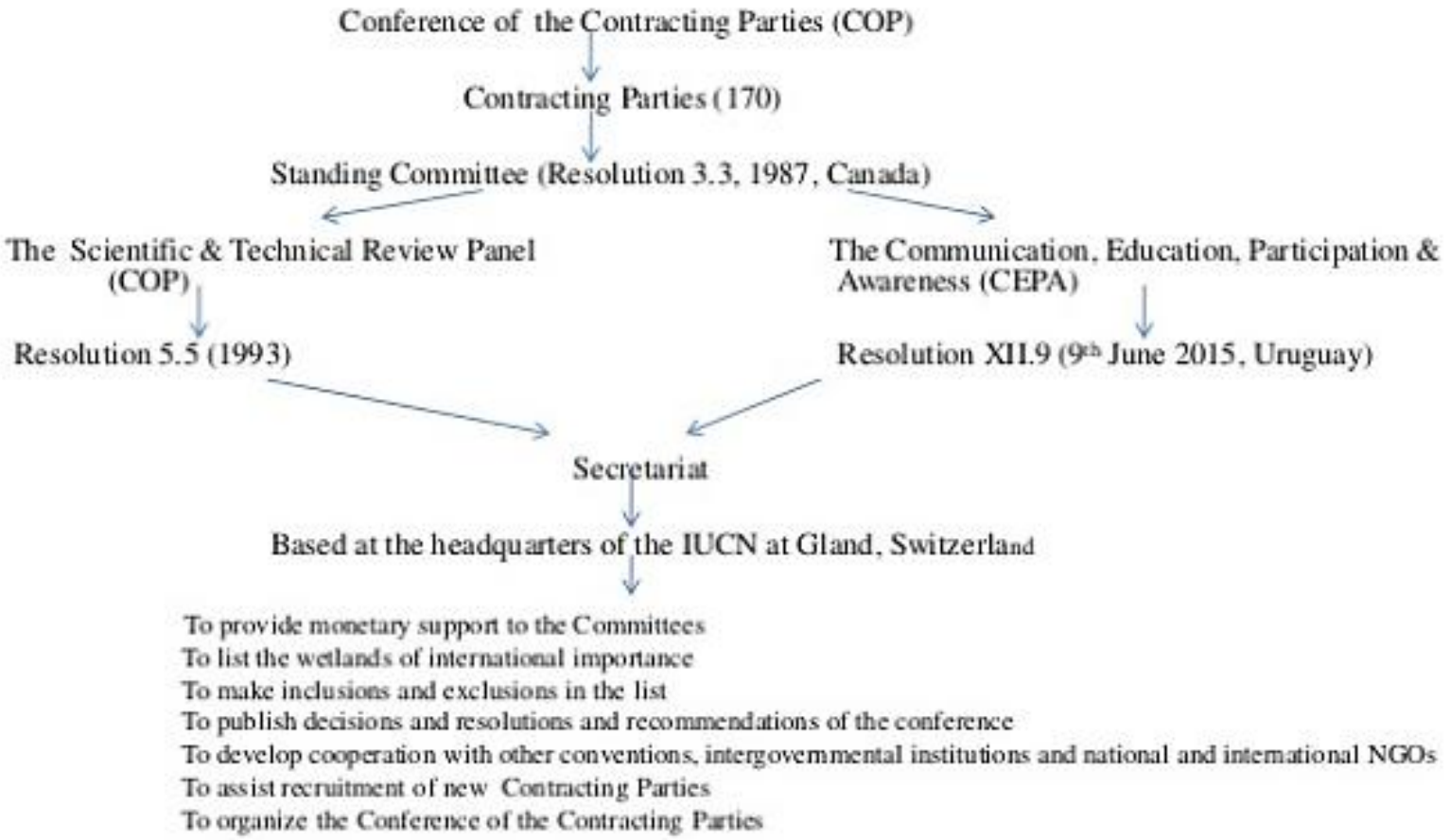
Source: www.ramsar.org Image source: www.outlookindia.com

OBJECTIVES OF THE CONVENTION

- Wetlands are distinct ecosystem inundated by water, permanently or seasonally, treasuring wide range of plants & animals.
- The Convention aims on conserving the wetlands with the following objectives:-
    - Maintenance & sustainable use of the Ramsar wetlands.
    - Designation wetlands for inclusion in the list of Wetlands of International Importance.
    - Promotion of International Cooperation with regard to transboundary wetlands, shared water systems, and shared species.

Source: www.ramsar.org Image source: www.ramsar.org

Organizing Bodies of Convention



Source: www.ramsar.org

Partnerships of the Convention

Global Conventions

- The Convention of the Biological Diversity (CBD)
- The Convention on the International trade in endangered species of Wild flora and fauna (CITES)
- The World Heritage Convention (WHC)
- The UN Convention on the Law of the Non-navigational Uses of International Watercourses
- The Convention on the Protection & Use of Transboundary Watercourses & International Lakes

International Organization Partners

- Birdlife international
- International Union for Conservation of Nature & Natural resources (IUCN)
- Wetlands International
- World Wide Fund for Nature (WWF)

Private Sector

- The Danone Group

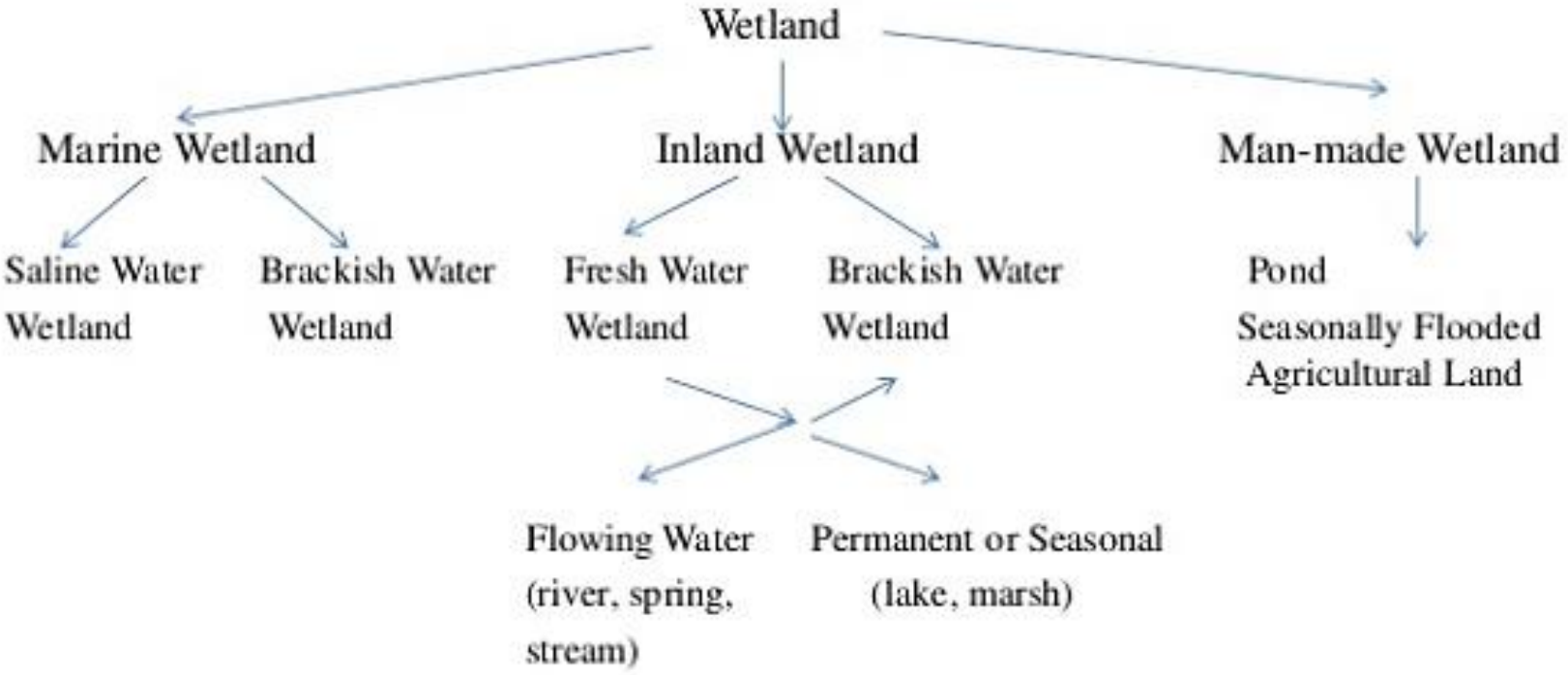
Source: www.ramsar.org Image source: medium.com

Designation Of Ramsar Site

Criterion 1:- The wetland must contain a representative, rare or unique example of natural or near natural wetland type found within the appropriate biogeographic region.
Criterion 2:- The wetland must support vulnerable, endangered, or critically endangered species or threatened ecological communities.
Criterion 3:- The wetland must support populations of plant and or animal species important to maintain the biodiversity of a particular biogeographic region.
Criterion 4:- The wetland must support plant and or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
Criterion 5:- The wetland must support 20,000 or more waterbirds.
Criterion 6:- The wetland must regularly support 1% of the individuals in a population of one species or subspecies of waterbird.
Criterion 7:- The wetland must support a significant proportion of indigenous fish subspecies,.
Criterion 8:- The wetland must be an important source of food for fishes, spawning ground, nursery.
Criterion 9:- The wetland must support 1% of the individuals in a population of one species of wetland dependent non-avian animal species.

Source: www.ramsar.org

The Ramsar Classification For Wetlands



Source: www.ramsar.org

Ramsar Sites Around The Globe

Total 2,326 Ramsar Sites around the globe, covering 249,579,562 hectares of earth surface area.

Fig. Map Showing Distribution of Ramsar Sites In The world

Name of Continent	Number of Ramsar Site	Area (hectares)
Africa	23	557, 028
Asia	332	1,800,100
Europe	1052	27,000,000
Latin America	113	37300
North America	381	1,860,879
Australia	66	8,342,175
Oceania	10	2,710,953

Source: www.ramsar.org Image source: gislounge.com

Ramsar Sites In India

- 26 Ramsar sites in India, covering a total of 689,131 hectares.
- The Ramsar Convention in India came into force on 1st February 1982.

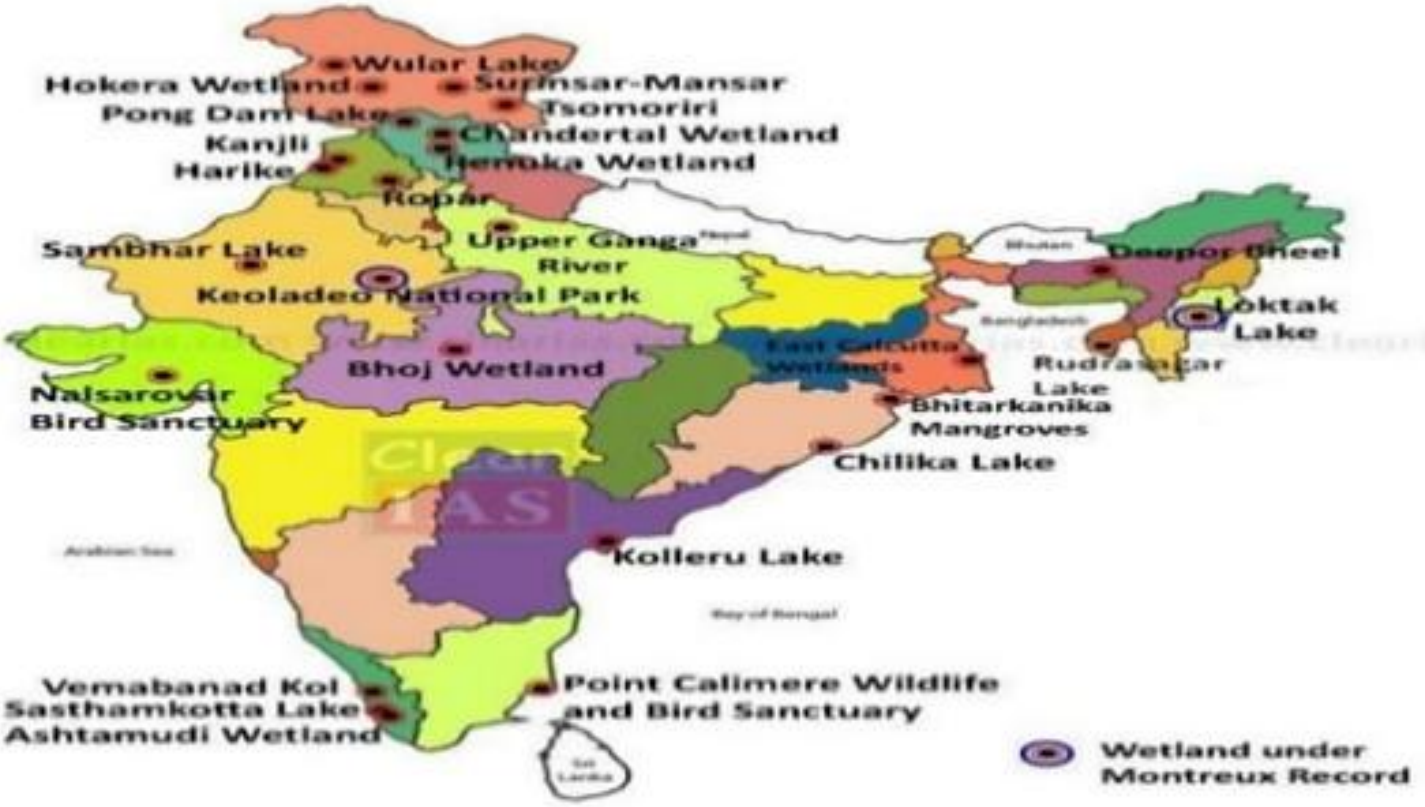


Fig. Map Showing Distribution of Ramsar Sites Throughout India

Source: www.ramsar.org Image source: www.clearias.com

List Of Ramsar Sites In India

Ramsar site	State	Area (hectares)
Ashtamudi wetland	Kerala	61,4000
Bhitarkanika Mangroves	Orissa	65,000
Chandertal Wetland	Himachal Pradesh	49
Chilka Lake	Orissa	116,500
Deepor Beel	Assam	4,000
East Calcutta Wetlands	West Bengal	12,500
Harike Wetland	Punjab	4,100
Hokera Wetland	Jammu & Kashmir	1,375
Kanjli	Punjab	183
Keoladeo national park	Rajasthan	2,873
Kolleru lake	Andhra Pradesh	90,100
Loktak lake	Manipur	26,600

Source: www.ramsar.org

Ramsar site	State	Area (hectares)
Nalsarovar	Gujarat	12,000
Point Calimere Wildlife & Bird sanctuary	Tamil Nadu	38,500
Pong dam lake	Himachal Pradesh	15,662
Renuka wetland	Himachal Pradesh	20
Ropar	Punjab	1,365
Sambhar lake	Rajasthan	24,000
Sasthamkotta lake	Kerala	373
Surinsar-Mansar lakes	Jammu & Kashmir	350
Tsomoriri	Jammu & kashmir	12,000
Upper Ganga River	Uttar Pradesh	26,590
Vembanad-kol wetland	Kerala	151,250
Bhoj Wetland Rudrasagar Lake Wular lake	Madhya Pradesh Tripura Jammu & Kashmir	3,201 240 18,900

Management of Wetlands

- Maintaining and enforcing the Montreux Record to assess any change in the ecological characters of the Ramsar sites.
- Use of the wetlands for sustainable agriculture & fishing.
- Spreading knowledge among the people regarding the importance & maintenance of the wetlands.
- Spreading awareness regarding the depletion & conservation of wetlands.

Fig. Sustainable Practices In Wetland

Source: Bassi et al. (2014) Image Source: www.Wildfilmsindia.com

The 2016-2024 Mission

- Refers to the 4th Ramsar strategic Plan approved at the 12th Conference of the Contracting Parties.
- The Mission goals at:-
- **Strategic Goal 1:- Addressing the Drivers of Wetland Loss & Degradation**
  - Eradication of invasive alien species
  - Prevention to their introduction & establishment
- **Strategic Goal 2:- Effectively Conserving & managing the Ramsar Site Network**
  - Addressing the sites at the risk of ecological changes
  - Restoring & maintaining the ecological characters
- **Strategic Goal 3:- Wisely Using All Wetlands**
  - Documenting & respecting the traditional knowledge & practices of the indigenous people towards wise use of wetlands
  - Wide demonstration & distribution of wetland services & benefits
  - Enhancing sustainability of key sectors like forestry, tourism, aquaculture and fisheries, agriculture, etc.
- **Operational Goal 4:- Enhancing Implementation**
  - Providing Scientific guidance & technical methodologies to the policy makers & practitioners.
  - Providing financial support for effective implementation of the plans.

Source: www.ramsar.org

Summary

- The world celebrates World Wetlands Day on 2nd February.
- The 13th Meeting of the Contracting Parties will be held from 21st to 29th October 2018 in Dubai, United Arab Emirates.
- Its our keen responsibility to preserve & nourish these gifts of nature "the wetlands".

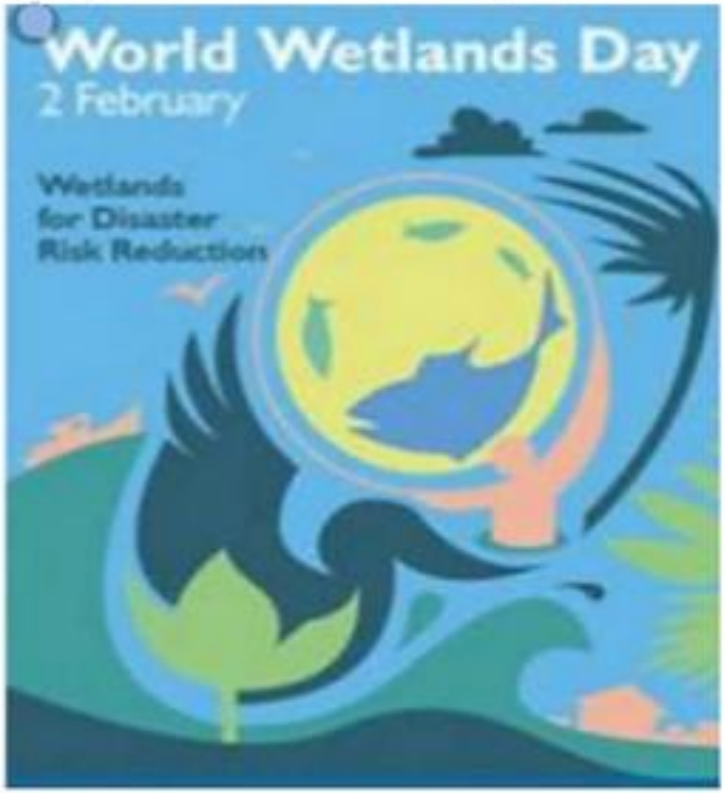


Image source: www.nlb.by

International agreements and programmes- The Chemical Weapons Convention (CWC)

The Chemical Weapons Convention (CWC) is a multilateral treaty that bans chemical weapons and requires their destruction within a specified period of time. The treaty is of unlimited duration and is far more comprehensive than the 1925 Geneva Protocol, which outlaws the use but not the possession of chemical weapons.

CWC negotiations started in 1980 in the UN Conference on Disarmament. The convention opened for signature on January 13, 1993, and entered into force on April 29, 1997.

The CWC is implemented by the Organization for the Prohibition of Chemical Weapons (OPCW), which is headquartered in The Hague with about 500 employees. The OPCW receives states-parties' declarations detailing chemical weapons-related activities or materials and relevant industrial activities. After receiving declarations, the OPCW inspects and monitors states-parties' facilities and activities that are relevant to the convention, to ensure compliance.

The CWC is open to all nations and currently has 193 states-parties. Israel has signed but has yet to ratify the convention. Three states have neither signed nor ratified the convention (Egypt, North Korea and South Sudan).

Prohibitions

The Chemical Weapons Convention prohibits:

- Developing, producing, acquiring, stockpiling, or retaining chemical weapons.
- The direct or indirect transfer of chemical weapons.
- Chemical weapons use or military preparation for use.
- Assisting, encouraging, or inducing other states to engage in CWC-prohibited activity.
- The use of riot control agents “as a method of warfare.”

Declaration Requirements

The CWC requires states-parties to declare in writing to the OPCW their chemical weapons stockpiles, chemical weapons production facilities (CWPFs), relevant chemical industry facilities, and other weapons-related information. This must be done within 30 days of the convention's entry into force for each member state.

Chemical Weapons Stockpiles—States-parties must declare all chemical weapons stockpiles, which are broken down into three categories:

- Category 1: chemical weapons based on Schedule 1 chemicals, including VX and sarin. (See below for an explanation of “scheduled” chemicals.)
- Category 2: chemical weapons based on non-Schedule 1 chemicals, such as phosgene.
- Category 3: chemical weapons including unfilled munitions, devices and equipment designed specifically to employ chemical weapons.

Other weapons-related declarations states-parties must make include:

- Chemical weapons production facilities on their territories since January 1, 1946.
- Facilities (such as laboratories and test sites) designed, constructed, or used primarily for chemical weapons development since January 1, 1946.

- "Old" chemical weapons on their territories (chemical weapons manufactured before 1925 or those produced between 1925 and 1946 that have deteriorated to such an extent that they are no longer useable).
- "Abandoned" chemical weapons (abandoned by another state without consent on or after January 1, 1925).
- Plans for destroying weapons and facilities.
- All transfers or receipts of chemical weapons or chemical weapons-production equipment since January 1, 1946.
- All riot control agents in their possession.

Chemical Industry—The CWC requires states-parties to declare chemical industry facilities that produce or use chemicals of concern to the convention. These chemicals are grouped into "schedules," based on the risk they pose to the convention. A facility producing a Schedule 1 chemical is considered a Schedule 1 facility.

- Schedule 1 chemicals and precursors pose a "high risk" to the convention and are rarely used for peaceful purposes. States-parties may not retain these chemicals except in small quantities for research, medical, pharmaceutical, or defensive use. Many Schedule 1 chemicals have been stockpiled as chemical weapons.
- Schedule 2 chemicals are toxic chemicals that pose a "significant risk" to the convention and are precursors to the production of Schedule 1 or Schedule 2 chemicals. These chemicals are not produced in large quantities for commercial or other peaceful purposes.
- Schedule 3 chemicals are usually produced in large quantities for purposes not prohibited by the CWC but still pose a risk to the convention. Some of these chemicals have been stockpiled as chemical weapons.

The CWC also requires the declaration of facilities that produce certain nonscheduled chemicals.

Destruction Requirements

The convention requires states-parties to destroy:

- All chemical weapons under their jurisdiction or control.
- All chemical weapons production facilities under their jurisdiction or control.
- Chemical weapons abandoned on other states' territories.
- Old chemical weapons.

Category 1 chemical weapons destruction must start within two years after the CWC enters into force for a state-party. States-parties must destroy 1 percent within three years of the CWC's entry into force, 20 percent within five years, 45 percent within seven years, and 100 percent within 10 years. States parties that signed the treaty when it entered into force in 1997 were supposed to complete destruction of category 1 chemicals by April 29, 2007.

States-parties that signed the treaty when it entered into force were supposed to destroy their entire stockpiles by April 29, 2012. However, the OPCW may extend these deadlines due to "exceptional circumstances," and in December 2006, the OPCW Executive Council granted nearly all possessors extensions of differing lengths. The only exception was Albania, which was the sole state-party nearing the complete destruction of its stockpile at that time,

Category 2 and 3 chemical weapons destruction must start within one year after the CWC enters into force for a state-party.

Destruction of CWPFs capable of producing Schedule 1 chemicals must start within one year after the CWC enters into force for a state-party. States-parties that signed the treaty when it originally entered into force had to complete of CWPFs producing schedule 1 chemicals by April 29, 2007.

Destruction of other CWPFs must start within one year after the CWC enters into force for a state-party. States-parties that signed the treaty when it originally entered into force had to complete destruction by April 29, 2002.

States-parties may request to convert CWPFs to facilities that they can use for nonprohibited purposes. Once their requests are approved, states-parties that signed the treaty when it originally entered into force were supposed to complete conversion by April 29, 2003.

As of December 2016, 90 of the 97 CWPFs declared to the OPCW have either been destroyed (67) or converted for peaceful purposes (23).

On-Site Activity

The convention establishes three types of on-site activities that aim to generate confidence in states-parties' CWC compliance. These include:

- "Routine inspections" of chemical weapons-related facilities and chemical industry facilities to verify the content of declarations and to confirm that activities are consistent with CWC obligations.
- "Challenge inspections" which can be conducted at any facility or location in states-parties to clarify questions of possible noncompliance. (To prevent abuse of this measure, the OPCW's executive body can vote by a three-quarters majority to stop a challenge inspection from going forward.)
- Investigations of alleged use of chemical weapons.

Trade

The convention encourages trade among states-parties, calling upon them not to maintain restrictions on one another that would hamper the trade of chemical-related items to be used for peaceful purposes. The convention does restrict trade with non-states-parties, outlawing the transfer of Schedule 1 and 2 chemicals. To ensure that Schedule 3 transfers to non-states-parties are not used for purposes prohibited by the convention, the CWC requires exporting states-parties to obtain an end-use certificate from importing states.

Penalties for Noncompliance

If states-parties are found to have engaged in prohibited actions that could result in "serious damage" to the convention, the OPCW could recommend collective punitive measures to other states-parties. In cases of "particular gravity," the OPCW could bring the issue before the UN Security Council and General Assembly.

States-parties must take measures to address questions raised about their compliance with the CWC. If they do not, the OPCW may, inter alia, restrict or suspend their CWC-related rights and privileges (such as voting and trade rights).

Possessor States' Category I Destruction Implementation

	Declared Category 1 Stockpile	Declared Agents	Remaining Stockpile	Projection
Albania	16 metric tons	Mustard	None	Completed destruction on July 11, 2007.
India	1,044 metric tons	Sulfur Mustard	None	Completed destruction on March 16, 2009
Iraq	Unknown Quantity	Unknown	None	The OPCW announced the destruction of Iraq's chemical weapons remnants on March 13, 2018.
Libya	24.7 metric tons[1]	Sulfur Mustard	None	Completed destruction of Category 1 chemicals on May 4, 2013.
Russia	40,000 metric tons	Lewisite, Mustard, Phosgene, Sarin, Soman, VX	None	Completed destruction on September 27, 2017.
South Korea	605 metric tons	Unknown	None	Completed destruction on July 10, 2008.
Syria	1,308 metric tons	Sulfur Mustard	Declared stockpile has been eliminated but undeclared chemicals still exist	No projected timeline for destruction of undecared chemicals.
United States	27,771 metric tons	Binary nerve agents, Lewisite, Mustard, Sarin, Soman, VX	1,731.8 metric tons (as of March 27, 2020)	Will not meet deadline; U.S. estimates September, 2023.

1. Libya's official 2004 declaration was 24.7 metric tons. Libya declared additional CW stocks in November 2011 and February 2012, bringing the total to 26.3 metric tons.

International agreements and programmes-UNEP

UNEP is the voice for the environment within the United Nations system

UNEP's mission is to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations.

What is UNEP ?

- The **United Nations Environment Programme** (**UNEP**) is an agency of the United Nation that coordinates its environmental activities, assisting developing countries in implementing environmentally sound policies and practices.

UNEP

United Nations Environment Programme

Abbreviation : UNEP

Formation : 1972 June 5

Type :Programme

Legal status :Active

Headquarters : Nairobi, Kenya

Head :Achim Steiner

Parent organization: United Nations

Website : www.UNEP.org

History Of UNEP

- *It was founded by Maurice Strong, its first director, as a result of the United Nations Conference on the Human Environment in June 1972 and has its headquarters in the Gigiri neighborhood of Nairobi, Kenya. UNEP also has six regional offices and various country offices.*
- ***UNEP has aided in the formulation of guidelines and treaties on issues such as the international trade in potentially harmful chemicals, transboundary air pollution, and contamination of international waterways.***

What UNEP does

- Assessing global, regional and national environmental conditions and trends.
- Developing international agreements and national environmental instruments.
- Strengthening institutions for the wise management of the environment.
- Integrating economic development and environmental protection
- Facilitating the transfer of knowledge and technology for sustainable development.
- Encouraging new partnerships and mind-sets within civil society and the private sector.

UNEP around the world

UNEP's global headquarters are in Nairobi, Kenya. Being based in Africa gives UNEP a first-hand understanding of the environmental issues facing developing countries.

UNEP is represented across the globe by six regional offices:

- **Africa: Nairobi, Kenya**
- **Asia and the Pacific: Bangkok, Thailand**
- **Europe: Geneva, Switzerland**
- **Latin America and the Caribbean: Mexico City, Mexico**
- **North America: Washington DC, USA**
- **West Asia: Manama, Bahrain**

UNEP's main activities are :

- *Climate change;*
  - *Including the Territorial Approach to Climate Change (TACC);*
- *Disasters and conflicts;*
- *Ecosystem management;*
- *Environmental governance;*
- *Environment under review;*
- *Harmful substances;*
- *Resource efficiency.*

Convention on International Trade in Endangered Species of Wild Fauna and Flora

Washington, D.C., on 3 March 1973

FAO FIAT PANIS

40 CITES 1973-2013

CITES objectives

Ensure that wild fauna and flora in international trade are not exploited unsustainably

Legality, sustainability, traceability

S. Heindrichs / PEW, Shark fins, China

CITES is a multilateral agreement

Operates through an **intergovernmental process**,

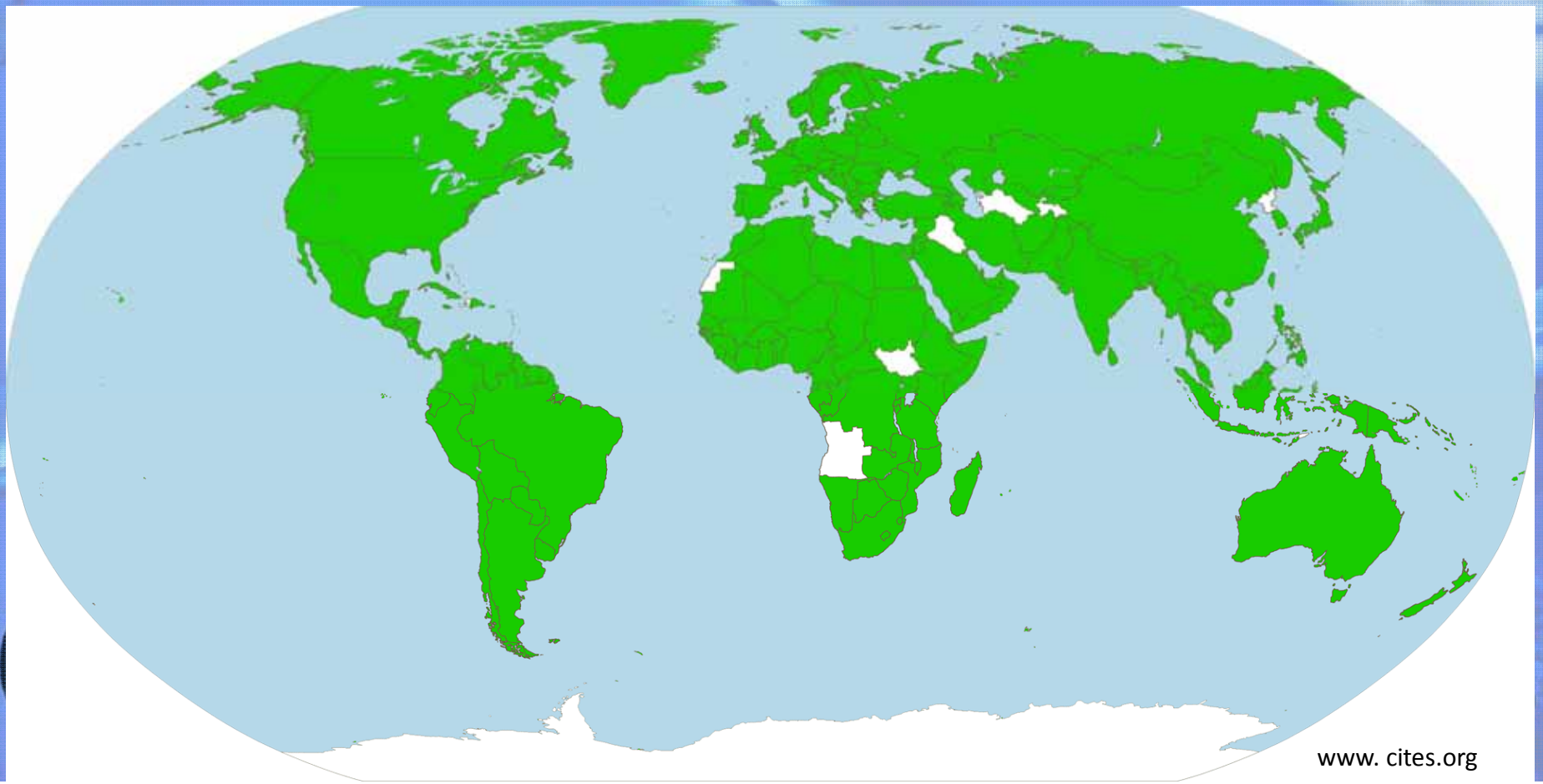
which combines **wildlife** and **trade** themes within a legally binding instrument,

achieving **conservation and sustainable use** objectives

…by setting a common procedural mechanism

CITES coverage & scope

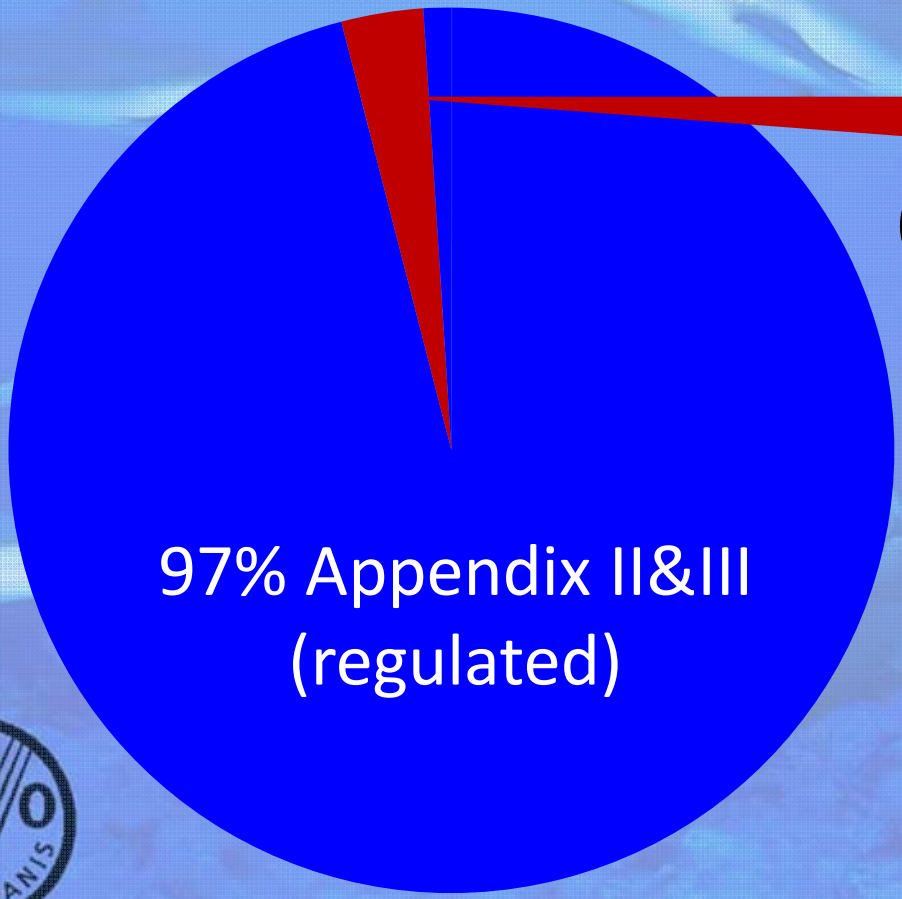
- **179 member countries**
- Regulates international trade of 35,000+ listed species (live, dead, parts and derivatives)



www. cites.org

Not all species are prohibited from trade…

Of the 35,000+ listed species…

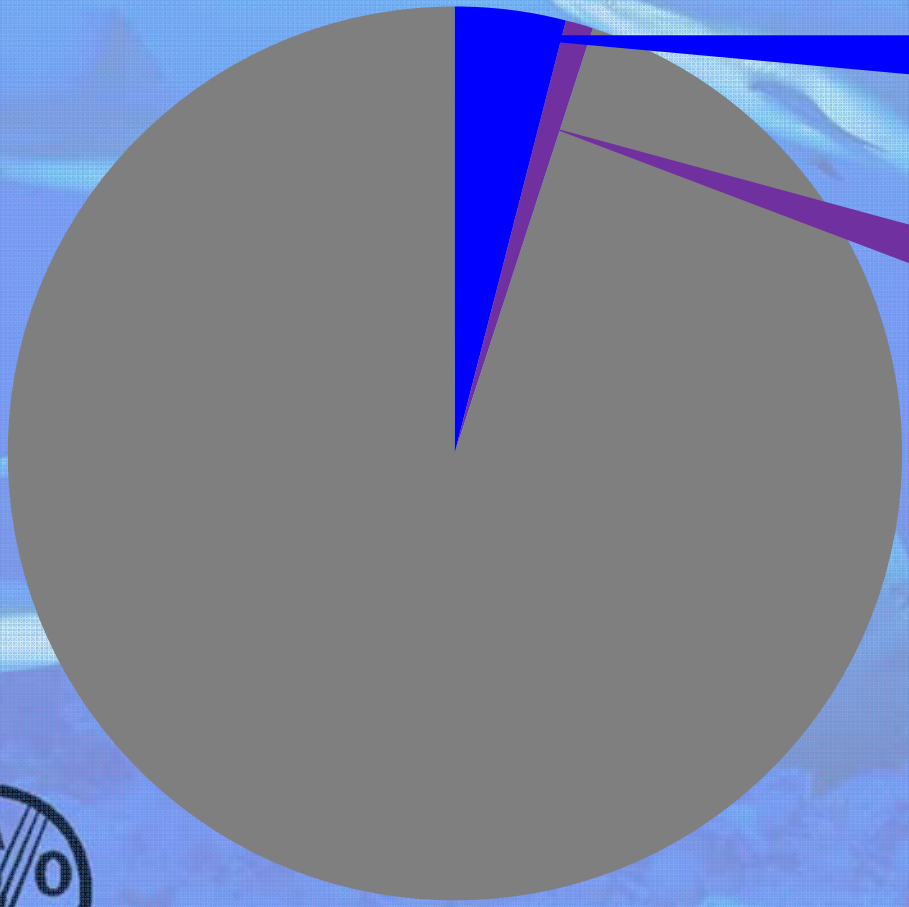


3% Appendix I

(international commercial trade in wild specimens prohibited)

Not all listed species appear in trade…

Of the 35,000+ listed species...



4% commonly traded

1% highly traded

About **150 animal** and **1,800 plant** species account for 90% of CITES transactions

Wildlife Trade & Economy

Value of CITES trade

- Record of 13 million trade transactions
- Globally valued in billions of US Dollars

Examples:

- Queen conch: $ 60 MM/year
- Python skins = $ 1 BN/year
- Bigleaf mahogany = $ 33 MM/year

“Value” of illegal trade…

USD 5-20 billion /year

(*Estimated, excludes marine & timber)

- Specimens that cannot be commercially traded but for which an illegal market exists (tiger skins, rhino horn, etc.)
- Specimens that can be lawfully traded, but are not handled in accordance with CITES

Wildlife trade – economic sectors

Housing & furniture	Mahogany, ramin, cedar, …	
Pharmaceuticals		Vaccines, herbal, research,…
Cosmetics	Wax, oils,…	
Food		Caviar, fish, wild meat, plants,…
Leather & fashion	Bags, watches, fur, fibers,…	

Wildlife trade – economic sectors

Pets

Birds, reptiles, fish…

Tourism

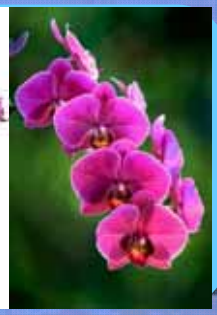
Zoos, museums, botanical gardens, circus

Collections

Hunting safaris, falconry, trophies, souvenirs (shells, corals)

Ornamental plants

Decoration, landscape design, gardens, houseplants, cut flowers



CITES Appendices

Species* regulated under CITES are divided amongst 3 Appendices

I

II

III

** "Species" means any species, subspecies, or geographically separate population thereof"*

CITES Appendix I

- Species threatened with extinction, which are or may be affected by trade
- International (commercial) trade in wild specimens is generally prohibited
- **3%** of all listings (Conference of the Parties to decide)

Sawfishes: *Pristidae* spp.

CITES Appendix II

- Species not necessarily currently threatened with extinction, but may become so unless trade is strictly regulated to avoid utilization incompatible with their survival
- Also, species that resemble species already included in Appendix II
- International (commercial) trade is permitted but regulated
- **96%** of all listings (Conference of the Parties to decide)

Sharks/Manta rays in Appendix II

Cetorhinus maximus
(Basking shark)

Carcharhinus longimanus
(Oceanic whitetip shark)

Sphyrna lewini, S.mokarran, S. zygaena
(Hammerhead sharks)

Rhincodon typus
(Whale shark)

Lamna nasus
(Porbeagle shark)

Manta spp.
(Manta rays)

Carcharodon carcharias
(Great white shark)

Entry into effect delayed to 14 September 2014

CITES Appendix III

- Species for which a country is asking Parties to help with its protection
- International trade is permitted but regulated (less restrictive than Appendix II)
- 1% of CITES trade (no CoP decision needed)

*Lamna nasus**

(Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland)

*Sphyrna lewini**

(Costa Rica)

***Until 14 September 2014**

Other marine species in CITES Appendices

- Humphead wrasse (Napoleon fish) - Appendix II
- Queen conch – Appendix II
- Giant clams – Appendix II
- Hard corals, black corals – Appendix II
- European eel – Appendix II
- Sturgeons – Appendix I & II

CITES listing criteria

Biological criteria

Low productivity (slow-growing, small number of pups), behavioral vulnerability to harvesting

Trade criteria

(historic population declines related to international trade in fins, meat and bycatch)

- Great and Smooth hammerheads: specimens most frequently traded resemble those of the scalloped hammerhead to such an extent that enforcement officers are unlikely to be able to distinguish them

What should Parties do by 14 Sept. 2014?

Countries wishing to (re-)export or import specimens of the recently CITES-listed sharks and rays **after 14th September 2014** have to meet certain requirements.

What should Parties do by 14 Sept. 2014?

Legality

National laws, legal aquisition, RFMOs, enforcement, …

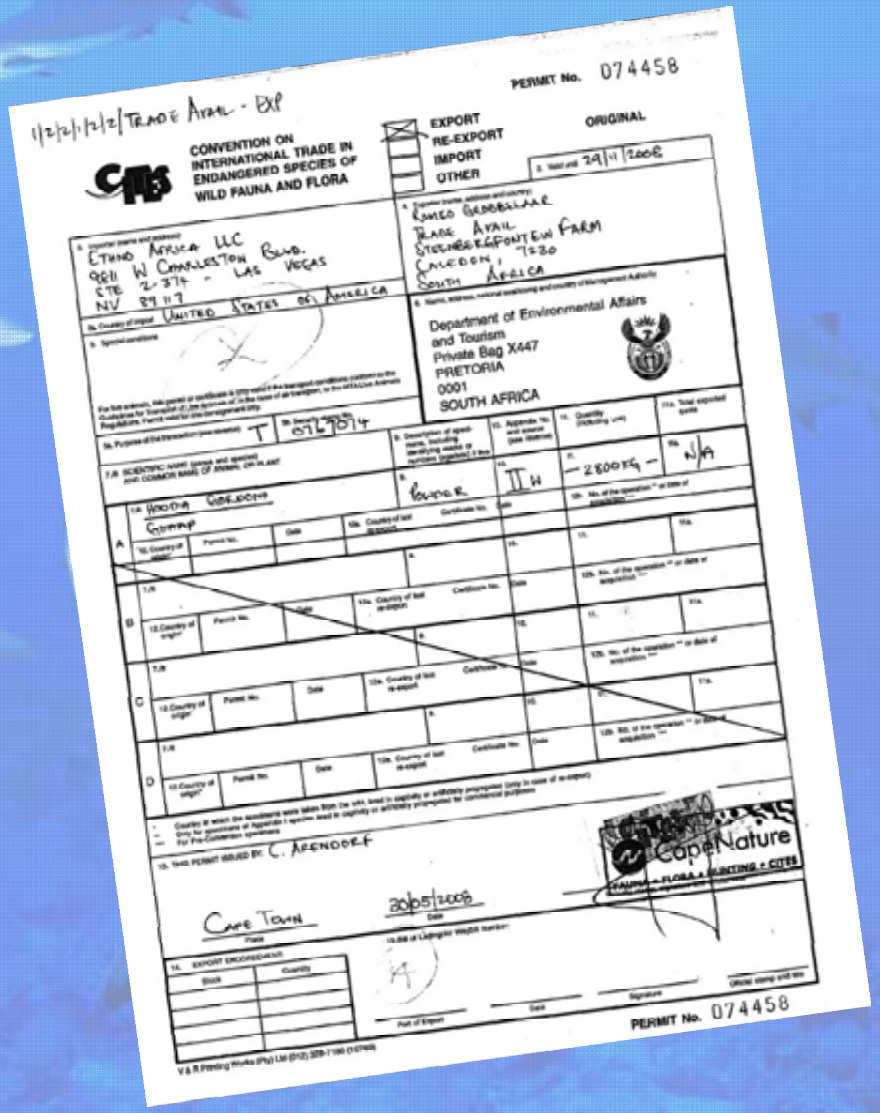
Sustainability

NDFs, science, Introduction From the Sea, …

Traceability

Permits, identification, reporting, databases

CITES Permits and Certificates



PERMIT No. 074458

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA

EXPORT
RE-EXPORT
IMPORT
OTHER

ORIGINAL

Department of Environmental Affairs and Tourism
Private Bag X447
PRETORIA
0001
SOUTH AFRICA

CapeNature

PERMIT No. 074458

CITES permits and certificates

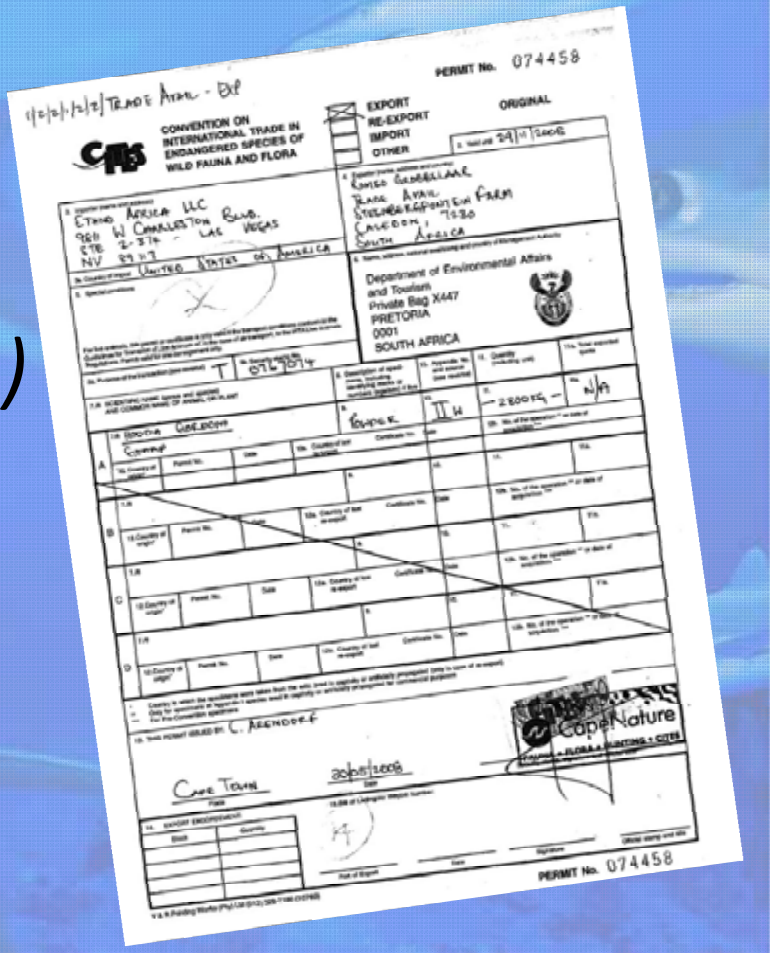
import | export | re-export | introduction from the sea

- Animals and plants (live, dead, parts and derivatives)
- Permits and certificates issued under certain conditions:
  - Lawfully obtained
  - Trade will not be detrimental to the survival of the species

CITES permits and certificates

Provides:

- *Scientific information (non-detrimental findings)*
- *Legal origin & sourcing*
- *Trade data*
- *Purpose of the trade*
- *Duration of validity*



Trade with non-Parties

- Comparable documentation may be accepted
  - issued by competent authorities
  - conforms with CITES requirements for permits and certificates

- Details of the competent authorities and scientific institutions must be included in the CITES Directory

Collaboration and cooperation are essential for CITES implementation

National stakeholders include:

- CITES Authorities
- Natural resources sector (fisheries, forestry, etc.)
- Businesses (traders, wholesalers, transport, etc.)
- Customs
- Police
- Judiciary
- Others

Summary: CITES is…

- Intergovernmental agreement on international trade in wild fauna and flora
- Legality, traceability, and sustainability
- Legal framework & procedural mechanisms
- system of permits and certificates
- Inter-agency and inter-sector collaboration

Sustainable Development Goals: India's National Action Plan on Climate Change and its major missions

Introduction

- The **National Action Plan on Climate Change (NAPCC)** was launched in **2008** by the **Prime Minister's Council on Climate Change.**
- It aims at creating awareness among the representatives of the public, different agencies of the government, scientists, industry and the communities on the threat posed by climate change and the steps to counter it.
- There are **8 national missions** forming the core of the NAPCC which represent multi-pronged, long term and integrated strategies for achieving key goals in climate change. These are-

    1. **National Solar Mission**
    2. **National Mission for Enhanced Energy Efficiency**
    3. **National Mission on Sustainable Habitat**
    4. **National Water Mission**
    5. **National Mission for Sustaining the Himalayan Ecosystem**
    6. **National Mission for A Green India**
    7. **National Mission for Sustainable Agriculture**
    8. **National Mission on Strategic Knowledge for Climate Change**

Salient Features

- NAPCC is guided by following principles-

    - **Protection** of poor and vulnerable sections of society through **inclusive and sustainable development strategy,** sensitive to climate change.
    - **Achievements of national growth** through qualitative changes enhancing **ecological sustainability.**

- **Deployment of appropriate technologies** for both **adaptation and mitigation of GreenHouse Gases emissions** extensively and at an accelerated pace.

GreenHouse Gases (GHG)

- These are gases that **absorb and emit radiant energy within the thermal infrared** range.
- Primary GHGs are **water vapour, carbondiaoxide, methane, nitrous oxide and ozone.**
- Earth's surface temperature would be −18 °C instead of the present average of 15 °C without GHGs.
- GHGs create **Green House Effect** which is the process by which radiation from a planet's atmosphere warms the planet's surface.

- **Regulatory and voluntary mechanisms** to **promote sustainable development** and engineering new and innovative forms of market.
- **Effective implementation** of plans using **unique linkages** like civil society and local governments through **public-private partnership.**
- **Invite international cooperation** for **research, development, sharing and transfer of data and technologies** enabled by sufficient funding and backed up by a global IPR regime under the **United Nations Framework Convention on Climate Change (UNFCCC).**

UNFCCC Secretariat (UN Climate Change)

- It was established in **1992** when countries adopted the **UNFCCC.**
- Located in **Bonn, Germany.**
- Focuses on facilitating **intergovernmental climate change negotiations.**
- Provides **technical expertise and assistance on analysis and review of climate change reports** presented by the parties.
- Plays a crucial role in implementation of the Kyoto Protocol and the Paris Agreement.

Approach

- NAPCC addresses the country's critical and urgent needs by **directionally shifting the development path** and **enhancing** the current and planned **programmes and technologies.**
- It **identifies measures** that **promote our developmental goals** and **co-benefits** by addressing **climate change** also.

1. The Jawaharlal Nehru National Solar Mission

- Governed by **Ministry of New and Renewable Energy.**
- It was **launched in 2010** with the primary aim of achieving **grid parity by 2022** and **with coal-based thermal power by 2030.**
- Aims to increase the share of **solar energy** in India's energy mix.
- It takes the measures of increasing R&D efforts, promoting decentralised distribution of energy by creating cheaper and more convenient solar power systems.
- Emphasis on manufacturing solar panels at the local level and to tie up local research with international efforts.
- Seeks to **reduce the absolute cost** of solar energy to bring it down and make it affordable.

Functions and Goals

- Making **solar water heaters mandatory** in buildings to promote the already proven and commercially viable **solar heating systems.**
- By the **remote village electrification programme,** using solar power as an off-grid solution to provide power to the power deprived poor.
- **Creating conditions for research and application** in the field of solar technology and **support & facilitate** the already on-going R&D projects.
- The ultimate objective is to develop a solar industry in India, **capable of delivering solar energy competitively again the fossil fuel options.**
- It is hoped that **by the end of the third phase, 2022,** India should have installed **20,000 MW** of solar power.

2. National Mission for Enhanced Energy Efficiency

- Governed by the **Ministry of Power.**
- Based on the **Energy Conservation Act, 2001.**
- It creates a market based mechanism to **enhance cost effectiveness** of improvements on energy efficiency. Switching to cleaner fuels, commercially viable technology transfers, capacity building needs etc are the way forward for this mission.
- **Development with energy efficiency** as a key criterion.

Functions and Goals

- **Spread awareness** about the efficacy and efficiency of energy efficient products and **create demand.**
- **Ensure adequate supply** of energy efficient products, goods, and services by forming a cadre of energy professionals.
- **Create financing platforms** which can make risk guarantee funds, financial derivatives of performance contracts.
- **Formulate** well thought out **evaluation and monitoring mechanisms** to capture energy savings in a transparent manner.
- **Overcome market failures** through regulatory and policy measures.
- Key areas to work upon are **Energy, Efficiency, Equity and Environment.**

3. National Mission on Sustainable Habitat

- Governed by the **Ministry of Urban Development.**
- **Manifold agenda** mission because it looks at energy efficiency within buildings, waste disposal from these buildings and betters the public transport system.
- Plans to make **urban areas more climate friendly** and **less susceptible to climate change** by a **multi-pronged approach** to mitigate and adapt to it.

Functions and Goals-

- To create and adopt a more holistic approach for **solid and liquid waste management,** ensuring their full potential for energy generation **(conversion of solid waste into energy),** recycling, reusing and composting.

- To **encourage alternative transport systems** and **establish fuel efficiency standards and reduce fuel consumed per passenger travel** by the provision of pedestrian pathways.
- To provide for **adoption and creation of alternative technologies** mitigating climate change and to **encourage community involvement** for it.
- Creation of **one building code** for the entire nation.
- A system to **enforce law and order.**
- Establish **financial incentives** based on **green rating.**
- **Reduce** need for pumping of water, **proper treatment of waste** water and use of **better designed toilets.**
- **Promote** use of **natural gas** and alternative & renewable fuels.
- **Comprehensive urban renewal master plan** proposals with sustainable designs.

A master plan is a dynamic long-term planning document that provides a conceptual layout to guide future growth and development.

- **Better enforcement of** Urban Development Plan Formulation and Implementation **(UDPFI) guidelines.**

4. National Water Mission

- Governed by the **Ministry of Water Resources, River Development and Ganga Rejuvenation.**
- Ensures **better integrated water resource management** leading to **water conservation, less wastage, equitable distribution** forming better policies.
- Looks into the issues of **groundwater and surface water management, domestic and industrial water management, improvement of water storage capacities and protection of wetlands.**

Functions and Goals

- **Review and data collection** on the network of hydrological, automatic weather and automated rain gauge stations.
- Expeditiously **implement water projects in climate sensitive** regions.
- Promotion of **water purification and desalination techniques.**

- **Enactment of a bill** for the regulation and management of **groundwater sources.**
- **Research** in water use efficiency in industry, agriculture and domestic sectors.
- Providing **incentives for water neutral & positive technologies.**
- **Review National Water Policy** to include **integrated water resources** management, **evaporation** management and **basin level** management.
- Water data base in the public domain and the assessment of impact of climate change on water resource
- **Promotion of citizen and state action** for water conservation, augmentation and preservation.
- More focused attention to **over-exploited** areas.
- **Improving water use efficiency by 20%** through regulatory and pricing mechanisms.

5. National Mission for Sustaining the Himalayan Ecosystem

- Governed by the **Department of Science and Technology.**
- Created to **protect** the **Himalayan ecosystem.** The mandate is to evolve measures to **sustain and safeguard the Himalayan glaciers, mountain ecosystems, biodiversity and wildlife conservation & protection.**

Functions and Goals

- **Human and knowledge capacities-** appointing trained personnel who can capture, store and apply knowledge relating to vulnerability and changes in the region.
- **Institutional capacities-** creating capability to conduct long term observations, studies to understand and warn of changes in the Himalayan ecosystem
- **Evidence based policy building and governance-** creating a platform for Himalayan states and the Centre to interact with various bodies.
- **Continuous self learning for balancing** between forces of Nature and actions of mankind by creating strong linkages with community based organisations.

- Establishing of a **modern centre of Glaciology, standardisation of data collection to ensure interoperability and mapping of natural resources** in the area.
- **Identification and training of experts and specialists** in the area relevant to sustaining the Himalayan ecosystem.

6. National Mission for Green India

- Governed by the **Ministry of Environment, Forest and Climate Change.**
- It has the **mandate of reviving degraded forest land** with a focus on **increasing forest cover & density** and **conserving biodiversity.**
- Works towards **reducing fragmentation of forests, enhancing private public partnerships for plantations, improving schemes based on joint forestry management etc.**
- Makes plans to tackle the challenges posed by climate change.

Functions and Goals

- **Enhancing carbon sinks** in **sustainably managed forests.**
- **Enhancing the resilience of vulnerable species and ecosystems** to **adapt** to climate change.
- **Enabling forest dependent communities** to **adapt** to climate variability.
- **Double the area** to be taken up for **afforestation.**
- **Increase greenhouse gas removals** by Indian forests.
- **Enhance resilience of forests and ecosystems** falling under the mission.

7. National Mission for Sustainable Agriculture

- Governed by the **Ministry of Agriculture.**
- It works towards **devising strategies** to make **Indian agriculture less susceptible to climate change.**
- It would **identify and develop new crop varieties,** use **traditional and modern agricultural techniques.**
- This mission sees **dry land agriculture, risk management, access to information and use of biotechnology** as **areas of intervention.**

Functions and Goals

- **Strengthening agricultural insurance, develop a system based on Geographic Information System (GIS)** and **remote sensing** to map soil resource and land use.
- **Providing information and collation** of off-season crops and **preparation of** state-level **agro-climatic atlases.**
- **Strategise to evolve low input agriculture** with **enhanced water and nitrogen efficient** crops.
- **Nutritional strategies** to manage heat stress in dairy animals.
- Using of **micro irrigation systems.**
- Promotion of agricultural techniques like **minimum tillage, organic farming and rain water conservation.**
- **Capacity building** of farmers and other stakeholders.
- **Production of bio-fertilizer, compost** along with subsidies for **chemical fertilizers.**
- **Strengthening** of **National Agricultural Insurance Scheme.**

8. National Mission on Strategic Knowledge for Climate Change

- Governed by the **Department of Science and Technology.**
- It **identifies challenges and requisite responses** to climate change. This will be done through **open international collaboration** and **would ensure sufficient funding** for this research.
- There is a need for strong strategic knowledge system on climate change.

Functions and Goals

- **Develop regional climate science.**
- **Leverage international cooperation.**
- The efforts undertaken here would feed into the **Indian National Network for Climate Change Assessment (INCCA)** which is a **stock taking exercise conducted every two years as part of the national obligations under UNFCCC.**
- Creation of a **data generation and sharing system** by mapping resources on knowledge relevant to climate change.

- **Identifying knowledge gaps** and inspiring from global technological trends to select and test technologies.
- **Creating new centres dedicated to climate research** within existing institutional framework.

Achievements

- **The World Wide Fund for Nature-India (WWF)** feels that the National Action Plan is fairly **comprehensive** and has **cross-sectoral links** through the eight National Level Missions. The **focal point** is India's impetus on **following on a low carbon energy path without impending economic growth** and quality of life of people.
- NAPCC brings a **balanced perspective on mitigation and adaptation** through some new dimensions like creation of National Mission on Strategic Knowledge for Climate Change as this would **ensure exchange of knowledge and informed research** in India.

Challenges and Suggestions

- India has the potential to do things differently because it is in an **early stage** of development and it **contributes very little to the changing climatic conditions.** It can leapfrog to a **low carbon economy by using high-end and emerging technologies.**
- The plan report **makes no commitment to cut the country's carbon emission** which should have been an integral part of it.
- The **focal point** of NAPCC **seems to be solar power mission only** and the government’s efforts to maximise the solar energy seemingly approve it. **Equal emphasis on all missions with equal inputs** would have enabled the county to yield fast and visible results.
- Missions related to sustainable habitat, water, and agriculture and forestry are **multi-sectoral, overlapping, multi-departmental, advisory and very slow moving** in nature. Several ongoing activities are in principle aligned with the objectives of these missions which should **either be integrated** with the missions or **scrapped** to save the time and cost.

- Another challenge is the **monitoring systems,** which are **either ineffective or absent.** Progress reports for NSM, NMEEE, and NWM are currently available but mapping of progress for other missions has been difficult due to their cross-cutting nature.
- Ministries are **required to report progress and have regular meetings** with the PM's Council on Climate Change.
- Finally, it can be said that **institutional, systemic and process barriers—** including **financial constraints, inter-ministerial coordination, lack of technical expertise and project clearance delays—**stand as **major challenges** in the efficient implementation of the missions.
- The **cross-cutting subjects** of the missions have **not yielded any positive results** on grounds yet **so a new approach is needed** to solve this and bring the agenda of climate change to the mainstream.
- While these challenges have drawn criticisms, they also provide us with the opportunity for discussion on the approaches to deal with climate change in India and understand the best way ahead to mainstream climate change.

Way Forward

- Recognising that climate change is a global challenge, the plan promises that India will **engage actively in multilateral negotiations** in the UN Framework Convention on Climate Change, in a **positive, constructive and forward-looking manner.**
- It is now clear that initiatives to prevent climate change have been started but, most importantly, these **initiatives must be continuous and sustainable** and every individual of every country will need to contribute to prevent climate change.
- By releasing the NAPCC, the **Indian government has shown its commitment** to address climate change issues and also **sent a positive message** to the public, industries, and civil society about the government's concern to address the climate change issue through concerted action.
- Issues related to the **awareness** regarding global warming and climate change **among the general population** and the **issue related to agriculture and health hazards** due to climate change **must be addressed strongly and effectively.**

Wildlife (Protection) Act, 1972

Introduction

Wildlife Act, a landmark in the history, was enacted for providing protection to wild animals and birds. Wildlife was transferred from State list to concurrent list in 1976, thus giving powers to the Central government to enact legislation.

- The Act also provides the constitution of Indian Board of Wildlife (IBWL), which actively took up the task of setting up Wildlife National parks and sanctuaries.

Objectives of the Act:

Wildlife Act, a landmark in the history, was enacted for providing protection to wild animals and birds. Wildlife was transferred from State list to concurrent list in 1976, thus giving powers to the Central government to enact legislation.

The Act also provides the constitution of Indian Board of Wildlife (IBWL), which actively took up the task of setting up Wildlife National parks and sanctuaries.

1. Restriction and prohibition on hunting and trapping wildlife.
2. Rehabilitation of endangered and threatened species.

3. Preservation of biological diversity by establishing sanctuaries, national parks and biosphere reserves.

4. Grant of a special permit to hunt a wildlife for scientific research, scientific management and collection of specimens for zoological gardens, museums etc.

5. Regulation of trade in wildlife and national conservation strategy.

6. Collaboration with voluntary bodies and NGO's.

Drawbacks of the Wildlife (Protection) Act, 1972:

1. It seems that the Act has been enacted just as a fallout of Stockholm Conference held in 1972. It has not included any locally evolved conservation measures.
2. The personal ownership certificates for animal articles (tiger, leopard skins etc.) are permissible which very often serve as a tool for illegal trading.

3. The Wildlife traders in Jammu and Kashmir easily get illegal furs and skins from other states which after being made into caps, belts etc. are sold to other countries. This is so happening because J and K has its own Wildlife Act and it does not follow the Central Wildlife Act. Moreover, hunting and trading of several endangered species prohibited in other states are allowed in J and K, thereby opening avenues for illegal trading in such animals.

4. There is little emphasis on protection of plant genetic resources.
5. The offender of the Act is not subject to very harsh penalties. It is just up to 3 years imprisonment or a fine of Rs. 25000 or both.

Water (Prevention and Control of Pollution) Act, 1974

- The Act defined terms like pollution, sewage effluent, trade effluent, stream and boards.

The salient features and provisions of the Act are summed up as follows:

- 1. The Act provides for maintenance and restoration of quality of all types of surface and ground water.
- 2. It provides for the establishment of Central and State Boards for pollution control.
- 3. The Act assigns powers and functions to these Boards to control pollution.
- 4. The Central and State Pollution Control Boards are given comprehensive powers to advise, coordinate and provide technical assistance for prevention and control of water pollution.

- 5. The Act has provisions for funds, budgets, accounts and audit of the Central and State Pollution Control Boards.
- 6. The Act prohibits disposal of any poisonous, noxious or polluting matter to the flow of water in a stream. However, dumping of any material into a stream for the purpose of reclamation of land is not considered an offence.
- 7. The Act provides for severe and deterrent punishments for violation of the Act which includes fine and imprisonment.
- The main regulatory bodies are the Pollution Control Boards, which have been conferred the following functions and powers.

Functions of Central Pollution Control Board (CPCB):

- 1. CPCB advises the Central government in matters related to prevention and control of water pollution.
- 2. Coordinates activities of State Pollution Control Boards and provides them technical assistance and guidance.
- 3. Organizes comprehensive programmes on pollution related issues through mass media.

- 4. Lays down standards for water quality parameters.
- 5. Collects, compiles and publishes technical and statistical data related to pollution.
- 6. Prepares manuals for treatment and disposal of sewage and trade effluents.
- 7. Establishes laboratories for analysis of water, sewage or trade effluent samples.

Functions of State Pollution Control Board (SPCB):

- 1. The SPCB has similar functions to be executed at state level and are governed by the directions of CPCB.
- 2. SPCB advises the State government with respect to the location of any industry that might pollute a stream or river.
- 3. It lays down standards for effluents entering the water bodies.
- 4. The State Board has powers to obtain information, to take samples of effluents from any industry, to sanction or refuse consent of the industry, to make survey of any area and gauge and keep record of the volume and other characteristics of any stream or well.

- 5. Every industry has to obtain consent from the Board (granted for a fixed duration) by applying on a prescribed proforma providing all technical details along with a prescribed fee following which analysis of the effluent is carried out.
- 6. A person empowered by the Board has the right to enter, inspect and examine any plant, record, register, document or any other material object, or for conducting a search of any place where he has reason to believe that no offence of water pollution is committed.
- 7. The Board has powers to restructure the outlets for dumping pollutants. The Board suggests efficient methods for utilization, treatment and disposal of trade effluents.

- While development is necessary for the progress of a nation but it is most important to prevent pollution, which can jeopardise the existence of man. Installation and proper functioning of effluent treatment plants in all polluting industries is a must for checking pollution of water and land. Despite certain limitations in the Act, the Water Act has ample provisions for controlling water pollution through legal measures.

The Water (Prevention and Control of Pollution) Cess Act, 1977:

- 1. This Act empowers the Central Water Board to collect cess on water consumed by persons carrying on certain scheduled industries and by local Authorities responsible for supplying water.
- 2. The cess and the consent fees from the major sources of revenue to run the Central and State Water Boards.
- 3. The Act has been amended in 1991 with a view to augment the resources of the Boards by removing the lacunae in the Act and to provide rebate to the industries for complying with the consumption and effluent quality standard.

Technical Difficulties in Controlling Water Pollution:

- There are, however, several enforcements problems. Although the Water Cess Act was passed to meet the expenses of the Central and State Boards yet the Water Board has no power to take direct action against the erring party. The court procedures are time consuming and delays often prevent quick and preventive action thereby defeating the sole purpose of the Act.

- Because of the problems inherent in the implementation of the Act, amendments were proposed for strengthening the working of the State Boards. Inspite of the legislative measures, the pollution of our water ways continues unabated. This is due to the lack of civic sense among people and due to the lack of necessary infra structure for enforcing implementation of the laws efficiently.

Forests (Conservation) Act, 1980

Introduction

The Act covers all types of forests including reserve forests, protected forests or any forested land irrespective of its ownership. The Act has made ample provisions to check deforestation and encourage afforestation of non-forest areas.

The National Forest Policy (1980) prohibits State governments for declaring any portion of forests as non-reserved without approval of Central government. The policy also prohibits State government for allotting any forest land for non-forest purposes.

The amended Act (1988) prohibits lease of forest land to anybody other than the government. It enhances conservation, plantation and increase of forest cover to an average of 30%.

Amended Forest Act, 1992:

1. The Act made provision for allowing some non-forest activities in forests without cutting trees with prior approval of Central government. These activities include setting of transmission lines, seismic surveys, exploration, drilling and hydroelectric projects.

2. Wildlife sanctuaries, National Parks etc. are totally prohibited for any exploration or survey without prior approval of Central government even if no tree felling is involved.

3. Cultivation of tea, coffee, spices, rubber, mulberry for rearing silk worms and cash crops are included under non-forestry activities and are not allowed in reserve forests.

4. Even cultivation of fruit bearing trees, oil yielding plants or medicinal plants in the forest area need to be first approved to maintain the balance in the ecology of the forest.

5. Mining is a non-forestry activity and prior approval of Central government is mandatory.

- 6. Any proposal sent to Central government for non-forest activity must have a cost benefit analysis and also Environmental Impact Statement (EIS) of the proposed activity.
- 7. More stringent penal provisions are made against violators of the Act.

Drawbacks of the Forest (Conservation) Act:

1. This Act has just transferred the powers from States to Centres to decide the conversion of reserve forest lands to non-forest areas. Thus powers have been centralized at the top.
2. The Act has failed to attract public support because it has infringed upon the human rights of the poor native people.

- 3. Very marginal participation of the poor community in the Act remains one of the major drawbacks which affects proper execution of the Act.

4. Forest dwelling tribal communities have a rich knowledge about the forest resources, their values and conservation. But their role and contribution is neither acknowledged nor honoured.

5. Efforts are now being made to make up for gaps in laws by introducing the principles of Public trust or Human rights protection.

Air (Prevention and Control of Pollution) Act, 1981

Air (Prevention and Control of Pollution) Act, 1981:

- Air pollution is defined as the presence of any liquid or gaseous substances in the atmosphere in such a concentration which tends to be injurious to man, animals, plants or environment.

- Air Act was passed under Article 253 of the Constitution of India and in pursuance of decisions of Stockholm Conference.
- 1. The objective of this Act is to provide means for the prevention, control and abatement of air pollution in order to preserve the quality of air.

- 2. The Act defines relevant terms such as air pollution, air pollutants, vehicular exhausts and industrial plants etc.
- 3. The Act also includes automobiles, diesel vehicles, transport, railways and domestic fuels.
- 4. The Act provides, as per Section 19, the declaration of certain heavily polluted areas as Air pollution control area and no industrial plant shall be operated in these areas without prior consent of the State Pollution Control Board.

- 5. The Central and State Water Boards have been entrusted with the task of controlling and preventing air pollution and accordingly they have been redesigned as Central Pollution Control Board and State Pollution Control Board respectively.
- 6. The State Boards have to lay down and enforce standards for prevention and control of air pollution.
- 7. Under Section 20 of the Act, the State Government in consultation with the respective Board may give instructions to the concerned Authority in-charge for Registrations under the Motor Vehicles Act, 1939, to ensure emission standards for automobiles. Failure to comply with the conditions prescribed for this purpose is punishable with fine and imprisonment.

- 8. The State Boards have powers to sue a polluter in a court of law to punish him for polluting the air and the expenses incurred by the Board will be recovered from the polluter.
- 9. The Boards have powers to authorise any person to inspect the premises of the polluter and to collect samples of emissions from chimneys, flues, ducts or any other outlets for the analysis of pollutants.
- 10. The Act also includes noise under the category of air pollutants in 1987.

Environment Protection Act, 1986

Environment Protection Act, 1986:

The Environment Protection Act, November 19, 1986 was enacted as per the spirit of the Stockholm Conference held in June 1972 to take appropriate steps for the protection and improvement of the environs and to prevent hazards to human beings, living creatures and property. The Act consists of 26 Sections distributed among four chapters and extends to the whole country.

Section 2 of the Act empowers the Central Government to make following rules for the first time for:

(i) Standard of quality of air, water and soil for various areas and for various purposes.

(ii) Maximum permissible limits of concentration for various environmental pollutants (including noise) for different areas.

(iii) Procedures and safeguards for handling of hazardous substances.

(iv) Prohibition and restrictions on the location of industries and carrying out operations.

(v) Procedures and safeguards for prevention of accidents which may cause environmental pollution and

(vi) Providing for remedial measures in case of accidents.

Salient Features of the Act:

a. EPA is a land mark legislation to provide a single focus in the country for the protection of environment and to plug the loop holes in the earlier laws.

b. The Act ensures enforcement of several Acts/Regulations concerning pollution control.

In fact, EPA is an umbrella legislation which provides a framework for the coordination of Central and State Governments and authorities established under Water and Air Acts.

This Act confers powers to the Central Government to:

1. Take all such measures as it deems necessary for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution.
2. Issue directions (i) for the closure, prohibition or regulation of any industry, operation and process and (ii) for the stoppage or regulation of the supply of water, power or any other service even without obtaining court orders.
3. Empower any person to enter, inspect, take samples and test.

4. Establish or recognise environmental laboratories and appoint Government analysts.

5. Prohibit industrial emission or discharge of environmental pollutants over and above the limits stipulated by the relevant standards.

6. Any person can make a complaint of violation of provisions of the Act to the Central Government or authority or officer authorised for this purpose.

7. The Act prescribes stringent penalties to the defaulters for violation of the provisions of the Act.

8. The jurisdiction of Civil Court is barred under the Act. Every State has to set up Green Bench Courts to attend to Public Interest Litigation (PIL) cases concerning environmental hazards affecting the quality of life of citizens.

The State Pollution Control Boards have to follow guide lines provided under schedule 6 of EPA, 1986, some of which are as follows:

a. They have to advise the industries for treating the waste water and gases with the best technology to achieve the prescribed standards.

b. The industries have to be encouraged for recycling and recovery of biogas, energy and reusable materials.

c. The Central and State Boards have to emphasize on the implementation of clean green technologies by the industries to reduce the generation of pollutants.

The Government has taken several steps to provide legal and institutional basis for implementation of the Act. These include issue of rules, notification of standards, action regarding environmental laboratories, strengthening of State Departments of Environment and Pollution Control Boards, delegation of powers, identification of agencies for carrying out various activities for hazardous chemical management and setting up of Environment Protection Councils in the States. Besides this the Ministry has recently taken several new initiatives to steer the country towards the basic premises of sustainable developments and towards providing ecological security for the future.

Amendments to the EPA, Rules:

1. Environmental Impact Assessment:

Under the Environment (Protection) Rules, 1986, an amendment was made in 1994 for Environmental Impact Assessment (EIA) of various (29 major) development projects. EIA of 29 specified projects falling under sectors such as Industries, Mining, Irrigation, Power, Transport, Tourism etc., require clearance from Central Government before establishment.

- The project proponent has to provide EIA report, risk analysis report, NOC from State Pollution Control Board, project report/feasibility report, technical information for environmental appraisal of the project, availability of water and electricity and comprehensive rehabilitation plan etc.

2. Biomedical and Hazardous Wastes:

Under the EPA, 1986, the Central Government has also made Biomedical and Hazardous Waste (Management and Handling) Rules, 1989.

3. Environmental Audit:

The Government of India promulgated an amendment to the EPA rules, 1992. Every person carrying on any industry or operation requiring consent under the Water Act, 1974 or Air Act, 1981 or hazardous waste rules, 1989 issued under EPA, 1986 shall submit an environmental audit report for each financial year ending 31st March in a prescribed form to the State Pollution Control Board. This form covers information of quantity of raw materials consumed including water per unit of product, total production, quantity of pollutants and hazardous wastes as well as the extent of recycling and reuse.

Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

Why in News?

- Recently Supreme Court asked states to free tracts of forest land in possession of people whose claims have been rejected under the Forest Rights Act (FRA), 2006.
- The judgement has triggered protests from forest rights groups, who contended that wildlife conservation cannot overcome natural justice goals.

Historical Background

- A large number of people especially the scheduled tribes have lived in and around forests for a long period in symbiotic relationship.
- This relationship has led to formalized or informal customary rules of use and extraction, often governed by ethical beliefs and practices that have ensured that forests are not too degraded.
- During the colonial time the focus shifted from the forests being used as a resource base for sustenance of local communities to a State resource for commercial interests and development of land for agriculture.
- Several Acts and policies such as the 3 Indian Forest Acts of 1865, 1894 and 1927 of Central Govt and some state forest Acts curtailed centuries-old, customary-use rights of local communities.
- This continued even after independence till much later until enactment of The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

Related Acts and Provisions

- **Wildlife protection Act 1972**
  - This act prohibits the capturing, killing, poisoning or trapping of wild animals.
  - It extends to the whole of India except the State of Jammu and Kashmir
  - It also regulates and controls trade in parts and products derived from wildlife.

- **1988 National Forest Policy**
  - The policy aims at maintaining of environmental stability.
  - It looks at conserving the natural heritage of the country by preserving the remaining natural forests.
  - Increasing forest/tree cover in the country through massive afforestation and social forestry programmes.
  - Creating a massive people's movement for achieving these objectives and to minimise pressure on existing forests.
- **The Provisions of the Panchayats (Extension to the Schedule Areas) Act 1996 (PESA)**
  - It safeguards and preserves the traditions and customs of the people, and their cultural identity, community resources, customary mode of dispute resolution.
  - PESA empowers Gram Sabha/Panchayat at appropriate level with right to mandatory consultation in land acquisition, resettlement and rehabilitation of displaced persons.
  - PESA seeks to reduce alienation in tribal areas as they will have better control over the utilisation of public resources.
  - It will help minimise exploitation of tribal population as they will be able to control and manage money lending, consumption and sale of liquor and also village markets.
  - PESA looks to promote cultural heritage through preservation of traditions, customs and cultural identity of tribal population.

Features of the Act

- The act recognize and vest the forest rights and occupation in Forest land in forest Dwelling Scheduled Tribes (FDST) and Other Traditional Forest Dwellers (OTFD)who have been residing in such forests for generations.
- The act also establishes the responsibilities and authority for sustainable use, conservation of biodiversity and maintenance of ecological balance of FDST and OTFD.
- It strengthens the conservation regime of the forests while ensuring livelihood and food security of the FDST and OTFD.
- It seeks to rectify colonial injustice to the FDST and OTFD who are integral to the very survival and sustainability of the forest ecosystem.

- The act identify four types of rights:
  - **Title rights**
    - It gives FDST and OTFD the right to ownership to land farmed by tribals or forest dwellers subject to a maximum of 4 hectares.
    - Ownership is only for land that is actually being cultivated by the concerned family and no new lands will be granted.
  - **Use rights**
    - The rights of the dwellers extend to extracting Minor Forest Produce, grazing areas, to pastoralist routes, etc.
  - **Relief and development rights**
    - To rehabilitation in case of illegal eviction or forced displacement and to basic amenities, subject to restrictions for forest protection
  - **Forest management rights**
    - It includes the right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use.

Who can claim these Rights?

- Members or community of the Scheduled Tribes who primarily reside in and who depend on the forests or forest lands for bona fide livelihood needs.
- It can also be claimed by any member or community who has for at least three generations **(75 years)** prior to the **13th day of December, 2005** primarily resided in forests land for bona fide livelihood needs.
- The Gram Sabha is the authority to initiate the process for determining the nature and extent of Individual Forest Rights (IFR) or Community Forest Rights (CFR) or both that may be given to FDST and OTFD.
- **Procedure**
  - First, the gram sabha (full village assembly, NOT the gram panchayat) makes a recommendation – i.e who has been cultivating land for how long, which minor forest produce is collected, etc. The gram sabha plays this role because it is a public body where all people participate, and hence is fully democratic and transparent.
  - The gram sabha's recommendation goes through two stages of screening committees at the taluka and district levels.

- The district level committee makes the final decision (see section 6(6)). The Committees have six members – three government officers and three elected persons.
- At both the taluka and the district levels, any person who believes a claim is false can appeal to the Committees, and if they prove their case the right is denied (sections 6(2) and 6(4)).
- Finally, land recognised under this Act cannot be sold or transferred.

Importance

- The acts looks to right the wrongs of government policies in both colonial and independent India toward forest-dwelling communities, whose claims over their resources were taken away during 1850s.
- The act also has potential of sustainably protecting forest through traditional ways along with providing tribes means of livelihood.
- It expands the mandate of the **Fifth and the Sixth Schedules** of the Constitution that protect the claims of indigenous communities over tracts of land or forests they inhabit.
- The alienation of tribes was one of the factors behind the Naxal movement, which affects states like Chhattisgarh, Odisha and Jharkhand. The act through identifying IFR and CFR tries to provide inclusion to tribes.
- It has the potential to democratise forest governance by recognising community forest resource rights over an estimated 85.6 million acres, thereby empowering over 200 million forest dwellers in over 1,70,000 villages.
- The act will ensure that people get to manage their forest on their own which will regulate exploitation of forest resources by officials, forest governance and management as well as tribal rights etc.

Challenges

- **Administrative Apathy**
  - Implementation of the act remains the biggest challenge as acts related to the environment are not entirely compliant with the law, illegal encroachments have happened as much as that claims have been unfairly rejected.

- As tribals are not a big vote bank in most states, governments find it convenient to subvert FRA or not bother about it at all in favour of monetary gains.

- **Lack of Awareness**
  - Unawareness at the Lower level of forest officials who are supposed to help process forest rights claims is high and majority of the aggrieved population too remains in the dark regarding their rights.
  - The forest bureaucracy has misinterpreted the FRA as an instrument to regularise encroachment instead of a welfare measure for tribals.
- **Dilution of Act**
  - Certain sections of environmentalist raise the concern that FRA bend more in the favour of individual rights, giving lesser scope for community rights.
  - Community Rights effectively gives the local people the control over forest resources which remains a significant portion of forest revenue making states wary of vesting forest rights to Gram Sabha.
- **Reluctance of the forest bureaucracy to give up control**
  - There has been deliberate sabotage by the forest bureaucracy, both at the Centre and the states, and to some extent by big corporates.
  - The forest bureaucracy fears that it will lose the enormous power over land and people that it currently enjoys, while the corporates fear they may lose the cheap access to valuable natural resources.
- **Institutional Roadblock**
  - **Rough maps** of community and individual claims are prepared by Gram Sabha which at times often lack technical knowhow and suffers from educational incapacity.
  - **Intensive process of documenting communities' claim**s under the FRA makes the process both cumbersome and harrowing for illiterate tribals.

Way Forward

- The government of India views MFP rights as a means to curb Naxalism since the states most affected by Naxalism are also home to the maximum number of people dependent on forest produce.

- The recognition of CFR rights would shift forest governance in India towards a community conservation regime that is more food security and livelihood oriented.
- Large-scale awareness and information dissemination campaigns are required at local level informing both tribal and lower level officials.
- It is important to develop a detailed strategy of training and capacity building of people responsible for implementing the FRA, such as Panchayats, Gram Sabha, village level Forest Rights committee etc.
- The relevant maps and documents should be made available to the Forest rights committee and claimants to simplify the task of the Gram Sabha in identifying and filing claims for individual and community rights.
- Providing clarity on the time limit for settling claims the act does not specify any time limit for resolving claims. In most of the areas, both the officials and beneficiaries are unaware of this fact.
- Centre should take more proactive role in pushing states to honour a law that could change the lives of millions.