

Global climate change and Sustainable

Development: Challenges and Opportunities

I - Introduction.

II - Deciphering the terms of Global climate change and Sustainable Development

III - Challenges of Sustainable Development for Mitigating Global Climate change

1 - Population Explosion

i - The Eight billion population of the globe

ii - Burden on Natural Resources.

a - If the fossils fuels are used at the same pace, they will run off the surface of Earth by 2075.

iii - Increased development to meet their needs.

2 - Poverty

i - War on Natural Resources.

ii - Civil unrest

iii - Unemployment

iv - Urbanization

a - Land destruction.

3 - Expensive Switching Techniques to Alternate Energy Resources

i - Electric cars

ii - Shifting coal energy to renewable energy resources

a - Solar power

b - Tidal energy

4 - Excessive Deforestation

i - Producing Timber for livelihood.

ii - Cooking and Burning

iii - Land clearing for setting up industries.

a - Forest land cover of the globe reduced by 25% of that of 1970s.

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excellent checked by Khushi Malik

trimming the sequence

outline extensive? you can call it over expensive. rest is perfect.

5- Weak implementation of Laws.

- i- Industries violating atmosphere beyond limitations.
- ii- Overlooking Environmental Protection Agency (EPA's) recommendations.
- iii- Excessive levels of noxious gases injected into the atmosphere unfiltered.

6- Apathy of Global North to suffering Global South

- i- 20% of the population utilizing 80% of the natural resources of the developing countries.
- ii- The USA, the sole global hegemon, not taking the adequate responsibility.
- iii- Pakistan less than 0.5% emissions' contributor but 5th largest climate vulnerable state.

7- Lack of Funds for Climate Mitigation in Developing states.

- i- Most of the funds for climate change utilized in Disaster management and Rehabilitation.
- ii- Floods in Pakistan, 2022.
- iii- Natural Disasters: load on already crunched economies.

IV- Opportunities for Achieving Sustainable Development to Reduce the Pace of the Global Climate Change

1- Harnessing the potential of Renewable Energy Resources.

i- What suits the topology the best.

ii- Solar energy.

iii- Tidal power

iv- Geothermal energy.

v- Hydroelectric energy.

2- Adopting "Re-use" Strategy

- i- Reusing the materials: Decreasing burden on natural resources
- ii- Reuse of glass reduce 20% air pollution and 50% water pollution.

3- Recycling methods promotion ✓

- i- Adequate sewage treatment plants.
- a- Recycling water. ✓
- b- Composting - Enriched fertilizer yield.
- c- Avoiding Eutrophication ✓

4- Afforestation.

- i- Natural carbon sinks. ✓
- ii- A tree sequesters 250 billion tons of carbon dioxide in its lifetime. ✓
- iii- Climate purification. ✓
- iv- Cooling effect to climate; Mitigating Global Climate Change
- v- Chipko, Apiko, Narmada Bachao Andolan.

5- Public Awareness regarding Energy conservation ✓

- i- Switch off the equipments when not in use.
- ii- Not buying aerosol products with ozone depleting substances.
- iii- Buying energy efficient equipments.
- iv- Replacing old equipments.

6- Climate Fund.

- i- Materialized at Conference of Parties (COP-28), 2023.
- ii- A globalized world's concerted efforts to fight this menace. ✓
- iii- Ensuring climate justice and equity. ✓

7- Habitat conservation.

- i- Wildlife sanctuaries ✓
- ii- Natural Protected Areas.
- iii- Conservation of Biodiversity.
- iv- Balanced Ecosystem ✓
- v- A ray of hope for threatened species.
- a- Blind Dolphin ✓
- b- Snow Leopard.
- c- Pandas

V- Recommendations for Achieving Sustainable

Development to counter Global Climate Change

- i- Green and clean technologies.
- ii- Buying Biodegradable products.
- iii- Utilizing maple seedlings for carbon sequestration.
- iv- Adopting the 'ORCA model' of Iceland for Direct Air Capture.
- v- Afforestation and Reforestation.
- vi- Global Awareness and practical measures.

VI- Conclusion

"Go Green. There is no Planet B". The inquisitiveness of the mankind quenched his thirst of achieving the milestones of marvellous industrialization at the stake of his breathing atmosphere. He invented incredible equipments that facilitated him not only in mundane chores but also aided him in carrying out his specialized work. But these anthropogenic activities expedited the phenomena of Global warming that ensued a cascade of a devastating climate change that is manifesting itself in varied forms of natural disasters. The inordinate use of natural resources depleted the ability of the Earth to replenish its precious fossil fuels at the same pace. The conservationists of the environment advocated the need for maintaining the capability of the Earth to provide the natural resources and preserve the ecosystem through the platform of United Nations Framework convention for climate change in 1972 in Stockholm where sustainable development was proposed as the sustainable solution for saving the only inhabitable planet, the Earth.

The fast pace of the global climate change

can be halted by adopting the measures assuring sustainable development through adequate utilization of ^{available} the opportunities while shunning away the halting challenges to restore economic, social and environmental sustainability of the Earth.

The phenomenon of Global Climate Change is the natural process of the globe to maintain adequately warm temperature to sustain life. It is naturally fueled by volcanic eruptions, marsh lands and swamps along with carbon dioxide from the human activities but it has now assumed the shape of "Extended Global warming" that is increasing temperature of the planet due to anthropogenic activities. These anthropogenic activities include deforestation, industrialization, urbanization and excessive use of the fossil fuels. The gases released as byproducts of these human-induced endeavours form blanket around the Earth and cause Global warming. The temperature rise of 4.5 to 4.50°C is predicted by the end of this century with its terrible manifestations that need sustainable development to be adopted to check its alarming pace. Sustainable development means to utilize the natural resources of the Earth in a way that the replenishing capacity of the planet is not worn out and it continues to supply them for mankind for extended periods of time.

Population explosion is a profound challenge for materializing the sustainable development to reduce the accelerated pace of the global climate change. The enormous eight billion population of the globe is a huge toll on the scarce natural resources of the only liveable planet. According

to a projected study if the fossil fuels are used at the same pace, they will go off the surface of the Earth by 2075. It is rightly said that when the last fish has been caught, the last tree been cut down and the last stream been poisoned, people will realize that we cannot eat money. But the man overlooked the consequences of his accelerated pace of industrialized and went on for conquering more and more domains of the technology adding to the polluted atmosphere and utilizing the precious resources of the Earth inadvertently.

Similarly, poverty, a state having inadequate resources to fulfill the needs also mobilised the impoverished man to the urban centres and putting a burden on the carrying capacity of the ecosystem. The projections are that the upcoming wars will be on water - a precious natural resource - necessary for maintaining and sustaining life. The impecunious person also engages in the activities that resultantly cause civil unrest in the societies. Also, the unemployment due to exceeding carrying capacity of the ecosystem leads him to greedy measures of interfering with the environment for example clearing the land forests for establishing industries or sowing crop lands for earning from agriculture and saturating the capability of the land with excessive fertilizers for attaining more crop yield.

Furthermore, another obstacle to sustainable development and undermining climate change is the costly switching expenditures needed for alternate energy resources installations while decreasing the usage of natural fossil fuels. For instance,

shifting from petrol, liquified natural gas and diesel powered engines to electricity powered engines in the form of electric cars need hefty sum of money that is less likely in the developing and underdeveloped states. Further, switching from already established coal powered plants to renewable energy resources is an uphill task for the global south.

Abandoning the natural resources i.e. decarbonization of the technologies not only needs research based upgraded technological support but also huge loads of funds allocated for utilizing solar energy and tidal power.

Moreover, man ~~since~~^{for the} times immemorial engaged himself in inordinate deforestation for procuring timber for livelihoods and domestic purposes including burning it for heating in winters and cooking.

Also, he indulged in the practice of wiping the green sinks off the Earth that were a natural way of sequestration of carbon dioxide, the biggest contributor of Global warming, and in this way disturbed the environmental sustainability necessary for maintaining a balanced ecosystem.

According to a study, the forest land cover of the globe has reduced by 25% from that of 1970s.

It also resulted in increased temperature of the Earth as they maintain the cooler climate and ~~mitigate~~^{ensured in} intense natural resources like floods, hurricanes and cyclones.

In addition to that, the weak implementation of the laws is also a stumbling block in attaining sustainable development and mitigating the climate change. Their less stringent adoption gives the industries a leverage to pollute the atmosphere,

hydrosphere and lithosphere beyond set limitations. Also, the laws governing bodies like Environmental Protection Agency in Pakistan get overpowered by the power centres and give in to them by allowing their approval despite the shortcomings. In this way, these point sources of pollution, the industries, pollute the atmosphere with the noxious gases without adequate filtration; vitiate the lithosphere by their toxic wastes and malign the hydrosphere by polluting the fresh water sources with harmful byproducts. Further, the apathy of the Global North to the suffering Global South also proved to be a hurdle in achieving the sustainable development and reducing the climate change. The rich nations are utilizing 80% of the natural resources, that the nature has endowed the developing nations with, for only 20% of its population. They procure the raw natural resources at minimal costs and take them to their industrial setups, produce finished goods there and pollute the atmosphere with noxious gases utilized to run their industrial set ups and sell them to the poor nations at costly rates, therefore jeopardizing their climates by pollution and exploiting their impoverished economies by selling expensive finished products. Also, the United States of America, the sole global hegemon and guarantor of peace of the world ignores the notion of adopting responsibility in adopting the measures to mitigate climate change. Similarly, Pakistan, a developing nation continues to suffer as the 5th most vulnerable nation to climate change despite a meagre contribution of 0.5% to global emissions.

Furthermore, the developing states also face the dearth of funds when it comes to spending in the domain of the climate mitigation. Most of their

expenditures is spent in the domains of disaster management and rehabilitation of the infrastructure and the human beings, that is an additional toll on their crippling economies hardly meeting the food security, water security, health hazards and morbidities and mortalities. The floods in 2022 in Pakistan inundated half of the country causing loss of lives, livelihoods, homes and infrastructure.

The refugees had to face both financial and psychological trauma along with health hazards namely the disease outbreaks. The intense natural disasters gaining strength amidst worsening global climate change put a huge load on the struggling economies of the states with the developing economies the ones that are most affected.

However, there are a plethora of opportunities that must be utilized for achieving sustainable development and reducing the global climate change. One of them is harnessing the vast potential of the renewable energy resources. What type of renewable energy will be best suited to the country depends on the topology, geography and the location of the country. For example, Pakistan can utilize the geothermal energy potential that suits its topology. Also, it can harness the tidal power in its coastal belt where the required speed of 7.1 metres per second ^{of} wind exists, an ideal condition to use this alternative source of energy.

Also, the small buildings, houses and the businesses can gradually shift their energy dependence on the renewable energy resources which will not only reduce the dependency on the natural resources but also ensure clean energy, not polluting the planet anymore.

Further, the adoption of 'Reuse' strategy is not only pocket friendly but also environmentally sustainable. It ensures sustainable development by sparing the fossil fuels which are otherwise utilized in generating these items. The re-use strategy also reduces the waste generation and further reduces the energy needed for proper waste disposal through incineration or fueling the treatment plants. It also decreases the pollution of the environment. For example, reusing a glass reduces air pollution by 20% and water pollution by 50%.

Moreover, the promotion of recycling methods also ensures sustainable development by reducing fossil fuels for usage in generation of those items along with decreased climate change impact by institutionalizing de-carbonization and de-fossilization. The adequate sewage treatment plants not only avoid eutrophication but also yield recycled water ready to be utilized and along with an enriched fertilizer yield the humus-yielded as the result of composting of the sewage byproducts. The recycled and purified water can be utilized for irrigation of the agricultural lands saving the precious freshwater for drinking and cooking purposes.

Similarly, the sustainability of the planet can be ensured by planting new trees; replenishing the green and vegetative cover of the Earth that serve as climate filters along with the banks for the storage of carbon dioxide. The CO_2 is incorporated into food chain and oxygen is given off in the atmosphere. A single tree is estimated to sequester 250 billion parts per million of CO_2 in its lifetime. Further, the phenomenon of 'transpiration' also regulates the

environmental temperatures and keep it cooler. The mankind after witnessing its varied benefits went for 'Apiko', Chipko and 'Narmada Bachao Andolan' for advocating the afforestation and reducing and uprooting the practice of deforestation altogether.

In addition to it, the public awareness and education presents an opportunity for achieving sustainable development for reducing the carbon footprint and ensuring climate change. One way to achieve is by adopting energy conservation which is to switch off the equipments when not in use. Also, not buying the aerosol products with chlorofluorocarbons that deplete the only protective layer of the Earth, ozone against the ultraviolet radiations of the sun. Also, the planet can be aided by buying the energy efficient equipments; similarly, the older ones should be replaced with the newer ones so that the precious energy generated at the cost of precious fossil fuels, thousands of years old, can be saved and utilized adequately.

Furthermore, the opportunity of the "Climate Fund" materialized at the Conference of Parties (COP)-28 in Nov-Dec, 2023 in Abu Dhabi, ^{The} United Arab Emirates presented the global community a chance to exert concerted efforts to fight the menace menace of the ever-growing climate change and achieve sustainable development. It brought the climate responsibility onto the shoulders of the global north to aid the Global South in mitigating their sufferings as a result of the phenomenon of global warming. It is actually a project of saving the global worth itself as the climate change knows no borders and limits. It

also upholds the notion of climate justice and equity for the ones suffering the most though contributing negligibly to it.

Lastly, the habitat conservation is the opportunity of reassessing the sustainable development by maintaining the variety of species, the beauty of the earth preserved. The global communities have made wildlife sanctuaries and declared naturally protected areas to ensure provision of natural ecosystem to the threatened species. Pakistan also hosts 25 sanctuaries. Also, the countries are also maintaining seeds' gene pool for preserving the ability of ecosystem to enjoy its diverse colours which ensures a balanced ecosystem. It also serves as a ray of hope to protect the threatened species like Blind dolphin, snow leopard and pandas which is actually a plan to save man who cannot stay isolated ~~land~~ is a part of this ecosystem in a food web.

The sustainable development can be achieved by adopting clean and green technologies not adding any adverse byproducts into the atmosphere ^{and} buying biodegradable products. The measures for carbon sequestration can also be adopted by ^{employing} genetically engineered maple seedlings. Also, the states ^{should} mimic the model of ORCA model of Iceland deployed for direct Air capture and utilized for generating biodiesel giving two way benefit of not only carbon sequestration but also de-fossilizing the Earth. The Earth must be aided by replenishing its green sinks by afforestation and reforestation. The global populace must be enlightened regarding the need and methods of adopting sustainable measures for mitigating the climate change.

The intensifying speed of the phenomenon of global climate change can be contained by ensuring sustainable development by utilizing the available options and removing the obstacles in the pathway for mitigating this menace of climate change to uphold the sustainable potential of the planet. The sustainable utilization of the scarce natural resources ensures not only their long-term availability but also their adequate usage for matching the sustainability in the domain of economy, society and environment. The adoption of clean and green technologies and alternate sources of energy help in defossilization and mitigating the impact of carbon footprint on the Earth. The silver lining in the sky is the pledge of the Global North in COP-28, 2023 to take up the responsibility in aiding the global South in mitigating the climate change impacts and reducing its aftermath by practical steps such as climate fund. The mankind must join hands to exert joint efforts for saving the only green planet capable of supporting life.