The Hague International Model United Nations

Forum: Environment Sub-commission 1 (EVC 1)

Issue: The use of Artificial Intelligence for the benefit of our planet

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Introduction

The rapid development of technology and, consequently, its integration into people's daily lives have transformed our world and subverted our traditional lifestyles, bringing about both detrimental and advantageous but significant changes in our lives. People's interactions with nature and their surroundings evolve in tandem with technological advancements. The relationship between humans and nature grows, shaped by differing understanding and engagement in each period. This relationship was initially harmonious, but the balance worsened as people's impact on nature expanded.

Since the start of time, humans, along with all other life forms, used to concurrently and symbiotically exist with the environment, reciprocally benefitting off of (and sometimes perilously impacting) each other. With the Industrial Revolution, this relationship has been altered. Fossil fuel combustion, land usage, resource extraction, and waste disposal have all contributed significantly to greenhouse gas emissions, leading to global warming and environmental damage (IBM). Humans' notion of nature as an infinite resource has resulted in growing strain on it from factories, machinery, and fossil fuel consumption, disturbing ecological balance, hence leading to other issues such as but not limited to deforestation, soil erosion, and pollution.

Environmental issues are disturbances in the normal functioning of ecosystems. Humans cause some, while others occur naturally. Earth's ecosystems can endure disturbances like forest fires and

floods. However, human actions have undeniably increased the frequency and intensity of these events, overwhelming the ecosystem's capacity. When they exceed the capacity, these disruptions severely affect the ecosystem, biodiversity, and public health. Four primary environmental issues will be discussed in this report: climate change, air pollution, ocean health and water pollution, and loss of biodiversity (IBM).

Various approaches have been adopted to address ecological concerns. While laws and international agreements have been established to protect the environment, these efforts often fall short of their goals and results.

A recent alternative strategy has been using artificial intelligence to address environmental challenges. However, research also shows that the expansion of Artificial Intelligence (AI) has negative ecological consequences because data centres housing AI servers generate electronic waste, consume scarce water, rely on unsustainable minerals and rare elements, and use massive amounts of electricity, resulting in greenhouse gas emissions. Thus, while AI has tremendous potential for combating environmental concerns, its implementation raises a contentious paradox (UNEP).

Definition of Key Terms

Artificial Intelligence (AI)

The exploration and creation of computer systems that perform tasks once requiring human intelligence. Examples include autonomous vehicles, banking systems, robotics, digital assistants (such as Siri and Google Assistant), facial recognition systems (which can be integrated across multimedia devices), smart products (such as smartphones, smart watches, smart boards), chatbots, natural language processing devices, social media applications, maps and navigation, generative AI, language translation, fraud detection systems, digital healthcare systems, recommendation systems and so on (Cambridge Dictionary).

Pollution

Introducing any substance (solid, liquid, or gas) or energy into the environment at a rate that surpasses its ability to disperse, dilute, decompose, recycle, or store safely raises serious concerns. There are various types of pollution, namely water pollution, noise pollution, light pollution, soil pollution, thermal pollution, air pollution, radioactive contamination, plastic pollution, biological pollution, chemical pollution, land pollution, electromagnetic pollution, domestic sewage, marine pollution (which depletes natural freshwater resources, generally though irregulated fishing) and oxygen depleting water pollution (Britannica).

Microplastics

Microplastics are microscopic fragments of plastic debris that are present in the environment as a result of the disposal and degradation of consumer products and industrial waste. They take various forms, the most prominent being microplastic beads, fragments, pellets, films, foams, and fibres (Oxford Languages Dictionary).

Garbage Patch

“large areas of the ocean where litter, fishing gear, and other debris - known as marine debris - collects” (Marine Debris Program)

Predictive Analytics

“a branch of advanced analytics that makes predictions about future outcomes using historical data combined with statistical modelling, data mining techniques and machine learning” (IBM)

Biodiversity

“all the different kinds of life you’ll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world” (World Wildlife)

Greenhouse Gases

“gas is any gas that absorbs infrared radiation (net heat energy) emitted from Earth’s surface and reradiates it back to Earth’s surface, thus contributing to the greenhouse effect. Carbon dioxide, methane, and water vapour are the most important greenhouse gases” (Britannica)

Carbon Footprint

Carbon footprint is the amount of carbon dioxide (CO_2) emitted by a person, organisation, or community. In relation to the issue and its implications for the use of AI, AI models, especially large generative AI models like ChatGPT, utilise a tremendous amount of power and energy, thereby contributing significantly to the world's carbon footprint. In addition, AI systems generally require the allocation of large data centres and facilities, which also require a tremendous amount of energy for the servers to run and store data and cooling to prevent hardware from overheating. The development and production of AI systems, whether it be digital or physical, require their own infrastructural background, referring to tools such as iron cables shaped from mining materials, manufacturing chips and transporting hardware, all of which have their individual carbon footprints and contribute to the pollution of the world. Therefore, every form of AI, although it has its practical

benefits, has tradeoffs on the environment and perilously impacts the future generations of humankind and other organisms (Oxford Languages Dictionary).

Ocean Acidification

"the worldwide reduction in the pH of seawater as a consequence of the absorption of large amounts of carbon dioxide (CO_2) by the oceans" (Britannica).

Eutrophication

"excessive richness of nutrients in a lake or other body of water, frequently due to run-off from the land, which causes a dense growth of plant life" (Oxford Languages Dictionary).

Fossil Fuels

"fuels, such as gas, coal, and oil, that were formed underground from plant and animal remains millions of years ago" (Cambridge Dictionary).

Renewable energy

"energy derived from natural sources that are replenished at a higher rate than they are consumed. Sunlight and wind, for example, are such sources that are constantly being replenished" (United Nations).

Background Information

AI can improve energy efficiency and minimise energy consumption, help with environmental monitoring and management, and address many other aspects of the problem (Yale School of the Environment). As previously mentioned, AI has great potential to transform and combat the catastrophic consequences of environmental problems caused by human interactions. Yet, the technology designed to protect the planet may ironically contribute to the pending catastrophe. Therefore, the cautious use of AI is essential. As mentioned previously, environmental problems are branched into many sub-categories. When looking for AI-based solutions, it is critical to regard these challenges separately since they may differ dramatically or intersect greatly depending on the method used.

Climate Change

Climate change is the primary environmental concern that comes to everyone's mind. According to the recorded data, 2023 was the hottest year recorded. Unsurprisingly, the same year's carbon dioxide levels were also piqued, showing their interrelation. The carbon dioxide levels reached 420 ppm, almost doubling the values before the onset of the Industrial Revolution (Robinson).

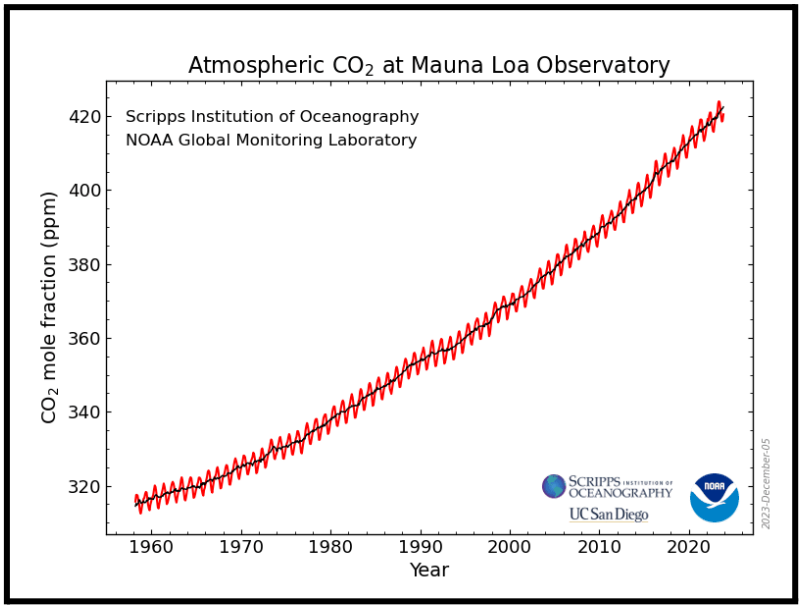

Image 1: Increasing CO2 Levels

These drastic changes result from human activities involving fossil fuels instead of renewable alternatives. The greenhouse effect intensifies as carbon dioxide levels and other greenhouse gases increase (Robinson). The greenhouse effect happens naturally in the atmosphere. It keeps the earth's temperature constant to prevent overheating or cooling. Yet, balance in the atmosphere is lost when human activities release excessive gases that mimic this process and contribute to it ("What Is the Greenhouse Effect?").

They also create other circumstances, such as unprecedented rapid melting in Arctic regions and the Greenland ice sheet, growing deforestation in the Amazon rainforest, and increasingly frequent tropical storms and other weather phenomena, such as hurricanes, heat waves, and flooding (Robinson).

Artificial Intelligence Applications

In this case, AI applications will refer to ways to slow climate change and halt its complications, such as the rapid melting of ice and deforestation. AI can monitor where and how fast the ice is melting in the Arctic due to the climate crisis. AI can detect temperature changes 100,000 times faster than humans, allowing me to identify the amount of melted ice in water released into the ocean. According to the European Space Agency, scientists at the University of Leeds have developed an AI that can scan massive Antarctic icebergs in satellite photos in one-tenth of a second (Masterson).

Similarly, AI can be used to map deforestation. Forest fires are becoming more frequent, and deforestation occurs due to climate crises. Yet, it intensifies the climate crisis, becoming a vicious cycle. Hence, monitoring deforestation and taking action accordingly is critical. AI-powered computers are

working with drones in Brazil to reforest the hills surrounding the seaside metropolis of Rio de Janeiro.

Furthermore, Space Intelligence has mapped more than 1 million hectares using AI and satellite images, presenting data regarding deforestation rates and the amount of carbon stored in forests. Similar AI models can identify patterns, predict future outcomes, and help authorities implement regulations based on changes. This approach is further exemplified in the UN's use of AI to anticipate weather patterns, allowing people and authorities to plan to adapt to and mitigate climate change in Africa (Masterson).

A third approach would be decarbonising the industries. This is also possible thanks to AI, which can make supply chains more efficient, increase energy efficiency, decrease packaging waste, lower inventory levels, and optimise energy systems (Howell).

Air Pollution

Air quality problems are bringing about a pending catastrophe. According to the World Health Organization (WHO), less than 8% of the population of Asia breathes "clean air" (UNEP). According to the report on public health policy in the Washington Post, air pollution shortens the average American's life expectancy by 2.6 years (University of North Carolina). According to WHO, 4.2 to 7 million people die from air pollution every year worldwide (Robinson). This demonstrates the urgency of taking practical actions to successfully grapple with the environmental crisis.

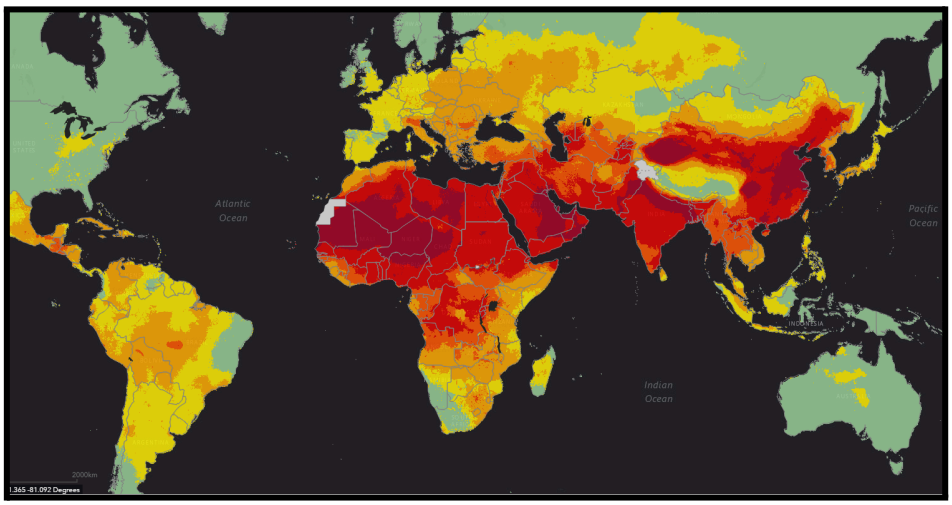

Image 2: Map Showing the Quality of Air

The Environmental Protection Agency classifies air pollutants into six major categories: carbon monoxide, ground-level ozone, lead, nitrogen dioxide, particle pollution, and sulfur dioxide (University of North Carolina). Of these six categories, a leading pollutant is particulate matter, also shown as PM in many sources. Particulate matter is the most dangerous pollutant, made up of black carbon and tropospheric ozone. It is dense in urban and heavily industrialised areas with high population densities.

Diesel soot, road dust, brake and tyre wear, trash burning, barbecues and cookstoves, industrial activity, and agricultural burning are the primary sources of black carbon. (Climate and Clean Air Coalition) Particulate matter is also known to cause cancer, heart and lung illness, asthma, and heart attack, raising public health concerns (UNEP). When sulfur dioxide combines with other molecules, it causes similar respiratory difficulties (University of North Carolina). All these pollutants must be further examined to understand their causes of release and their effects on the environment and better understand the issue.

Artificial Intelligence Applications

From real-time monitoring to predictive modelling, artificial intelligence can be helpful in various methods of combating air pollution.

For instance, Cornell engineers have already produced artificial intelligence that calculates fine particulate matter. This technology aims to collect data using real-time monitoring and provide it to city planners and government health officials. This way, the authorities become aware of the quality of the air the dwellers breathe. Shortcomings in the infrastructure plans are revealed so that they can be improved in the future. Furthermore, this advancement can also report promptly when pollutant levels exceed safe thresholds, enabling immediate action (Friedlander).

AI can also facilitate the identification of pollutants similarly, making it possible to determine the source of the problem. Loughborough University scientists created an AI-based model for predicting air quality (“AI in Pollution Control | Top 5 Revolutionary AI | AIWS”)

Additionally, the data collected can create an artificial intelligence predictive model. AI’s ability to identify patterns enables this. IBM and the Beijing government are working collaboratively to optimise air pollution forecasts via machine learning and cognitive capabilities (“AI in Pollution Control | Top 5 Revolutionary AI | AIWS”). Deep learning modules trained on a system similar to NASA’s GEOS Composition Forecasting System have accurately estimated pollution levels up to ten days in advance. Even though ten days is a limited period, it marks a significant milestone. As technology evolves, this period will get longer, and governments and organisations will have the necessary time to implement proactive measures when needed (Kerrigan). There are also direct ways in which the usage of AI decreases air pollution. For example, AI technology enables autonomous vehicles to be fuel efficient and AI-powered traffic signals adjust to traffic flow, minimising the driving time.

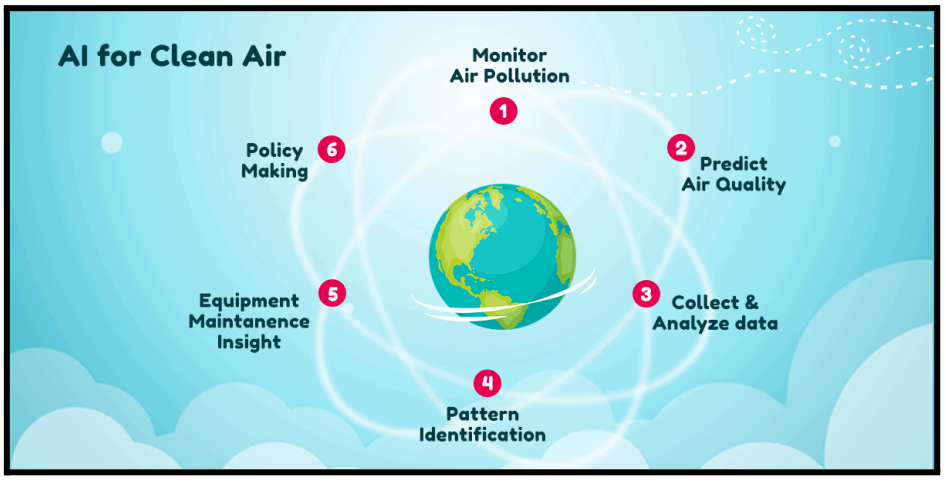

Image 3: AI for Clean Air

Ocean Health and Water Pollution

Garbage Patches

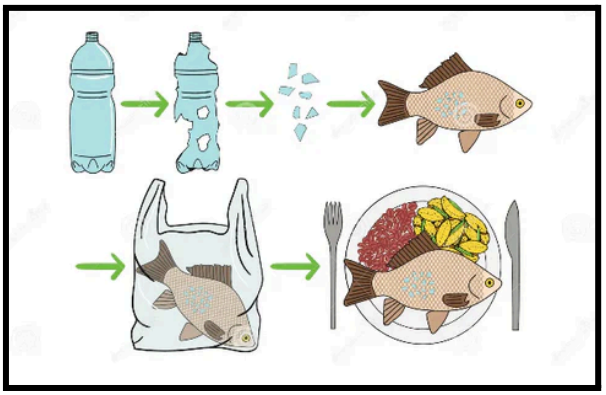

Image 4: The Journey of Microplastic in the Ecosystem

Plastic pollution is one of the most well-known current global issues. Low-income areas in the coastal regions don't have access to sustainable, non-plastic packaging options, which can be shown as a cause of the rapid increase in plastic production and pollution. Poor ocean health is a direct result of pollution. (Ballard Brief). When these polluted plastics break down after some time, they turn into microplastics, releasing toxic chemicals. They are known to damage the ecosystem, marine life, and communities. The damage to the aquatic ecosystem further poses severe public health problems as humans consume seafood from these affected, suffocated food webs and ecosystems (Treehugger).

Unfortunately, all the oceans are known to have at least one garbage patch as of today. They accumulate in important habitats of many species, such as coastal ecosystems where rivers meet the sea or where tidal flows trap floatable plastic. The Great Pacific Garbage Patch (GPGP) is the most and only known of many of these garbage patches, and it has captured attention, resulting in its cleanup efforts (Treehugger). This well-known garbage patch was identified in 1997, 25 years after the first-ever discovery of the garbage patch. It wasn't until 2006 that it was heard through the Los Angeles Times articles. The garbage patch developed in the upper part of the North Pacific Subtropical Gyre, where warm water from the South Pacific collides with cooler water from the north as colliding currents cause debris patches to grow in all marine gyres (Treehugger).

Half of the GPGP is fish nets by mass. This is an alarming reflection of the drastically increasing intensive fishing in the region. The microplastics mentioned are also known to come from other sources, such as plastic bags, bottles, and other consumer products. A reason for this can be shown as the extremely low amount of recyclable plastic and the abundance of one-time-use-only plastic products in the global market. Around one-tenth of this plastic waste ends up in the aquatic world, while 1,000 rivers worldwide, stormwater runoff, wind-blown litter from landfills or garbage bins, and sewage overflows are how this plastic travels to the oceans. The well-known debris includes 28,000 rubber ducks that fell overboard and the soccer balls that were swept into the sea after the earthquake in Japan (Treehugger).

The impact of the garbage patches depends on the size of the debris. The bigger pieces usually tend to float and damage the sea turtle, which eats these plastics and dies due to starvation and oxygen-breathing marine life as these animals, such as dolphins and turtles, get drowned by these waste products, while previously mentioned smaller pieces, namely microplastics make their way down the water columns altering the food chain and damaging the stability and continuity of our ecosystem.

Ocean Acidification and Eutrophication

The oceans have slowed the growth in atmospheric carbon dioxide concentrations, accounting for 24-33% of carbon dioxide emissions during the last five decades. This has caused changes in seawater chemistry, culminating in ocean acidification. Surface seawater pH is projected to decrease; however, this may not be entirely due to CO2 increases. Other chemicals, like sulfur oxide and nitrogen oxide, contribute to ocean acidification (Ramesh et al.)

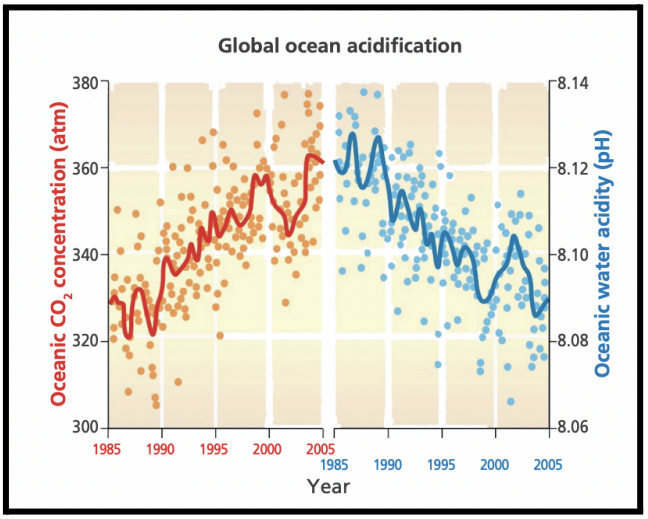

Image 5: Graph Showing Global Ocean Acidification

Nutrient runoff and eutrophication in coastal waterways also contribute to ocean acidification. Eutrophication is the over-enrichment of water, which causes hypoxia and destructive algal blooms, eliminating aquatic life. It is generally caused by increasing nitrogen and phosphorus loads from

land-based sources and micronutrients such as silica. Eutrophication is a significant issue that requires immediate attention. Excess organic matter in coastal and marine habitats is degraded by microbes, which use oxygen and produce carbon dioxide, potentially lowering pH (Ramesh et al.).

Artificial Intelligence Applications

AI is a tool for monitoring and gathering plastic debris in the ocean. Combined with satellite imagery, machine learning enables the identification of plastic waste, improving cleanup efforts. Additionally, autonomous boats monitor plastic pollution in the Great Pacific Garbage Patch. Researchers from the University of California, Berkeley, have also created a robot equipped with a camera and suction system to retrieve plastic waste (Robinson).

Several approaches have been used to prevent plastic pollution. Smart recycling bins, effective trash recovery systems, and robots are examples of AI advancements transforming the recycling sector (Robinson).

Loss of Biodiversity

Biodiversity is a variety defined as a particular reduction area. In this, the loss of quantity may have a species and ecological impact on communities, together with the functioning genetics of the ecosystem. Over the last 50 years, there has been an increase in population, consumption rates, and urbanisation, which has resulted in increased pressure on the earth's resources. According to the 2020 WWF report, the average decline of animal, fish, bird, reptile, and amphibian populations was 68% between 1970 and 2016. The primary cause of biodiversity loss includes changes in land use, such as converting other ecosystems into agricultural systems. (Britannica & Robinson)

Artificial Intelligence Applications

AI plays a significant role in addressing biodiversity loss by enabling monitoring and predictive analysis. Techniques like image recognition algorithms are capable of detecting and tracking animal populations. These records provide reliable data, while bioacoustic monitoring allows for ongoing biodiversity observation without disturbing wildlife. Some AI-powered technologies track the migrations of species, ultimately forecasting which habitats will be best for a particular species and directing conservation initiatives. Also, simulating climate change AI can be used to explore the effect of climate change further, allowing for the development of adaptive measures.

Limitations of AI Usage

AI can handle environmental problems, but it also has detrimental consequences. These include data centres for AI producing excessive waste, large water consumption, reliance on minerals and rare elements, and massive electricity usage, contributing to greenhouse gas emissions. Some scientists are concerned that AI-based apps may raise greenhouse gas emissions or spread

disinformation about climate change (UNEP). Particularly during AI's training, it requires a great deal of electricity. Training a large AI model can sometimes mean using up to thousands of megawatts every hour, significantly increasing the carbon footprint. Fossil fuels power some AIs. Hence, they directly contribute to greenhouse gas emissions.

Another issue is about the electronic waste that comes with AI usage, as AI technologies pro and literate electronic waste becomes excessive. Some of this waste includes hazardous materials like lead. When these materials are disposed of properly, they cause water and soil contamination.

Furthermore, over time, AI can develop bias. AI models tend to develop biases based on the data they were trained on. Hence, the content of this data is highly essential. If the data prioritises economic growth over promoting solutions to environmental problems, then in long-term usage, the AI can potentially cause harm to the environment despite having positive intentions initially.

UNEP continues highlighting AI's potential for environmental monitoring and assisting in adopting more environmentally friendly practices as long as AI's environmental imprint is considered. To reduce AI's ecological impact, UNEP recommends establishing standardised procedures for measuring it, developing regulations requiring companies to disclose their direct environmental consequences, making AI algorithms more efficient, and encouraging companies to green their data centres (UNEP).

Major Countries and Organizations Involved

United Nations (UN): The United Nations and its international bodies, especially UNEP, have taken significant steps to address environmental issues. However, few documents focus on integrating artificial intelligence. The listed resolutions address strengthening efforts to combat biodiversity loss, improving air quality globally, decreasing plastic pollution by drafting and enforcing regulations that limit plastic production and enhancing recycling efforts and water pollution by enhancing chemicals and waste management. The effectiveness of these solutions depends on the commitment of member states to implement and integrate the regulations suggested. The attached documents are essential to take into consideration while devising new solutions to tackle the issue; however, it is vital to bear in mind that these have not succeeded in fully addressing the impending threats to the environment, the Earth and many organisms, precisely because of their lack of detail and oversimplifications which has led to corrupt countries to make use of loopholes to avoid taking measures and continue their depletion of natural resources and the environment.

- UNEP Resolution on Ocean Action, March 2024 UNEP/EA.6/L.18
- UNEP Resolution on Air Pollution, March 2024 UNEP/EA.6/Res.10
- UNEP Resolution on Plastic Pollution, February 2021 UNEP/EA.5/Res.14

- UNEP Resolution on Waste Management and Pollution, February 2021 UNEP/EA.5/Res.8
- UNEP Resolution on Chemical Waste Management, February 2021 UNEP/EA.5/Res.7
- UNEP Resolution on Biodiversity, February 2021 UNEP/EA.5/Res.6
- Montreal Protocol, 1987
- Paris Agreement, 2015
- Minamata Convention on Mercury, 2017
- Rio Conventions, 1992
- Resolution on AI for Sustainable Development, March 2024 A/78/L.49
- UNEP Issue Note on AI's Environmental Footprint, September 2024

The United Nations Environment Programme (UNEP): UNEP produces AI-based solutions for environmental problems. These include monitoring methane emissions, predicting deforestation risks, freshwater ecosystem mapping, etc. For instance, monitoring methane emissions facilitates timely mitigation actions. Similarly, predicting deforestation risks contributes to the reduction of habitat degradation. Similarly, freshwater ecosystem mapping enables improved management techniques and conservation measures.

The Environmental Investigation Agency (EIA): The EIA is a global organisation dedicated to uncovering environmental offences, including pollution in the Pacific. It works to raise awareness and supply evidence of pollution incidents to ensure that polluters are held accountable and to advocate for enhanced environmental safeguards in the future (EIA).

United States of America (USA): The USA values AI as a tool to increase energy efficiency. The government and many big companies like Google DeepMind and IBM Watson invest heavily in AI. Bieden focused on integrating AI into clean energy strategies to decrease its carbon footprint. The U.S. has supported various UN resolutions. (“5 Countries Are Using AI to Reduce Carbon Footprints”). On the other hand, the USA has also withdrawn from the Paris Agreement under the Trump administration (BBC).

China: China is a pioneer and leader in AI and technology and its applications in different fields. The government actively promotes AI technologies to monitor air quality. On the other hand, the country is known for being the world's leading polluterina and has consistently supported UN resolutions on climate change and other environmental problems. These initiatives, such as Baidu and Alibaba, have projects to regulate traffic and reduce congestion and pollution (“5 Countries Are Using AI to Reduce Carbon Footprints”).

Timeline of Events

Date	Description of event
22 April, 1962	The first Earth Day is celebrated.
1970	The United States Congress adopted the Clean Air Act, the country's fundamental law regarding air quality.
3-14 June, 1992	The United Nations Earth Summit in Rio de Janeiro announces a comprehensive plan for sustainable development.
11 December, 1997	The Kyoto Protocol, an international treaty to reduce greenhouse gas emissions, was adopted, but the U.S. and China did not sign.
20 April, 2010	The Deepwater Horizon oil spill released over 200 million gallons of oil into the Gulf of Mexico.
12 December 2015	The Paris Agreement, a recent international climate change mitigation and adaptation treaty, was signed.
31 October, 2017	UNEP created the International Methane Emissions Observatory, which is an AI-based solution.
2022	UNEP founded the GEMS Air Pollution Monitoring platform.

Previous Attempts to Solve the Issue

Past attempts to tackle the issue mainly didn't include AI-based solutions. Various UN resolutions have addressed environmental problems, yet those problems persist. Many member states signed and ratified the Paris Agreement and Rio Conventions, but even such binding documents couldn’t stop the ongoing crisis from worsening. UNEP has come up with various AI Solutions for the environment. Yet, these are not enough to solve the problem as they are limited in number and focus heavily and merely on analysis and mapping. Additionally, they are not well known in society, undermining the number of people using them.

Possible Solutions

First of all, the "Background Information" section of this report on the contemporary agenda of the use of AI for the benefit of our planet discusses some of the potential applications and adaptations of AI, ranging from daily and incremental steps to global applications, such as AI mapping to track freshwater resources, to combat impending and pervasive environmental crises that endanger many lives. In most cases, AI serves as a monitoring tool and a predictive model, which means AI is not exactly part of the

physical solution and mostly helps identify it. Expanding these applications presents a feasible approach to the issue at hand. Also, finding other implementations of AI where it will have a more active involvement can be beneficial. Gathering experts on the topic in a conference setting might be an option.

Minimising AI's ecological impact is also an easy, essential measure. This entails optimising AI algorithms for energy efficiency and encouraging companies to adopt renewable energy for their AI-related operations.

For this purpose, experts diligently appointed by the United Nations, upon a process of meticulous background checks, can be tasked to develop ways to refine, revise and update the designing and training processes of AI models, including mechanical or digital forms. If the widespread adoption of these newly emerging methods is sustainably achieved through collective governance and international cooperation, the. In that case, the drastic carbon footprint emitted by various forms of AI can be reduced.

AI companies, employers and relevant stakeholders can tackle the pervasive impacts caused by the excessive use of non-renewable energy sources by ensuring the smooth transition to renewable energy sources, such as but not limited to wind turbines, solar panels, hydropower dams, geothermal reservoirs, ocean energy, bioenergy. Running their data centres using these more sustainable sources will reduce greenhouse gas emissions. The member states can support this transition and even be funded to a certain extent by the UN funds and resources created for this purpose.

Bearing in mind all the possible solution methods mentioned above, the delegates must approach the issue with an inclusive, feasible and economical approach to make sure that every country can benefit from the beneficial and practical use of artificial intelligence and to render the devised solutions applicable to every country, whether it be a Less Economically Developed Country (LEDC) or a More Economically Developed Country (MEDC). The delegates should also pay utmost attention to elaborately expanding on their solution methods to prevent any vague points that could be misinterpreted by other delegations and that present points for exploitation, as this would negatively affect the resolution of global environmental crises that not only threaten the future of the humankind but the future of all life forms on the Earth.

Bibliography

"5 Countries Are Using AI to Reduce Carbon Footprints." *MC Solutions - System Development to Facilitate GX (Green Business) - Web Application Development - Web System Development - Ordering System Development*, 13 Aug. 2024, mcsolutions.vn/5-countries-are-using-ai-to-reduce-carbon-footprints/. Accessed 10 Dec. 2024.

"AI in Pollution Control | Top 5 Revolutionary AI | AIWS." *AIWS*, 26 Sept. 2024, aiworldschool.com/research/ai-in-pollution-control/. Accessed 10 Dec. 2024.

Air Pollution Series Actions on Air Quality in Asia and the Pacific Executive Summary. 2022, wedocs.unep.org/bitstream/handle/20.500.11822/36698/AAQAP_ES.pdf .

Bhuyan, Md. Simul. "Effects of Microplastics on Fish and in Human Health." *Frontiers in Environmental Science*, vol. 10, Mar. 2022, https://doi.org/10.3389/fenvs.2022.827289.Accessed 10 Dec. 2024.

Cambridge University Press. "Cambridge Dictionary." *Cambridge Dictionary*, Cambridge University Press, 2024, https://dictionary.cambridge.org/.Accessed 10 Dec. 2024.

"Climate & Clean Air Coalition." *Climate & Clean Air Coalition*, 2020, www.ccacoalition.org/. Accessed 10 Dec. 2024.

Dianna Parker. "Garbage Patches | OR&R's Marine Debris Program." *Marinedebris.noaa.gov*, 11 July 2013, marinedebris.noaa.gov/discover-marine-debris/garbage-patches . Accessed 10 Dec. 2024.

"EIA." *Eia-International.org*, eia-international.org/ . Accessed 10 Dec. 2024.

Environment, U. N. "Restoring Clean Air." *UNEP - UN Environment Programme*, 24 Oct. 2017, www.unep.org/regions/asia-and-pacific/regional-initiatives/restoring-clean-air . Accessed 10 Dec. 2024.

"Environmental Issues." *Wikipedia*, 2 July 2024, en.wikipedia.org/w/index.php?title=Environmental_issues&oldid=1232218696 . Accessed 10 Dec. 2024.

Friedlander, Blaine. "AI Improves Detail, Estimate of Urban Air Pollution." *Cornell Chronicle*, 2023, news.cornell.edu/stories/2023/01/ai-improves-detail-estimate-urban-air-pollution .

GPAI. *Opportunities & Recommendations for Action Biodiversity and Artificial Intelligence*. 2022, gpai.ai/projects/responsible-ai/environment/biodiversity-and-AI-opportunities-recommendations-for-action.pdf . Accessed 10 Dec. 2024.

Hancock, Lorin. “What Is Biodiversity and Why Is It under Threat?” *World Wildlife Fund*, World Wildlife Fund, 2024, www.worldwildlife.org/pages/what-is-biodiversity. Accessed 10 Dec. 2024.

Howell, Beth. “9 Ways AI Is Being Used to Help the Environment | CleanHub.” *Cleanhub.com*, Cleanhub, 6 Sept. 2024, blog.cleanhub.com/how-is-ai-being-used-to-help-the-environment.

IBM. “What Is Predictive Analytics?” *Www.ibm.com*, 2023, www.ibm.com/topics/predictive-analytics. Accessed 10 Dec. 2024.

Kerrigan, Katie. “Using Artificial Intelligence, Better Pollution Predictions Are in the Air | Johns Hopkins University Applied Physics Laboratory.” *www.jhuapl.edu* , 2024, www.jhuapl.edu/news/news-releases/240130b-ai-improves-air-quality-forecasting . Accessed 10 Dec. 2024.

Kimber, Rebecca B. “A Simple Timeline of the Environmental Movement.” *EarthyB*, 6 Feb. 2018, earthyb.com/blog/a-timeline-of-environmental-history/ . Accessed 10 Dec. 2024.

Kingsolver, Whitney. “Effects of Plastic and Waste Pollution on Ocean Communities in the Asian Pacific Region.” *Ballard Brief*, 2023, ballardbrief.byu.edu/issue-briefs/effects-of-plastic-and-waste-pollution-on-ocean-communities-in-the-asian-pacific-region . Accessed 10 Dec. 2024.

Kuchta, David. “What Is the Great Pacific Ocean Garbage Patch?” *Treehugger*, 26 July 2022, www.treehugger.com/what-is-the-great-pacific-ocean-garbage-patch-4864171 . Accessed 10 Dec. 2024.

Mann, Michael E. “Greenhouse Gas | Definition, Emissions, & Greenhouse Effect.” *Encyclopædia Britannica*, 19 Mar. 2019, www.britannica.com/science/greenhouse-gas . Accessed 10 Dec. 2024.

Masterson, Victoria. “9 Ways AI Is Being Deployed to Fight Climate Change.” *World Economic Forum*, 12 Feb. 2024, www.weforum.org/stories/2024/02/ai-combat-climate-change/ . Accessed 10 Dec. 2024.

McGrath, Amanda, and Alexandra Jonker. “What Are Environmental Issues? | IBM.” *Www.ibm.com*, 28 Nov. 2023, www.ibm.com/topics/environmental-issues . Accessed 10 Dec. 2024.

McGrath, Matt. “Climate Change: US Formally Withdraws from Paris Agreement.” *BBC News*, 4 Nov. 2020, www.bbc.com/news/science-environment-54797743 . Accessed 10 Dec. 2024.

Nathanson, Jerry A. “Pollution.” *Encyclopædia Britannica*, 21 Dec. 2018, www.britannica.com/science/pollution-environment . Accessed 10 Dec. 2024.

Oxford Dictionary. “Oxford Languages.” *Oxford Languages*, Oxford University Press, 2024, languages.oup.com/google-dictionary-en/ . Accessed 10 Dec. 2024.

Rafferty, John. “Biodiversity Loss | Causes, Effects, & Facts.” *Encyclopædia Britannica*, 3 Sept. 2024, www.britannica.com/science/biodiversity-loss . Accessed 10 Dec. 2024.

Rafferty, John P. “Ocean Acidification.” *Encyclopædia Britannica*, 7 Aug. 2016, www.britannica.com/science/ocean-acidification . Accessed 10 Dec. 2024.

Ramesh, R., et al. *A Policy Brief Eutrophication and Ocean Acidification*. 2014, www.nutrientchallenge.org/sites/default/files/documents/files/FINAL%20Ocean%20Acidification%20policy%20brief%20spread_press%20quality_print.pdf .

“ResearchGuides: Environment: Timeline of the Environmental Movement.” *Lindahall.org*, 2022, libguides.lindahall.org/environment/timeline . Accessed 10 Dec. 2024.

Robinson, Deena. “15 Biggest Environmental Problems of 2024.” *Earth.org*, Earth.org, 3 Jan. 2024, earth.org/the-biggest-environmental-problems-of-our-lifetime/ . Accessed 10 Dec. 2024.

“The Anatomy of Air Pollution.” *UNC-MPH*, 26 Apr. 2019, onlinemph.unc.edu/blog/outdoor-air-pollution-health/. Accessed 10 Dec. 2024.

UNEP. “AI Has an Environmental Problem. Here’s What the World Can Do about That.” *UNEP*, 21 Sept. 2024, www.unep.org/news-and-stories/story/ai-has-environmental-problem-heres-what-world-can-do-about . Accessed 10 Dec. 2024.

UNEP. “How Artificial Intelligence Is Helping Tackle Environmental Challenges.” *UNEP*, 7 Nov. 2022, www.unep.org/news-and-stories/story/how-artificial-intelligence-helping-tackle-environmental-challenges . Accessed 10 Dec. 2024.

United Nations. “What Is Renewable Energy?” *United Nations*, United Nations, 2024, www.un.org/en/climatechange/what-is-renewable-energy . Accessed 10 Dec. 2024.

“What Is the Greenhouse Effect?” *GeeksforGeeks*, 24 May 2022, www.geeksforgeeks.org/what-is-the-greenhouse-effect/ . Accessed 10 Dec. 2024.

Yao, Yuan. “Can We Mitigate AI’s Environmental Impacts?” *Yale School of the Environment*, Yale

University, 10 Oct. 2024, environment.yale.edu/news/article/can-we-mitigate-ais-environmental-impacts . Accessed 10 Dec. 2024.

Appendices

I. https://www.unep.org/topics/digital-transformations/digital-accelerator-lab/ai-solutions-environment
II. https://www.unep.org/resources/resolutions-treaties-and-decisions/UN-Environment-Assembly-5-2
III. https://www.weforum.org/stories/2024/02/ai-combat-climate-change/
IV. https://research.aimultiple.com/sustainability-ai/
V. https://www.un.org/en/desa/artificial-intelligence-planet-solutions-climate-and-people-margins-sti
VI. https://environment.yale.edu/news/article/can-we-mitigate-ais-environmental-impacts
VII. https://environment.upenn.edu/events-insights/news/ai-and-environmental-challenges
VIII. https://www.unep.org/topics/air/monitoring-air-quality/monitoring-air-quality