

Advancing Science and Technology without Environmental Degradation: Sustainable Development and Way Forward

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Abstract : It is no secret that, given today's limitless scientific and technology developments and scarce natural resources, environmental and technological progress often intersects. Therefore, it is crucial to strike a balance between environmental concerns and technological development at the same time in order to conserve what we already have for future generations and, eventually, to prevent the Earth from degrading. The environment so far has been polluted and destroyed as a result of technological advancements like those related to radiation technology, electronic manufacturing, large-scale construction and energy production related industries, although these advancements typically incorporate measures to minimize environmental degradation. In the past ten years, irreversible ecological habitat destruction, excessive technowaste release into the environment, deforestation, global warming, and climate change has all emerged as major environmental threats. If it does not take actions to mitigate these threats immediately, mother Earth will eventually perish.

This paper aims to advocate the pure idea of "Sustainable Development" which has been stepped out from its framework due to the technological advancement. The paper employed doctrinal research methodology to attain this goal and the qualitative and quantitative data that were gathered from

books, journal articles and reports showed that the development of science and technology is the primary cause of environmental deterioration. The paper concludes that environmental preservation should be given more attention in sustainable development, and makes recommendations to minimize environmental degradation through advancements in science and technology in addition to other environmental legal principles.

Keywords: Environmental Degradation, Technological Advancement, Sustainable Development

1. Introduction

Environment in its broad context includes air, water, soil, flora and fauna. As provided in Principle 2 of the Stockholm Declaration on human environment is, 'the natural resources of the earth, including the air, water, land, flora and fauna and especially representative samples of natural ecosystems' constitutes the environment. It may be considered as a mixture of the most delicate and vulnerable natural resources on Earth in accordance with the preceding treaty description. Humans depend on the environment because it supports the livelihoods and ensures the survival in all of its aspects. Maintaining an ecologically healthy environment is therefore in own personal interests of humans as well as the common interest of all states to promote environmental well-being so that the

population can exercise the right to a healthy and productive environment.

It is clear that limiting the advancements in science and technology is not possible as humans in the twenty-first century. The premise ought to keep society from turning the focus away from environmental protection issues and towards the issues related to technological advancement. The majority of environmental pollution agents, however, appear to come from sectors that have developed as a result of research and technology. In fact, 75 percent of the land has been damaged by human activity in the domains of scientific and technology progress, according to a 2017 study from the Intergovernmental Panel on Climate Change (IPCC). This has resulted in a significant loss of biological diversity and desertification. The aforementioned facts demonstrate how science has developed to the point that it may eventually supplant environmental protection. The failure to give environmental protection, the consideration it deserves in relation to the concepts and principles of environmental law is where this important issue collides. One of the contemporary solutions to this conundrum is reconciliation with "Sustainable Development". In order to attain the primary goal of sustainable development, society should pay closer attention to environmental preservation since the degree of environmental protection correlates with the success of a development project. According to the Earth Charter of 1998 and the Precautionary Approach recognized under Principle 15 of the Rio Declaration on Environmental and Development of 1992, industrialists and project proponents can be further burdened to take precautionary measures to mitigate or at least to minimize environmental degradation. Since social norms generally emphasize taking essential activities before such actions lead to adverse effects, the same should be applied in

environmental aspects under "Precautionary Principles". As a result, the law states that those who violate these clauses could be liable under the Polluter-Pays Principle or the Precautionary Principle, depending on whether their actions ultimately result in adverse circumstances. Although the "Precautionary Principle" and the "Polluter-Pays Principle" play significant roles in the legal framework for environmental law, the environment still faces serious dangers.

Despite the provisions ingrained in these international treaties, conventions, and Protocols that followed them, people have chosen to tackle environmental problems from an anthropocentric perspective. This perspective views the environment in terms of human values and holds that as people are the most important being in the universe, thus the environment should be protected solely for their enjoyment. This premise hinders the intrinsic value of the natural earth, yet regarded for its substantial importance to human beings. Principle 1 of the Rio Declaration emphasizes the afore-stated stance, asserting that 'Human beings are at the centre of concerns for sustainable development, they have a right to a healthy and productive life in the natural environment'. The most key issue in this regard is how to successfully conserve and sustain the ecosystem without deteriorating it. Therefore, the article's goal is to illustrate the idea of 'Sustainable Development' from a fresh angle that prioritizes environmental preservation by suggesting more practical and competitive recommendations to be implemented in order to strengthen the pure values of the sustainable development framework.

2. Methodology and Experimental Design

A. Research Methodology

The paper adopted doctrinal research methodology to collect secondary quantitative

data and both primary and secondary qualitative data. The afore-stated was employed to understand the core principles and concepts of Environmental law, allowing for the recommendation of an effective framework to encourage environmental protection while also continuing to allow for scientific advancement.

B. Methods and Experimental Design

The Stockholm Declaration of 1972, Rio Declaration of 1992, and case laws from India and Sri Lanka were employed to acquire qualitative primary data. Since both jurisdictions have numerous competitive judgments on environment related case laws, it has eased the in-depth understanding of the legal perspective on the topic of the study. Books and journal articles were used to obtain qualitative secondary data, while pre-compiled reports from the United Nations (UN), IPCC and AIS Study Centre were utilized to obtain quantitative secondary data.

3. Results

One of the significant issues being considered in the contemporary context is environmental degradation. Environmental degradation is defined by the UN International Strategy for Disaster Reduction as the 'Reduction in the capacity of the planet to meet social and environmental goals and demands'. Long-term ecological consequences, some of which can destroy entire ecosystems, can be used to identify environmental issues. An environment is a special type of entity that includes both living and non-living elements. Even if it appears to be okay on the surface, there are negative effects. Some specialized animal and plant groups, the majority of which are unique to their bioregion or require a huge area to ensure that their genetic lines are maintained, feel the brunt of these effects the most. The combination of a significantly large and growing human population, steadily rising per capita income, and the use of resource-

depleting and environmentally destructive technologies results in ecological consequence or deterioration. When technological advancement divides up lands, the environment is also divided. Streets that cut through a forest or even trails that weave through plains are some examples of this.

According to research, it is evident that industrial activity, specifically deforestation, air pollution, and water pollution, is the main cause of environmental degradation. The investigations have shown that new constructions, which are entirely dependent on new technical building methods, are the main cause of the deforestation. When building sites use technological equipment for large structures instead of using human labour, the vibrations, radiation, and noises that the equipment emits produce additional negative environmental damages that will ultimately cause the ecosystem to degrade quickly. With the advancement of science and technology, industrial machines with high radiation outputs, vibrations, and noise levels are constantly used on building sites, degrading the environment. It is obvious that as knowledge and technology have developed, environmental degradation has been increasing quickly. Additionally, it is directly contributing to the negative health conditions facing the general people.

Environmental deterioration may have negative effects on human health. Respiratory issues like pneumonia and asthma can develop in areas where harmful air pollution is present. It is known that air pollution has caused millions of deaths indirectly. The UN has noted that during the Covid-19 Pandemic period, nearly all of the states had to halt operations at their industrial locations, and everyday vehicle traffic also decreased. As a result, the UN performed research as part of its 15th Sustainable Development target to determine how the ecosystem has changed. In the above-

noted study, it was found that the rate of air pollution had swiftly decreased and that the Taj Mahal Trapezium Zone had also been freed of the toxic chemicals that were being released by the factories. Additionally, they have seen that as industrial, scientific, and technological activities have decreased, the globe has become somewhat greener. Additionally, researches have showed that following the Pandemic, deforestation levels have grown once more due to an upsurge in development. Even though deforestation was prohibited during the pandemic period, practically all activities during that time were undertaken online, where the radiation from technical equipment badly affected the ecosystem.

off by environmental harm in the form of less greenery, diminished biodiversity, massive landfills, and increasing air and water pollution. In terms of restoring green cover, cleaning up landfills, and protecting endangered species, the enormous costs that a nation may have to bear owing to environmental degradation can have a big economic impact. The decline of the tourism sector might also have an economic consequence. Environmental degradation will also have a negative impact on the ozone layer, which shields the planet from dangerous UV rays. The ozone layer is being destroyed by the presence of hydrochlorofluorocarbons, also known as chlorofluorocarbons, in the atmosphere. When it runs out, it will release dangerous radiation back onto the planet.

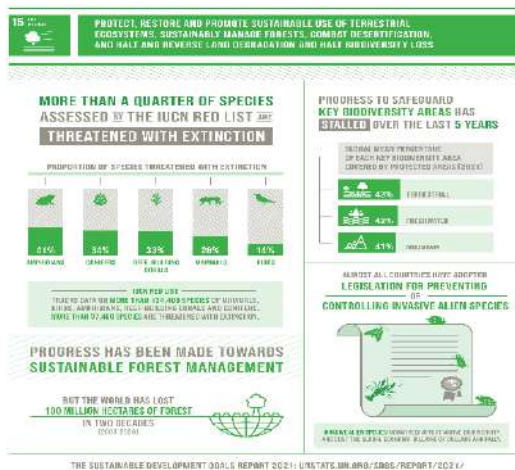


Figure 1. Life on land, UN Sustainable Development Goal #15

Source: The Sustainable Development Goals Report 2021

In order to resist pollution, replenish nutrients, safeguard water sources, and stabilize the climate, biodiversity is crucial for maintaining the ecosystem's equilibrium. The main drivers of biodiversity loss include deforestation, global warming, overcrowding, and pollution. For the tourism business, which depends on tourists for a daily income, environmental degradation can be a major setback. Most tourists may be greatly turned

4. Discussion

The primary components that must be guaranteed are the sustaining natural capital stock and the preservation of the environment from pollution in order to secure a country's sustainable trajectory, which ultimately calculates to the global sustainability. In addition, a suitable adaptation mechanism must be taken into account when responding to environmental challenges on a global scale, particularly those related to climate change. Despite the fact that changing current rules and regulatory frameworks has been the subject of several talks, little has been done to improve general environmental management practices. The three main categories into which the current global community's most pressing environmental issues fall are as follows. They are the degradation of natural capital stock, environmental pollution and the means of the responding impacts in global level.

Land, water, and air degradations are the three basic types of environmental degradation. Degradation of land and soil occurs as a result

of subpar farming methods, overuse of pesticides and fertilizers, and landfill leaks. Degradation of water is when significant amounts of industrial waste are dumped nearby in rivers or lakes, oceans are polluted by rubbish dumped there, and there is illegal dumping as well. Air deterioration, particle pollution, and ozone layer thinning are all examples of atmospheric degradation. In addition to the three primary techniques, there are numerous other types of pollution that can occur, including radiation pollution, noise pollution, and light pollution, all of which contribute to environmental degradation.

According to Toner Buzz (2022), the total amount of deforestation that has taken place over the past three decades has directly contributed to environmental degradation overall and will pose a threat to future global sustainability goals. The following is a list of the findings from the Toner Buzz studies:

- 31% of the earth's surface is covered by forests, approximately 4.06 billion hectares
- Only 18% of the world's forests are on land protected from deforestation.
- Over 420 million hectares of forest have been lost since 1990.
- Between 1990-2010 an average of 15.5 million hectares of forest were destroyed every year.
- Between 2010-2015, 12 million hectares of forest were destroyed every year giving a 22.58% decline for 2010-2015 compared to 1990-2010.
- Between 2015-2020, 10 million hectares of forest were destroyed every year giving a 35.48% decline for 2015-2020 compared to 1990-2010 and 16.67% decline compared to 2010-2015.
- 2,400 trees are cut down each minute.
- 25.8 million hectares of forest were lost in 2020, double the amount of forested land lost in 2001

- Prior to 2019, greenhouse gas emission from tropical forest degradation was seriously underestimated.
- 14,800 square miles of forest are lost every year. This is roughly the same size as Switzerland.
- Deforestation causes approximately \$2 trillion to \$4.5 trillion in lost biodiversity each year.
- 4.2% of the world's tree cover loss was between 1990 and 2020.
- By 2030, there may be only 10% of the world's rainforests left.
- 31% of modern diseases are a result of deforestation.
- 137 different species of plants, animals, and birds are lost every single day due to global forest loss.
- Approximately 1,400 tree species are currently listed as critically endangered.

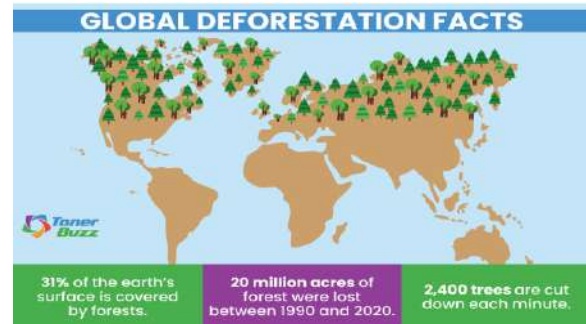


Figure 2. Global deforestation for the year 2022

Source: Toner Buzz

According to Deforestation Facts and Statistics 2022 [Global Data] by Toner Buzz, following studies demonstrate the extent of environmental degradation brought on by air pollution particularly that brought on by harmful industrial activity worldwide.

- 9 out of 10 people worldwide breathe polluted air

- About 7 million people die every year from air pollution. Almost 90% of deaths occur in countries of low and middle income.
- Air pollution is the 4th largest threat to human health.
- Air pollution led to 1 in 10 deaths in 2013, which cost the global economy about \$225 billion in lost labour income.
- Of the world's 20 most polluted cities, 18 are in China
- Air pollution kills more people than guns and car accidents put together in the United States.
- Despite being the world's largest carbon emitter and the country with the worst air pollution on the planet, studies demonstrated that the nation made major progress in reducing air pollution thanks to strict policy action.
- A child born today might not breathe clean air until they are 8 years of age.
- Breathing polluted air can reduce life expectancy by up to 2 years.
- Studies demonstrated that more than 200 pollutants in polluted air can age skin and makes us look older.
- 4 million people die from indoor air pollution each year.
- India, China, Bangladesh, and Pakistan account for the 50 most polluted cities in the world when it comes to air pollution.
- Air pollution kills more than 1 million seabirds annually.
- Lung cancer is responsible for about 6% of outdoor air pollution deaths.
- 91% of the world experiences outdoor air pollution.
- Pneumonia and ischemic heart disease are the most common causes of premature death brought on by indoor air pollution.

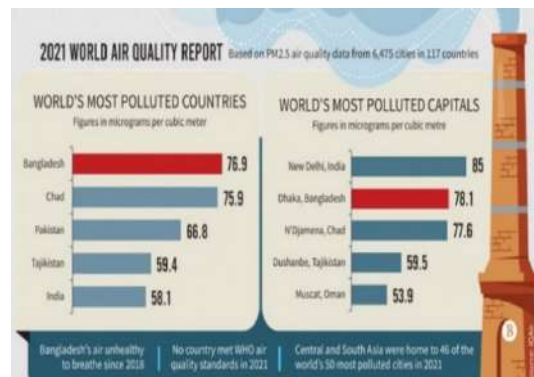


Figure 3. World air quality report for the year 2021

Source: Vajiram & Ravi, IAS Study Center

The notion of sustainable development has been acknowledged as a workable solution to end poverty and enhance the standard of living for people. Given that environmental deterioration is intensifying as science and technology advance, it appears to pose a serious danger to sustainable development. The following are the key components of sustainable development as they relate to the field of environmental law. Taking appropriate measures to stop and address the causes of environmental degradation is known as the precautionary principle. According to the Polluter Pays Principle, the polluter has an unequivocal obligation to pay for environmental restoration as well as compensation for victims. The laws that monitor and control human activities related to the environment when they are likely to lead to environmental degradation will ultimately safeguard the environment as the final characteristic. The Constitution, which establishes the right to a clean and healthy environment as well as the responsibility to safeguard it, and the country's Penal Code, which defines public nuisance to include all forms of pollution, are the two most important pieces of law.

In the case of *Geethani Wijesinghe and the Environmental Foundation Limited v. Minister of Environment and Natural Resources, Environment Ministry SC (FR) Application No. 87/2007* which is known as the Air Pollution Case in Sri Lanka, in order to lessen the excessive air pollution caused by the harmful gases generated by automobiles, the court has ordered the enactment of new legislations to monitor the Air emission, Fuel, and Vehicle Importation Standards of vehicles in Sri Lanka. The increased use of cars by the worldwide community as a result of scientific and technological advancements has led to environmental damage.

In the case of *Watte Gedara Wijebanda v Conservator General of Forest and eight others SC Application 1556/2004*, Justice Tilakawardane referred to Principle 21 of the Stockholm Declaration 1972 and Principle 1/2 of the Rio Declaration 1992. It was held that, '... although the instruments and the constitutional provisions cited above are not legally binding upon government, they constitute an important part of our environmental protection regime'.

In the case of *Al Haj M.T.M. Ashik and four others, Trustees of Kapuwatta Mohideen Jumma Mosque, Denipitiya, Weligama v. R.P.S.Bandula, O.I.C Weligama and nine others SC (FR) Application No. 459/2008*, which is known as the Noise Pollution Case, due to the noise produced by the mosque's amplifiers and loudspeakers, the case was brought before the court. In the case, it was made clear that excessive use of amplifiers and loudspeakers contributes to both public annoyance and noise pollution, both of which would have a negative impact on the environment.

In the case of *M.C. Mehta v Union of India (1997) 2 SCC 41*, the case was based on the Polluter Pays Principle where the Supreme Court of India has ordered to pay compensation for the

damages occurred due to the discharging of poisonous effluents from the factories situated near by the River of Ganges. In the case of *M.C. Mehta v Union of India (1997) 2 SCC 353*, which is a very famous case where the court has ordered to stop functioning and relocate the industries in another area since the gases emitted from the industries can damage the Taj Mahal with the time pass. Moreover, in the case of *M.C. Mehta v Union of India (1998) 9 SCC 93*, the court held that the authorities should strictly adhere to the laws and the protect the Taj Mahal Trapezium Zone from air, sound and other means of environmental pollutions where the case was filed against the musical concern by "Yanni" Troupe. It shows that the excessive usage of the scientific and chemical related sources in industries can be considerable threats to the environment.

In the case of *Vellore Citizens Welfare Forum v. Union of India and Others AIR (1996) SC 2715*, Justice Kuldip Singh stated that, "although the leather industry in India is a major foreign exchange earner and is of vital importance to the country, it has no right to destroy the ecology, degrade the environment and pose a health hazard". He further established that the traditional concept of development and ecology are opposed to each other is no longer acceptable since the only answer is enhancement of "Sustainable Development" towards environmental preservation.

5. Conclusion

With all the research done by experts and academics, it is now obvious that the environment, along with the variety of plants and animals it supports, is in danger due to the significant global advancements that the expansion of science and technology has sparked. Human health, the planet's biodiversity, country tourism, and the global economy have all been negatively impacted by environmental deterioration. The degree of a

healthy environment for a better existence has been severely eroded as a result of the negative impacts that have already taken place. It has directly contributed to the sustainable development being threatened. The goal of sustainable development is to meet the needs of the present generation while protecting the environment and all of its advantages for future generations. However, it is still debatable if the current diminishing resources will allow for the continued existence of future generations. The environment has degraded as a result of the advancement of science and technology, and the public now only cares about meeting their needs rather than the safety and preservation of the environment for future generations. As a result, the true value of the sustainable development concept has now been diminished. Furthermore, it is evident from the rulings made by state courts in environmental issues that the law always encourages the public to protect the environment, even when the authorities are acting inadvertently for their own gain. The environment has been severely harmed by the use of science and technology for development projects, but it has also been harmed by the radiation, gases, and other dangerous particles that are released. So, as a general proposal for preventing further environmental degradation, studies have indicated that the use of science and technology in a way that threatens the environment should be monitored, the violators should be punished, and the severity of laws and regulations should be enhanced.

6. Recommendations

The following suggestions might be made in order to prevent environmental deterioration and achieve the true objectives of sustainable development by prioritising the environmental protection, after analysing all the information on pollution and the study results.

1. **Reduce Deforestation - Stopping deforestation is essential for our environmental system in order to reduce the negative effects of environmental deterioration.** Trees store greenhouse gases, provide oxygen, serve as a natural habitat for a variety of animals and plants, many of which could become extinct if these forests are destroyed, hence it is not financially feasible to chop or burn them down. To conserve the environment, a significant afforestation campaign needs to be started. Through reforestation or afforestation, it can have better effects. Moreover, it can be reduced through inventing alternative sources to fulfill the wooden needs which should definitely be eco-friendly products.
2. **State laws governing human activities - Every time there are issues that significantly harm the environment, governments must step in and establish a framework.** Governments can easily achieve the actual means of sustainable development by minimizing the environmental degradation that occurs as a result of the advancement of science and technology by strengthening the laws relating to the environment as well as the scientific and technological means relating to the environment. Governments impose substantial levies on activities that damage the environment and provide financial incentives for ecologically favourable behaviour. These will also compel businesses and individuals to refrain from actions that worsen the environment.
3. **Proper education on environmental protection and sustainable development - It is imperative that kids understand how daily actions have a negative impact on the environment and how society may reduce**

its ecological footprint. Early education should begin in the classroom. Compared to adults, kids are typically more ready to learn new things and alter their behaviour. When the kids get older, they are more inclined to act in an environmentally beneficial way, and they might even persuade their parents to do the same.

4. Intergenerational equity and Influence others - By persuading others of the value of acting in an ecologically responsible manner, one can further increase the positive effect. Expressing others about the true costs of environmental degradation to future generations and how making tiny changes in daily living might help to mitigate these negative consequences as is evident; a variety of factors can have an impact on the environment. People can contribute to the environmental destruction that is happening all around the world if they are not careful. However, they can take steps to stop it and care for the environment by offering environmental education to those who will help them become more aware of their surroundings and be able to address environmental issues, making the environment more useful and protected for the children and other future generations.
5. Fines and Penalties - To lessen the negative ecological effects, there should also be high sanctions for unauthorized dumping. People and businesses will continue to illegally dump their rubbish since they are aware that the penalties are minimal even if they are caught. Raising the penalties for unauthorized dumping would therefore make it more appealing to discard waste at designated waste disposal facilities. Illegal dumping should be severely punished, especially when it

comes to the discharge of dangerous scientific and technological equipment particles from industries.

6. Lower the consumption levels - Reduced consumption is now very necessary. The sophisticated culture is constantly seeking for the newest technology, including smartphones, electronics, fashionable clothing, and so forth. However, this behaviour causes a significant depletion of resources and an excessive amount of waste creation. To prevent the negative ecological effects, we must dramatically reduce our consumption levels. The most crucial reality is that overuse will once more raise the issue of throwing away items that are not in use.
7. Reuse to reduce waste generation - By making better use of the commodities and food, waste output can be decreased. If something is ancient but still functional, think of a creative method to give it a new look or put it to use in another way. The tangible items will be utilized more effectively as a result. If they are no longer usable, separate them and donate them for recycling. The development of science and technology has allowed for more technologies that recycle garbage from used materials without harming the environment.
8. Avoid Plastic - Plastic pollution and the deterioration of the ecosystem are both caused by plastic trash, which is a major environmental issue. It is considered to be among the worst products ever developed through science and technology and a significant environmental danger. Avoid using disposable plastic bags, cups, plates, containers, utensils to reduce plastic waste. Also, avoid purchasing goods that come in plastic packaging or wrappers. Bring your own reusable items that you

can use over and over again will be highly beneficial.

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