



## ROLE OF NUCLEAR ENERGY IN GLOBAL CLIMATE CHANGE MITIGATION: A NEW APPROACH

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### ABSTRACT:

Today in the world of advanced economies the prime concern for survival of the mankind is safeguarding the environment. Much of environment is exposed to greenhouse gases and carbon emissions thereby resulting in the depletion of the environment each day and climate change. The global greenhouse gases and carbon emissions is mostly by the emissions from the energy sector which is primarily generated by combustion of fossil fuels i.e. coal, natural gas and oil. The recent trends show that approximately 60% of our electricity comes from burning fossil fuels, mostly coal and natural gas. In 2020, the electricity sector was the second largest source of U.S. greenhouse gas emissions, accounting for 25% of the U.S. total. The environmental depletion is not because of the economic advancement but by the absence of the effective measures to reduce the greenhouse gases emissions. Therefore with this declining trend of the environment it becomes a significant concern to conserve the environment and to deploy such technologies which not only reduces the carbon emissions but is also a sustainable energy resource. On this concern, Nuclear energy has come to the forefront to mitigate climate change because of its zero-emission clean energy source and seemingly limitless supply of energy. Today it has become the most sustainable energy source vital for achieving Sustainable development goals. This paper explores nuclear power and the effects it has on combating the environmental pollution at national and global scale and also in achieving the demands of economic development of the countries worldwide

### KEYWORDS:

### INTRODUCTION

Energy is the backbone of a country's development. One of the human systems most immediately affected by climate change is by energy use. The investments, inventions, and new industries that are the foundations of employment, inclusive growth, and shared wealth for entire economies are made possible by energy. Energy is a necessity for everything in our home and is a hallmark of modern convenience. In essence, we use energy to complete daily chores at home, at work, and elsewhere. The most popular approach to categorise energy use is by the end outcome, which can be either electricity, thermal energy, which includes heating and cooling (including hot water), or transportation. The majority of the fuel, power, and heat consumed by people all over the world is produced by fossil fuels, which include coal, petroleum, and natural gas, which are the main sources of energy. As a result the burning of fossil fuels for transportation, heating, and electricity production due to numerous human activities globally releases large volumes of greenhouse gases into the atmosphere.

The primary source of greenhouse gas emissions from human activities worldwide is the usage of energy. Burning fossil fuels to produce energy for transportation, industry, heating, and other uses accounts for almost two thirds of worldwide greenhouse gas emissions. This atmospheric concentrations of greenhouse gases have been rising because of this imbalance between greenhouse gas emissions and the capacity of natural mechanisms to

absorb those emissions. This has resulted into climate change and widespread damaging effects across our planet. In the coming decades, there will likely be a significant rise in the world's energy demand. This is mostly because to the anticipated increases in both the global population and the economies and industries of developing nations like China and India. Of the three end outcomes of energy, electricity became to be the most important and widely used for development and human activities. Over half of the rise in primary energy demand was brought on by higher power generation. With worldwide energy demand increasing by 4% to more than 23 000 TWh in 2018, electricity has continued to stake its claim as the "fuel" of the future. Due to its rapid expansion, electricity will soon account for 20% of all final energy use. Burning fossil fuels, such as coal, oil, or gas, to produce electricity and heat causes a significant portion of the greenhouse gases, such as carbon dioxide and nitrous oxide, that cover the Earth and trap the sun's heat. Gas is the second-largest source of electricity production after coal worldwide. Due to industrialization and urbanization, there is a growing need for power on a global scale. For instance, the International Energy Agency predicts that, compared to 2019, the global demand for electricity for electric vehicles will increase five to eleven times by 2030. Electricity needs to be as low in carbon as feasible if electric vehicles are to have a positive climatic impact. Burning fossil fuels is a major factor in the creation of energy. The electrical industry, which accounted for 25%

of all greenhouse gas emissions in the US in 2020, was the second-largest contributor. Coal continued to be the primary fuel for power generation in 2019, accounting for 37% of the world's electricity production, 10% of which came from renewable sources. The biggest concern is that since the generation of energy is heavily dependent on the combustion of coal and other fossil fuels, which has now become a major contributor to climate change, as energy demand rises daily.

In 2018 89% of the world's CO<sub>2</sub> emissions came from industry and fossil fuels. Hence there is an overall increase in the green house gases in the atmosphere which is responsible for the climate change. According to data from the United States Environmental Protection Agency, emissions of greenhouse gases are second only to transportation. Coal accounts for 56% of all energy use in India. This coal is mostly used to make power. Today, coal is used to generate 76% of India's electricity.

For many of us who live in urbanised, developed cities, energy conservation has proven to be an unattainable goal. More than 75 percent of greenhouse gas emissions are caused by energy use. To prevent a rise in global temperatures, the amount of electricity produced from clean energy sources must double during the next eight years. A new multi-agency assessment from the World Meteorological Organization warns that if we don't act, climate change, more extreme weather, and water stress could compromise our energy security and potentially endanger renewable energy sources (WMO).

Economic expansion is not something what leads to environmental degradation; rather, the absence of effective regulations to reduce greenhouse gas emissions is the cause. Because of this, it is essential to safeguard the environment and to put in place technology that not only reduce carbon emissions but also offer a sustainable source of energy to combat climate change, it is essential to finance the widespread use of renewable energy sources and energy-saving technologies while gradually phasing out fossil fuels. In such a scenario Nuclear energy, which is a carbon free sustainable source of energy due to a number of reasons, including the threat of global warming and the requirement for dependable baseload electricity, has come to the forefront to meet the requirements of zero carbon emission, clean and sustainable energy source and to be as measure to face the environmental challenges. Besides being a carbon free power, nuclear energy produces more energy electricity on less land than any other sources of energy.

### **NUCLEAR ENERGY AND CLIMATE CHANGE**

One of the most significant problems the world is currently dealing with is climate change. Nuclear energy has the potential to significantly reduce greenhouse gas emissions (GHGs) while also providing for the rising energy needs of a growing world population and promoting sustainable development on a global scale. By producing nearly no greenhouse gases while producing electricity, district heating, and high temperature heat for industrial

processes, nuclear power offers a significant potential to help address the challenge of climate change. Nuclear power, which generates roughly 20% of our country's electricity and more than 60% of our low-carbon energy, is a crucial component of our energy plan as it is the only significant source of nearly greenhouse gas-free energy. The foundation of a clean, sustainable, and carbon-free energy source for the future has been built by nuclear energy, a low-carbon technique of generating electricity. Nuclear energy has helped to mitigate the greatest threat to humanity, i.e. climate change, by enabling the most sustainable energy transitions. It has established itself as a low carbon energy source, in contrast to coal, gas oil, and other energy sources. Nuclear power facilities do not emit CO<sub>2</sub> during the process of producing electricity. With 440 power reactors producing 10% of the world's electricity today, nuclear power has been essential in achieving environmental sustainability. With 28% of the total in 2019, nuclear power is the second-largest source of low-carbon energy worldwide. According to the World Energy Outlook 2021 published by the OECD International Energy Agency, nuclear energy is consistent with having the clean, dependable, and sustainable provisions of the Sustainable Development Scenario.

The Paris Agreement's politically-driven objective is to work toward limiting global temperature rise to 1.5°C and keeping it well below 2°C relative to pre-industrial levels (UNO, 2015). It is necessary to deploy low carbon energy technology much more widely in order to address the problems caused by climate change and to meet the objectives set forth in the 2015 Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). Nuclear industry has a considerably bigger role to play here. It can act as a baseload that supports renewable energy sources and ensures an ongoing, dependable, and dispatchable supply of electricity as nations increase their use of alternative carbon-free energy sources like solar and wind. Although there are many other renewable energy sources available for energy production, nuclear energy has emerged as one of the energy sources with the lowest carbon emissions when compared to other sources in terms of environmental impact. The nuclear energy has lifecycle emissions that are 90% less than coal and 80% less than gas, whereas hydropower, solar, and wind energy have lifecycle emissions that are much higher and have more negative environmental effects. Nuclear energy continues to be the largest source of low-carbon electricity in OECD (Organization for Economic Co-operation and Development) countries, accounting for 18.9% of total electricity production in 2012, despite the closure of all but two reactors in Japan following the Fukushima Daiichi accident (NEA, 2013). The greenhouse gas emissions per kilowatt-hour of electricity produced from uranium are minimal when compared to those from renewable energy sources when considering the entire life cycle of the metal (from mining through production to disposal). Nuclear power has the potential to play a significant role in achieving these mitigation goals and, as a large scale,

reliable, and concentrated source of energy, can also contribute to the broader economic and social dimensions of sustainable development.

### **ENVIRONMENTAL RISKS OF NUCLEAR ENERGY**

Nuclear energy one such energy source that has come to the forefront in response to environmental concerns and requests for a zero-carbon, sustainable, and clean energy source is. Nuclear energy provides more electricity on less land than any other kind of energy, in addition to being carbon free. To provide the necessary amount of electricity, nuclear power plants must currently be developed. The UN Charter and the Treaty on Principles Governing States' Activities in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, make it mandatory that activities in outer space involving the use of nuclear power sources be conducted in accordance with these principles in order to ensure the safe and limited use of nuclear material in space. Since justice is also the central idea when using nuclear energy in modern times, therefore in order to reduce the impact and risk of deploying radioactive material in space, this resolution restricts the use of nuclear energy sources to only those space missions that cannot reasonably be completed using non-nuclear energy sources.

The conundrum and the catastrophic dangers of the nuclear energy is the liability of the harm caused by potential radiation exposure from nuclear power plants and uranium mining. Three major nuclear power plant accidents, at Three Mile Island in the United States in 1979, Chernobyl in the Soviet Union in 1986, and Fukushima in Japan in 2011, have sparked debates about the risks nuclear energy poses to the environment and the general public, as well as the legal ramifications of such harm. Because of the catastrophic risks associated with nuclear accidents and radiation, using this alternative form of energy may present challenges for both persons and the environment. As a result, using nuclear energy allows for the establishment of justice on the bases of four principles: liability, safety, and security.

Due to its ability to provide climatic justice, nuclear energy is now a need.

In general, the possibility of exposure to extremely harmful radioactive emissions and the detrimental effects of this radiation on health come out on top when we look at the downsides of nuclear energy. Lack of proper management of radioactive waste can endanger the environment and public health. Understanding the hazards and negative effects of nuclear power is essential to maximising its potential to fulfil future energy demands while emitting minimal amounts of carbon dioxide. Even though it is the cleanest energy source in the entire planet, producing it involves some risk, just like any other industrial activity. Environmental concerns associated with nuclear energy include those related to nuclear fuel cycles, which produce radioactive waste, and uranium mining, all of which must be promptly addressed with appropriate legislation and other measures. At the

aftermath of the three nuclear accidents worldwide, radioactive pollution of the environment and an unprecedented discharge of radionuclides into the atmosphere exposed the ecosystem to radioactivity. The ecology began to deteriorate as a result of these radioactive deposits in the atmosphere, which also affected the agricultural, urban, forest, aquatic, and terrestrial environments. The plants and animals in the impacted areas were harmed by the buildup of radioactive material and nuclear radiation in the atmosphere, which led to a slow degradation of the environment. The damaging effects of radiation were also observed in aquatic ecosystems, where it was discovered that fish and other aquatic creatures had accumulated radiation pollution, and that radiation runoff from the soil had added to the contamination. After more than 35 years, fishing is still "limited" in some waters beyond the exclusion zone because of radioactive exposure. For 20 kilometres near Chernobyl's nuclear power station, radiation levels were high for both plants and animals. The area's wildlife's overall mortality rate and reproductive efficiency both rose. Genetic abnormalities and deformities have been caused by DNA damage brought on by radiation exposure. "Therefore, there are numerous concerns associated with nuclear accidents, including air pollution, damage to streams, and destruction of vegetation

### **CONCLUSION**

Nuclear energy has emerged as the most trustworthy and long-lasting energy source, but in order to fulfill the rising need for electricity, the catastrophic risks connected with its use must be decreased. We can see that the international community has put a lot of effort into strengthening the legal frameworks governing nuclear security, waste disposal, safety, and compensation in the event of an accident. They have been watchful in promoting the use of nuclear materials only in a safe manner. Through the creation of rules like the NPT, PTBT, and others, it has been sufficiently watchful in promoting the use of nuclear material solely for safe purposes. Additionally the uranium mining firms must use sustainable development methodologies in order to reduce the risks associated with uranium mining and ensure that it is carried out in a way that is both safe and environmentally responsible. Adopting the Environmental Impact Assessment procedure, which involves researching potential business efforts to reduce their negative environmental effects, is one way to do this. The environmental monitoring programme keeps track of any environmental concerns connected to the company and provides a framework for the sustainable development approach. The dangers of nuclear accidents, radioactive waste, and uranium mining can be reduced with the right legal structure, policies, and adherence to stringent criteria. The preservation of the balance between human activity and the rights of nature is essential for the future growth of economies. To prevent nuclear material from falling into the hands of unauthorized parties who might use it for uncontrolled activities that have a negative

impact on the general public or the environment, strict assessment and care must be taken throughout the entire fuel cycle, including during nuclear material transport, on both a national and international level. Therefore, significant national and international measures are required to prevent any nuclear material from being diverted or nuclear infrastructure from being sabotaged. The development and implementation of a physical protection system at the national level fall under the sole jurisdiction of the government and are inextricably linked to its national system of nuclear material accounting, safeguarding, and control. Strict assessment and care must be taken throughout the process. Throughout the whole fuel cycle, this system must include all nuclear material that is used, stored, and transported on a national and international level. A global system of nuclear safeguards was established by the IAEA.

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