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# AI Ensures Environmental Sustainability

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## ABSTRACT

*Today we live in the era of digitalization which involves the use of Artificial Intelligence (AI). Many of us may not be aware that we are surrounded by Artificial Intelligence all the time as it is omnipresent in the form of devices such as laptops, TV, mobiles, computer systems etc. AI has become so important in our life that one cannot imagine leading his life without it. We must also take into account the environmental issues being faced in the contemporary world, causing negative affect not only on the plants and animals but our mother Earth as whole. The greed of Human beings in search of a better lifestyle has caused deterioration to the environment. With the use of AI we can not only detect how the harm is taking place, how much harm has been caused and where it has been caused and also what remedial actions can be adopted for preventing such harm to our mother Earth. In recent years we have witnessed growing reliance on AI by the Indian Environmental Law regime, AI is being widely used by environmental agencies for effective implementation of environmental laws and achieving the objectives mentioned in such laws. AI is being utilized as a tool for ensuring environmental justice.*

## I. INTRODUCTION

In the contemporary world humans are facing severe environmental crises. India has also not remained untouched from such issues and is facing environmental issues such as habitat destruction, air, water and soil pollution, deforestation, poaching of endangered species. The overexploitation and non-judicious use of natural resources have caused a serious threat to the environment. Extraction of natural resources like wood, minerals, fossil fuels, etc. for satisfying human needs have given rise to issues like environmental degradation, global warming, climate change, habitat destruction, extinction of certain species of flora and fauna etc. It is important to note that such issues not only affect the environment but also are seriously affecting human life.

At the same time technological innovations like Artificial Intelligence are being used for various purposes including conservation of Environment. AI is being used for analysis of data collected and stored in different databases concerning the environment, which may be used for

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taking joint actions ensuring environmental conservation and protection<sup>3</sup>.

AI is also being used for tracking the pollution levels in any area which can be used for taking action by the concerned authorities for curbing or preventing such rise in pollution levels. E.g. plantation drives can be undertaken in the areas where pollution levels are high.

## **II. NEED FOR AI IN ENSURING ENVIRONMENTAL SUSTAINABILITY**

Environment plays a significant role in one's life. The food we eat, the water we drink and air we breathe are gifts of mother nature without which our existence would not have been possible however, under Indian mythology the rivers are presumed to purify human soul, for example taking bath in river such as Ganges, Kaveri, Narmada is considered to purify the unrighteous behavior of the devotees is considered auspicious and religious sentiments of Hindu devotees are attached with the rivers like Ganga, Kaveri, Godavari for instance such as disposal of ashes in river Ganges is considered in Hindu religion, there are various religious customs which are carried on the rivers and in which rivers plays a very vital role. Apart from that Hindu culture has always associated nature and its elements with gods and goddesses such as Indra Dev god of rain, Varun Dev of water and Ganga ji from jata lord Shiva. The faith of Hindu devotees that rivers are intrinsically pure and therefore, the water can't ever be polluted, works against the self-cleansing ability of the rivers. To resolve the issue of environment crisis in India the government has passed various legislations, policies such as Environment (Protection) Act, 1986, The Water (Prevention And Control Of Pollution) Act, 1977, The Air (Prevention And control Of Pollution) Act, 1981 etc. The underlying objectives of these acts is to ensure conservation, protection and improvement of India's environment. The bodies like CPCB (Central Pollution Control Board), SPCB (State Pollution Control Board), and NGT (National Green Tribunal) etc., act as pillars for ensuring environmental justice in India.

As mentioned above AI plays a significant role in protecting and conserving the environment. It not only helps in detecting the environmental damages being caused or can be caused but also provides remedies in preventing such damages. Therefore, various environmental law enforcement agencies, central and state governments have formulated AI based policies and programs and devices ensuring environmental sustainability and environmental justice through effective implementation of environmental laws.

AI as mentioned above helps in collecting information related to various environmental issues enabling the authorities to take accurate action towards protecting the environment from further

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<sup>3</sup> Ricardo Vinuesa et al., The role of Artificial Intelligence in achieving the Sustainable Development Goals, 11 Nature Communications (2020).

harm. AI helps in collecting data used for predicting possible threats of various environmental disasters like Tsunami, earthquake, cyclone etc. By collecting data through AI we not only get aware about upcoming possible disasters but also helps in taking remedial action timely which helps in saving lives of animals, human beings etc. AI helps in getting information about any virus attack which is or may affect the wild animals so the vaccine could be developed by using AI. AI not only helps in knowing the effect of virus on animals, the virus is attacking and its effect on the population of the animals etc.

Environmental issues like ozone layer depletion have become a major concern for all living creatures on earth. Ozone layer helps in protecting creatures on earth from harmful UV rays of Sun which may cause skin cancer etc. It was only because of the AI used in satellites we came across that the ozone layer is being depleted over the years, causes of such depletion such as release of CFCs, how much harm has been caused to the ozone layer and negative effects of such depletion on Earth. With the help of Artificial Intelligence and machine learning models we can predict and optimize water resources conservation.

Marine pollution has also become a major concern in today's world. The disposal of plastic waste, toxic substances, nuclear waste and oil spills in the oceans have become a major concern for the environment. The use of AI in the form of Ocean Data Alliance with the help of machine learning which uses the images from satellites<sup>4</sup>. It will help in monitoring marine pollution caused in the form of coral bleaching, oil spills, dead zones, plastic waste on sea shores and death of marine species diseases caused by pollution or by disposal of deadly chemicals.

AI can be used in making environmentally sustainable lifestyles with the invention of pollution sensor machines and cameras which monitor emission of greenhouse gasses by vehicles. If any vehicle is found emitting greenhouse gasses beyond prescribed limit, an online fine may be sent to the owner of the vehicle for causing such pollution. This will keep a check on vehicular pollution.

Over the years it has been observed that excessive extraction of raw materials\ natural resources like wood, herbs, etc has led to deforestation, reduction of soil fertility, and soil water storage capacity.

All this has led to another issue of growing desertification leaving behind barren lands, waste lands and destroying the ecosystem of the place. Use of AI through satellite helps in knowing

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<sup>4</sup> Renee Cho et al., Artificial Intelligence-a game changer for climate change and the environment State of the Planet (2018), <https://news.climate.columbia.edu/2018/06/05/artificial-intelligence-climate-environment/> (last visited Jun 26, 2022).

causes of such as desertification<sup>5</sup>, knowing the speed of such desertification, its negative effects on the environment including flora and fauna and possible remedies for preventing such desertification and its spread. AI as mentioned above helps in earlier detection of environmental changes enabling preparation of responses, mitigating negative outcomes and capability of incentivizing promising responses.<sup>6</sup>

As we know drinking water is a scarce resource and every creature requires water for its survival. From being used in Industries to household purposes water is used in every stage of life. However it's ironic to know that only one percent of water resources are fit for drinking purposes therefore many countries like Saudi Arabia have installed desalination plants for making ocean water drinkable by using AI and technology. Expeditious development engaged with climate change is converting earth's ecosystem to new states which had never been seen before and it can only be made possible by using AI. AI enables communities to develop workable solutions for addressing environmental concerns<sup>7</sup>.

For instance AI coupled with environmental data helps in optimally allocating water resources under environmental social and economic constraints<sup>8</sup>. Thereby, enabling management of freshwater resources (from quantity to quality) and preventing water crisis<sup>9</sup>. The questions concerning environmental justice and human rights require AI in getting their solutions. For instance new set of tools involving AI is required for tracking day light patterns for dealing the problems such as human trafficking, illicit harvesting and environmental degradation. It involves tracing environmental footprints of activities and meaningfully linking them to human outcomes.

Vehicle pollution has caused serious environmental crises such as increasing global temperature, diseases like airborne diseases, asthma, cough, sore throat, endangering lives of wildlife species of animals and birds. AI enabled autonomous vehicles (AV's)<sup>10</sup>, helps in dealing with the growing issue of environmental pollution with electric vehicles.

Electronic vehicles run on electricity not on conventional sources of energy like fossil fuels thereby, reducing carbon emissions and release of greenhouse gasses which are major

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<sup>5</sup> Ricardo, *Supra* note 1 at p 1

<sup>6</sup> K. Maher, Environmental Intelligence: Applications of AI to Climate Change, Sustainability, and Environmental Health Stanford HAI (2020), <https://hai.stanford.edu/news/environmental-intelligence-applications-ai-climate-change-sustainability-and-environmental> (last visited Jun 27, 2022).

<sup>7</sup> *Ibid*

<sup>8</sup> *Ibid*

<sup>9</sup> *Ibid*

<sup>10</sup> Dr. Celine Herweijer, 8 ways AI can help save the planet World Economic Forum (2018), <https://www.weforum.org/agenda/2018/01/8-ways-ai-can-help-save-the-planet/> (last visited Jun 27, 2022).

contributors in rising global temperature and climate change. Electronic vehicles consume electricity which can be produced by non-conventional sources of energy such as tidal energy, wind energy, hydro energy and nuclear energy (green energy).

AI as mentioned above a real time open API and AI infused digital Geo spatial dashboard for mother earth, enables monitoring and management of environmental systems at such scale and speed which had never been possible before<sup>11</sup>. It includes dealing with illegal deforestation, water extraction, air pollution, fishing and poaching, response to natural disasters and making agriculture efficient<sup>12</sup>.

### **III. METHODS/TECHNIQUES FOR USING AI FOR ENSURING ENVIRONMENTAL SUSTAINABILITY:**

- **Environment Decision Support System:** - Management of scarce natural resources is necessary for ensuring environmental sustainability over exploitation or non-judicious use of resources is a major factor behind the environmental crisis. AI in the form of Environmental Decision Support System (EDSS) involving environmental models, tools, databases and other technologies like graphical user interface (GUI), GIS (geographical Information System) helps in better management of natural resources. Through these models and technologies one can easily detect problems based on the environment, the scale of the problem, its impact on the environment including flora and fauna. The information gathered will help in taking decisions regarding policies, plans and strategies for effective management of the resources. The use of EDSS helps in knowing the efficacy of existing plans and strategies adopted for ensuring environmental sustainability. Further, regular monitoring of existing plans and strategies by using EDSS will help in knowing whether the plan and strategies is achieving the desired objectives including soil fertility, raising the population of plants and animals, improving water quality, checking soil erosion, improving air quality etc. If it is found that the desired objective could not be achieved by existing plans and strategies, the EDSS can also be used in making improvements in existing plans and strategies for ensuring achievement of their objectives.

- **Moisture Sensor Monitor:-** Environment monitoring has become so crucial. Environmental factors such as climate change, extracting water resources, and vulnerable habitats are driving the need of monitoring the environment. Monitoring soil moisture conditions provide useful information about the protection of soil fertility. Hydraprobe soil sensor is the most useful and versatile soil sensor which is available commercially. Hydraprobe

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<sup>11</sup> *Ibid*

<sup>12</sup> *Ibid*

basically used to collect data of soil. Monitoring water level of soil within the root zone of crops will help in agriculture. Monitoring soil moisture by using sensor techniques has so many benefits, it increases crop production, saving water resources from runoff and saving the cost of fertilizers. By establishing Hydraprobe technology in drought prone areas will help to better understand the hydrology of soil. Regional drought not only affects the poor peoples but it can also affect the economy of the country and in some regions it leads to starvation. With the advancement in computer technology and various environmental modelling methods, soil moisture data could be collected which will help in prevention of drought conditions. Soil moisture sensors play a vital role in protecting the water resources and climate change.

- **Geographical Information System and Aerospace survey (GIS and AS):-** Environmental protection cannot be studied without the knowing the role of GIS and Aerospace Survey. GIS involves using satellites for collecting and analysing data with respect to mapping forest cover, identification of wetlands, tracking the movement of wildlife in a particular location and their population, soil mapping for preventing further environmental degradation etc. Mapping of trees, wildlife movements, soil fertility on a real time basis, enables the conservationist to formulate and apply strategies for the environmental conservation and effective management of natural resources. It is important to understand that the information gathered by using GIS relating to the environment will not only help in conserving the resources for present generations but also for generations to come, thereby, ensuring sustainable development.

- **Disaster Research:-** Space technologies including remote sensing, satellite communications and global positioning system (GPSs) plays an important role in identification of terrain areas for mitigating natural disasters. It helps in preventing activities such as mining, deforestation, and creation of dams which may cause risk to the environment and the wildlife of concern terrain. Furthermore, GIS can be used for mapping possible chances of flood, forest fires, landslides, areas likely to be affected by it before their occurrence and causes of such disasters. This enables the concerned authorities to take action timely so as to prevent such natural disasters from taking place. If we have all the information regarding the possible environmental damage on a prior basis, we would be in a position to take remedial action timely without much delay.

- **Disaster free housing:-** Collapse of housing facilities, buildings used for residential purposes not only takes lives living in them but debris and dust caused due to such collapse can take lives of various living creatures including animals, and human beings.

The destruction of such residential buildings can also give rise to other disasters which have a long lasting effect on the environment and living creatures of the concerned area. Therefore, housing companies, builders, housing finance companies and the government shall ensure that buildings are being created and designed by keeping in mind the topography and geography of that area. The structures shall be built so as to mitigate the chances of such disasters thereby, preventing environmental harm to that area.

#### **IV. FUTURE OF AI IN ENSURING ENVIRONMENTAL SUSTAINABILITY**

Modern problems require modern solutions. Working on the same line it is not incorrect to state that the kind and the scale of environmental issues being faced in the contemporary world has never been seen in the past. With Global Warming increasing the Earth's temperature, speedier melting of glaciers, habitat destruction, loss of forest cover, rising pollution etc. we require a technology driven system for taking remedial actions timely without much delay. It will not be incorrect to state that AI will turn out to be a game changer in the future with respect to environmental sustainability.

Analyzing Climate Change still remains a critical issue, AI may be used for predicting climate change and its effects and for devising scientific mechanisms for preventing it. The use of AI in mapping soil fertility and moisture mapping will not only ensure sustainable agriculture and recovery of lost forest cover.

Development of AI based vehicles produced by TESLA and TATA etc. will keep a check on increasing vehicular pollution and thereby creating an eco-friendly transportation system. Use of Footprint Identification Technology and GPS collar helps in identifying sex, population and movements of endangered species. Using AI enabled cameras like Argonaut and collaborating it with apps like cerabella helps in detecting and preventing poaching activities by forest officials thereby, ensuring conservation of wildlife. The same is being used presently and will be widely used in the future to come. Similarly, Protection Assistant Wildlife Security (PAWS) is an AI based software which suggests the most effective patrol routes, making identification of patrol patterns more difficult for the poachers. The poachers are completely clueless about when and where the forest officials will appear. Various wildlife Sanctuaries in Asia and Africa are going to use PAWS for preventing poaching activities.

#### **V. CONCLUSION**

Artificial Intelligence and Environmental Protection together have a bright future. Contemporary environmental issues are not only complex in nature and it is not easy to find



their solution. Artificial Intelligence not only helps in identifying the present environmental issues and predicting the environmental issues which may arise in the future along with the effect of such environmental crises. AI and machine learning helps in providing eco-friendly, timely and effective solutions for various environmental problems ranging from pollution to conservation of flora and fauna. Countries and International Environmental organizations are not only emphasizing the use of AI in environmental protection but are widely using the same in conserving the environment.

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