Exploring the Ecological Ramifications of Artificial Intelligence through the Lens of Ecocide Law

Prof. (Dr.) Jyoti J. Mozika[1]
Ankita Sharma[2]

Abstract

Artificial intelligence (AI) is described as a new form of extractivism that uses information to drive the circulation of capital. Data and digital technologies are regarded as the primary source of raw materials for the information-based economy. However, these 'new' data-driven extraction techniques in the form of AI can be leveraged to address environmental challenges, but are not distinct from the 'old' techniques for extraction concerning their environmental footprints. AI could be considered dangerous to the environment for its increased energy consumption, larger carbon footprints, greenhouse gas emissions, generation of e-waste, etc. Such technology needs to be developed within a framework that strikes a balance between fostering innovation and ethical standards and ensuring that AI systems are aligned with ecological integrity and preserving ecological resources for present and future generations. Establishing an ecocide law could potentially provide an ethical foundation for developing and deploying AI in the pursuit of environmental justice. Both AI and ecocide law are powerful, transformative tools that will significantly impact society and its interaction with the natural environment for sustainable development. This research paper aims to explore the potential ecological implications of AI technologies, emphasising both positive and negative aspects. It seeks to examine the relevance of ecocide law as a crucial safety net for our future, which can serve as an ethical foundation for both the development and deployment of AI.

Keywords: Artificial Intelligence, Environmental Justice, Ecocide Law, Digital Technology, Sustainable Development.

I. Introduction

Our world is currently facing a critical life-threatening juncture marked by interconnected crises, which include greenhouse gas emissions, urbanisation and

[1] Professor and Head, Department of Law, NEHU, Shillong, Meghalaya.
[2] Research Scholar, Department of Law, NEHU.

materialistic lifestyles. These crises have led to identifying this era as the Anthropocene, which has left an indelible mark on the earth and created a complex web of environmental, economic and social challenges.[3] These issues are aggravated by factors such as globalisation, capitalism, industrialisation and excessive consumption. In response to these critical challenges, contemporary urban strategies are shifting towards technology, particularly Artificial Intelligence (hereinafter referred to as AI), as a potential solution to address these crises. With the widespread integration of AI, the entwined trajectory of techno-capitalist development has entered a new paradigm. AI is seen as a viable means to mitigate the dire consequences of the extensive environmental and socio-economic challenges faced by societies at large. Significant societal change has already been brought about by the integration of AI into contemporary environments. The integration of AI into contemporary society extends beyond institutional and industrial processes to shape the everyday lives of individuals. In light of this inescapable impact, it becomes imperative to critically examine AI's role and comprehensively explore its capacity to contribute to a sustainable and resilient future.

AI is often characterised as a novel form of extraction that revolves around using information to fuel economic growth. Data and digital technologies are seen as the cornerstones of the information-driven economy. However, these 'new' data-driven extraction techniques, powered by AI, share similarities with the 'old' forms of extraction when it comes to their environmental impact.[4] That is, the integration of AI isn't devoid of its ecological consequences, as it comes with a significant demand for energy consumption and computational resources. It is imperative to acknowledge that taking a purely technocratic approach fails to consider our intricate ecological interdependencies with the natural world. It doesn't absolve us from the impending catastrophes, such as ecocide and existential crises that loom large in the Anthropocene era.[5] The progress in AI-

[3] Paul J. Crutzen & Will Steffen, *How Long Have We Been in the Anthropocene Era?*, 61 CLIM. CHANGE 251, 255 (2003); Jason W. Moore, *The Capitalocene, Part I: On the nature and origins of our ecological crisis*, 44 J PEASANT STUD. 594, 600-01 (2017).
[4] Sy Taffel, et al., *Ecocide Isn't Ethical: Political Ecology and Capitalist AI Ethics*, *in* ECONOMIES OF VIRTUE: THE CIRCULATION OF ETHICS IN AI, 58, 58-61 (Thao Phan, et al. eds., 2022).
[5] Rosella Sabia, *Artificial Intelligence and Environmental Criminal Compliance*, 1 REV. INT. DE DROIT PENAL 179, 188-89 (2020).

driven technology has ushered in substantial transformations in the realms of society, politics, economics and the environment. This has given rise to the notion of cyberspace, characterised by the intricate and interlinked networks that manage information through Information and Communication Technology.[6] The environmental impact of artificial technology is significant, spanning its entire lifecycle. From resource extraction, material exploitation, emission of greenhouse gas, high energy consumption for complex algorithm training, water consumption for data centre cooling and lithium extraction, the environmental impact is substantial. This extends further to the accumulation of computing technologies contributing to the issue of electronic waste (hereinafter referred to as e-waste), entangling us in a complex web of ecological consequences.

The increasing role of AI in potentially enabling ecologically destructive practices raises significant concern, particularly regarding its energy consumption and alignment with sustainability goals. AI could be hazardous to the environment with respect to its high carbon footprint, increased energy consumption and generation of e-waste, etc. It is necessary to develop AI within a framework that balances innovation and ethical standards to ensure that AI systems promote ecological integrity and strive to conserve the environment for both current and future generations. As we progress towards unparalleled technological advancement, it is essential to achieve a harmonious balance between utilising AI's transformative potential and carefully managing its ecological consequences. Enacting ecocide legislation aimed at preventing severe environmental damage can provide an ethical foundation for the responsible development and use of AI. Both AI and ecocide legislation have the potential to significantly shape society's relationship with the natural world in pursuit of sustainable development.

This research paper thoroughly investigates the ecological implications of AI technologies, emphasising both their positive and negative aspects. It explores how the development of the AI industry places a strain on various resources, raising pertinent questions about its environmental impact. The paper also examines the concept of ecocide and applies it to specific instances of

[6] Maskun, et al., *Introduction to the cyber-environmental law: Convergence of human, technology and nature*, 1105 IOP CONF. SER.: EARTH ENVIRON. SCI. 1, 1-2 (2022); Tan Yigitcanlar, et al., *Towards Post-Anthropocentric Cities: Reconceptualizing Smart Cities to Evade Urban Ecocide*, 26 J. URBAN TECHNOL. 147, 150 (2019).

environmental harm associated with AI. By scrutinising environmental harm directly linked to AI, the ecological consequences of constructing AI infrastructure and the material aspects of AI, the paper explores the potential of utilising the concept of ecocide to redefine the intricate relationship between AI and the environment.

II. Ecological Impact of AI Technologies

The development of AI technologies is considered a viable solution to reverse the severe repercussions of the extensive environmental and socio-economic challenges. This developing field is distinguished by a multitude of creative ideas and approaches. It offers a wide range of environmental conservation solutions such as ecosystem preservation, sustainable farming, smart urban design and effective energy use. Though the proliferation of AI-powered technologies has enormous potential for sustainable practices and resource optimisation, it could inadvertently lead to the destruction of habitat and depletion of resources. Automated processes improve industries, but by raising consumption rates, they risk exceeding the Earth's capacity for regeneration.[7]

Significant energy and mineral resources are required for the production of AI hardware, thereby creating new challenges in maintaining a balance between innovation and resource conservation. Although AI is a transformative tool, its data-intensive operations require a significant amount of computer power and data inputs, making it a resource-intensive instrument. This dependence on resources has a number of negative effects on the environment, including material exploitation, resource extraction and GHG emissions from IT operations. Furthermore, the substantial energy and water consumption needed for complex algorithm training and data centre cooling contribute to environmental concerns.[8]

The proliferation of AI also contributes to the issue of e-waste due to the accumulation of computing technologies. Overall, the integration of AI enhances

[7] Daron Acemoglu & Pascual Restrepo, *Artificial Intelligence, Automation and Work*, 24196 NBER 1 (2018); OECD, *Measuring the environmental impacts of artificial intelligence compute and applications: The AI footprint*, 341 OECD DIGITAL ECONOMY PAPERS 15 (2022).

[8] Charlotte Freitag, et al., *The real climate and transformative impact of ICT: A critique of estimates, trends and regulations*, 2 PATTERNS 1, 2-6 (2021).

the systematic extraction of natural resources, driving economic growth through technological advancements. As societies advance with AI-driven innovations, the symbiotic relationship between resource extraction and technological progress becomes even more intricate. This includes the environmental footprint of expanding data centres, critical for AI's operation, which has raised concerns about their significant carbon footprint. The mining of rare minerals for AI hardware and the growing demand for energy-intensive data centres contribute to carbon emissions and resource depletion.[9]

This dual nature of AI highlights the intricate connection between technological advancement, resource extraction and environmental consequences. AI can monitor the environment and provide resource-efficient solutions, but it must be used carefully to mitigate its own environmental impact. For a sustainable future, it is necessary to have a holistic approach that prioritises both the ethical deployment of AI and the responsible extraction of resources.

A. The Bright Side of Artificial Intelligence

From a positive standpoint, AI has the ability to significantly address environmental issues associated with resource extraction and techno-capitalist progress while promoting sustainable development. By maximising the positive effect of technology on urgent environmental concerns, it provides a wide range of possible applications for protecting the environment and improving human well-being. Climate change, biodiversity preservation, water security, clean air preservation, improving weather and disaster resilience are the six main environmental challenges identified by the World Economic Forum in collaboration with PwC and the Stanford Woods Institute for the Environment.[10] AI has become a crucial instrument in tackling these issues, which call for revolutionary measures. In essence, AI's contribution to addressing environmental issues can be incorporated into diverse policy frameworks. This integration reflects a collective dedication to harnessing technology for the betterment of both the environment and all of humanity. Furthermore, AI can

[9] Alexander Dunlap, *The Politics of Ecocide, Genocide and Megaprojects: Interrogating Natural Resource Extraction, Identity and the Normalization of Erasure*, 23 J. GENOCIDE RES. 212, 213-15 (2021).

[10] World Economic Forum (WEF), *Harnessing Artificial Intelligence for the Earth - Fourth Industrial Revolution for the Earth Series*, 2018 WEF 5.

serve as an enabler for the achievement of the Sustainable Development Goals (SDGs) set by the United Nations by strengthening environmental protection efforts through digital technologies.[11]

AI plays a crucial role in mitigating the impacts of climate change and natural disasters by enhancing urban planning, optimising energy management and promoting data-driven development strategies. It enhances waste management through smart waste containers and reduces CO_2 emissions by forecasting air pollution and optimising traffic systems. to minimise idle times for vehicles, thereby reducing unnecessary CO_2 emissions.[12] A recent survey conducted by the Capgemini Research Institute found that AI has the potential to assist companies in reducing their greenhouse gas emissions by approximately 16% by the years 2023-2025.[13] Notably, Google has harnessed AI to forecast peak workloads within its data centres, resulting in a significant 40% decrease in energy consumption.[14] Further, AI has opened up possibilities for reducing pesticide use, implementing smart irrigation practices and employing drones for disease detection in the agricultural field. In contrast to traditional methods, drones are highly energy-efficient, consuming about 1,000 times less energy than helicopters. Autonomous tractors further enhance agricultural efficiency.[15] It also extends to prevent forest fires and aids in understanding atmospheric conditions for wind farms' optimal operation. Through AI, wind farms can be fine-tuned to anticipate electricity generation from wind turbines and enhance their overall

[11] Ricardo Vinuesa, et al., *The role of artificial intelligence in achieving the Sustainable Development Goals*, 11 NAT. COMMUN 233 (2020).
[12] Arnault Pachot & Celine Patissier, *Artificial Intelligence & Environmental Protection: the paradox of an energy-consuming technology serving the ecological challenges of tomorrow*, 2022 HAL OPEN SCIENCE 19.
[13] Capgemini, *According to a Capgemini Research Institute report, artificial intelligence could help organizations reduce greenhouse gas emissions by 16% over the next 3 to 5 years*, DECIDEO (Nov. 17, 2020), https://www.decideo.fr/Selon-un-rapport-du-Capgemini-Research-Institute-l-intelligence-artificielle-pourrait-aider-les-organisations-a-reduire_a12288.html.
[14] Joe Devanesan, *Has Google cracked the data center cooling problem with AI?*, TECHWIRE ASIA (May 7, 2020), https://techwireasia.com/2020/05/has-google-cracked-the-data-centre-cooling-problem-with-ai/.
[15] Tanha Talaviya, et al., *Implementation of artificial intelligence in agriculture for optimisation of irrigation and application of pesticides and herbicides*, 4 ARTIF. INTELL. AGRIC. 58, 58-61 (2020).

efficiency. Additionally, it optimises energy consumption and facilitates the sustainable utilisation of energy resources in urban areas, such as automatically controlling streetlights based on the detection of people in the vicinity.[16]

Further, the adoption of new technologies based on AI holds great potential for environmental monitoring, particularly in preventing environmental crimes. AI can indeed play a crucial role in digitally monitoring and strengthening the enforcement of compliance with environmental laws. It enhances the capacity to monitor and respond to environmental changes effectively, thereby contributing to environmental protection efforts. The integration of AI in environmental monitoring also fosters a collaborative approach to preserving the environment involving both public and private entities. It represents a disruptive innovation capable of significantly enhancing the effectiveness of implemented measures. Introducing intelligent systems for real-time monitoring, such as monitoring air or water quality, can serve as a vital tool in promoting greater compliance with relevant legislation and reducing the potential risks of harm.[17] Compliance with environmental regulations becomes more robust, particularly for operations with significant environmental impact. By incorporating AI's computational prowess, predictive models, data analysis and optimisation capabilities into different sectors, it becomes feasible to avert and alleviate the adverse outcomes linked to conventional extraction methods. This integration can revolutionise supply chains that can streamline processes, thereby reducing inefficiencies and minimising the ecological footprint of resource extraction industries. Thus, the incorporation of AI systems for digitising environmental monitoring and strengthening prevention measures signifies a substantial shift in the approach to preserving and safeguarding the environment for both current and future generations.

B. The Dark Side of Artificial Intelligence

The deployment of AI systems in society brings forth a wide range of ethical, social and economic concerns. *While the digital industry is progressing towards* environmentally friendly and more energy-efficient practices, technological *advancements nevertheless use a significant amount of energy.* The expansion of AI technologies in agriculture, forestry and transportation can lead to unforeseen

[16] *Supra* note 10.
[17] Maskun, *Supra* note 4.

ecological repercussions concerning increased energy consumption, larger carbon footprints, greenhouse gas emissions, the generation of e-waste, etc.

While evaluating the ecological impact of AI technologies, one of the main concerns is their carbon emissions and the related energy usage. AI systems use a lot of energy since they require a lot of processing power, especially for deep learning models. Large amounts of data and computational power are needed for the development and training of AI models, which increases the demand for hardware and energy-intensive processes. Significant environmental challenges arise at every stage of such an AI-led digital lifecycle, from the initial extraction of materials required for digital technology to its eventual disposal. This involves the extraction of rare and non-renewable earth elements and minerals for manufacturing, often under environmentally destructive mining practices, which in turn lead to habitat destruction, soil and water contamination and ecosystem disruption. The widespread production of digital products significantly contributes to the depletion of Earth's natural resources. As digital technology advances, the demand for precious metals and rare earth elements vital for their production continues to grow.[18] This relentless pursuit of resources, encompassing the depletion of precious natural reserves, soil contamination and deforestation, leads to severe and lasting environmental harm stemming from the ever-expanding mining operations.

The essential infrastructure required to host AI servers, including extensive data centres and terminal equipment, consumes a significant amount of energy, mostly derived from fossil fuels, leading to a rise in greenhouse gas emissions. These data centres are essential for storing vast amounts of cloud-collected data, but their operations are incredibly energy and resource-intensive due to the multitude of servers they house. The escalating demand for such infrastructure, driven by the need to support evolving technologies like 4G, 5G and the upcoming 6G, has led to deforestation and the obliteration of entire agricultural regions. These ecological repercussions profoundly impact local populations, causing soil pollution from heavy metal dissolution.[19]

---

[18] *Supra* note 10; PHILIPPE BIHOUIX, THE AGE OF LOW TECH: TOWARDS A TECHNOLOGICALLY SUSTAINABLE CIVILIZATION (1st ed. 2020).

[19] Anders Andrae & Thomas Edler, *On Global Electricity Usage of Communication Technology: Trends to 2030*, 6 CHALLENGES 117, 119-121 (2015).

Furthermore, there are serious environmental issues because of the substantial water consumption involved in the manufacturing of AI devices and the generation of a significant amount of e-waste, particularly in the microchip industrial sector. Due to its crucial role in the environmental impact of computing and data processing, water has emerged as a vital resource in the digital era and is often referred to as 'the new coal'. Data centres serving as hubs for gathering, processing and storing data need a lot of energy for cooling a large number of computing devices. Water supplies may be under more stress as a result of this increasing energy demand.[20] In typical semiconductor manufacturing facilities, as much as 15 million litres of water per day are utilised. This excessive water usage has a significant negative impact on the environment.[21]

Moreover, there has been a noticeable increase in e-waste in the AI industry as a result of the broad application of AI and the significant usage of electrical and digital equipment. The early obsolescence of digital gadgets, driven by the rapid development of AI technology, contributes to the increase in e-waste. Device wear and tear is accelerated by the complexity of AI algorithms, which require a significant amount of processing power. This accelerated obsolescence of digital objects not only escalates the volume of e-waste but also increases the production of new devices, further depleting the limited natural resources required for production. The global trends seen in the larger electronics industry are reflected in the growing significance of this e-waste problem. An estimated 53.6 million metric tons of e-waste or around 7.3 kg per person, were produced worldwide in 2019 by the AI industry.[22]

The resource-intensive character of AI is highlighted by the extraction of minerals for hardware production, the energy requirements of data centres, and the need for a significant amount of processing power. The environmental effects of AI's expansion are similar to those of earlier technological revolutions, such as habitat disruption, increased energy consumption and the proliferation of e-

[20] Bora Ristic, et al., *The Water Footprint of Data Centers*, 7 SUSTAINABILITY 11260, 11262-64 (2015).
[21] Lubna Rashid, *The case of nature: Digital Ecocide by Tech Companies,* DIGITAL SOCIETY BLOG (Sept. 27, 2021), https://www.hiig.de/en/how-do-digital-tech-companies-get-away-with-unsustainable-behavior/.
[22] VANESSA FORTI, ET AL., THE GLOBAL E-WASTE MONITOR 2020: QUANTITIES, FLOWS and THE CIRCULAR ECONOMY POTENTIAL, 48-59 (2020).

waste. The algorithms that power AI systems may also inadvertently exacerbate imbalances in the human environment by sustaining social injustices. A prominent example of this concern is exemplified by the widely publicised case of Bitcoin. Built on blockchain technology, this cryptocurrency demands a significant amount of processing power to validate transactions. The rapid growth of Bitcoin mining has raised concerns about its environmental impact, prompting a reevaluation of the balance between societal gains and ecological costs.[23]

In essence, the trajectory of AI-driven techno-capitalist development is entangled with extractive economic structures. This extractive structure results in extensive and catastrophic ecocidal effects that impact both human civilisation and delicate ecosystems globally. Driven by an unrelenting pursuit of economic expansion, such a techno-capitalist framework demonstrates an insatiable appetite for consuming or depleting natural resources. Such a destructive appetite plays a pivotal role in driving and sustaining ecocidal activities that shape modernity.

III. Artificial Intelligence and Environmental Law

As we confront the global climate crisis, it is necessary to address the ethical obligations associated with technological advancements, particularly with respect to AI. The confluence of AI with environmental concerns poses a multifaceted challenge with respect to environmental protection and corporate responsibility. The ecological impact of AI raises ethical concerns that call for a regulatory framework governing the development and implementation of AI technologies with potential environmental repercussions. Striking a balance between fostering innovation and preserving the environment is of paramount importance.

A fundamental question that demands attention is whether the current legal framework is adequate to effectively address the potential environmental harm resulting from AI technologies. Are the measures in place sufficient to prevent irreversible environmental damage? In the realm of environmental law in India, specific environmental crimes are well-defined and often related to pollution within clearly defined contexts. However, it is worth noting that many recognised

[23] Alex de Vries, *Bitcoin boom: What rising prices mean for the network's energy consumption*, 5 JOULE 509, 509-10 (2021).

environmental crimes are essentially regulatory offences with limited coercive measures and relatively low sanctions, often centred around fines. Although penalties are a frequently used punishment for environmental violations, they might not always serve as effective deterrents, particularly when the possibility of significant gains outweighs the financial risks associated with these fines. This dynamic may make it more difficult for environmental laws to effectively discourage actions that can seriously damage the environment. Therefore, it is necessary to reassess our legal framework and explore ways to improve the effectiveness of sanctions and regulations in order to better support environmental preservation.

One possible way to address this gap in environmental law is to contemplate the imposition of stricter legal consequences for environmental offences. This is required particularly in cases capable of causing widespread harm or irreversible ecological damage. Rather than viewing such acts as mere regulatory infractions, the legal system could redefine them as serious criminal offences and impose harsher punishments, including the possibility of imprisonment. In this context, there is a strong case for recognising large-scale environmental destruction as a separate and distinct crime, often referred to as 'ecocide.' Establishing ecocide as a criminal offence would not only reinforce the deterrent and punitive dimensions of environmental law but also carry its profound social and moral significance. It would encourage a more profound commitment to safeguarding the environment by holding corporations, governments and industries accountable for significant environmental damage.[24] This strategy goes beyond fines and introduces the prospect of criminal liability and imprisonment for those responsible for the act of ecocide. Since such an approach carries the stigma of being labelled as a criminal and the possibility of going to jail, the introduction of such a legal framework would serve as a powerful deterrent. It would incentivise greater investments in sustainable practices and a stronger commitment to preserving the environment. Treating such enormous environmental wrongdoing as a serious crime rather than a mere regulatory violation would ensure imposition of more stringent penalties, a broader jurisdictional reach and a stronger commitment to prosecute the most severe environmental offences. This shift in perspective could encourage a more careful

[24] Tarini Mehta, *Recognise ecocide as crime*, DECCAN HERALD (July 27, 2021), https://www.deccanherald.com/opinion/recognise-ecocide-as-crime-1013230.html.

analysis of the long-lasting environmental impacts of various activities. This ultimately would contribute to the establishment of a new moral standard where activities causing mass harm or destruction of natural ecosystems are deemed socially and morally unacceptable.

In the context of AI and its potential ecological consequences, this reevaluation of environmental law becomes even more pertinent. Due to the resource-intensive nature and potential for ecological impact, AI technologies may require a more rigorous legal framework to ensure accountability for environmental harm. This involves critically assessing its alignment with the principles of Ecocide Law and exploring avenues for strengthening environmental protection in the digital age.

A. Ecocide Law: Ethical Foundation for Artificial Intelligence

The term ecocide refers to mass harm or obliteration of environments, often executed with knowledge of the risk. It can be defined as intentional, reckless, or negligent actions leading to long-lasting environmental harm, frequently with irreversible effects and endangering entire populations. It is a systematic eradication of ecosystems with adverse consequences for their inhabitants, involving significant harm or destruction and includes both natural and anthropogenic causes for the harm. In other words, it entails causing severe damage or destruction to the environment on an enormous scale or its fundamental components in a manner that disrupts the habitat or peaceful co-existence of an ecosystem.[25] Polly Higgins, a leading advocate of Ecocide Law, defined ecocide as *'the extensive damage to, destruction of or loss of ecosystem(s) of a given territory, whether by human agency or by other causes, to such an extent that peaceful enjoyment by the inhabitants of that territory has been or will be severely diminished.'*[26]

Ecocide law is an eco-centric response to such environmentally harmful practices occurring at an unprecedented scale by corporations and other entities. It is mainly committed by states, corporations, or individuals and typically involves acts and policies pursued with the knowledge of the harm they cause, despite

[25] Kubra Kalkandelen & Darren O'Byrne, *On ecocide: toward a conceptual framework*, 18 DISTINKTION 333, 338-39 (2017).
[26] POLLY HIGGINS, ERADICATING ECOCIDE: LAWS AND GOVERNANCE TO PREVENT THE DESTRUCTION OF OUR PLANET, 59-60 (2nd ed. 2015).

viable alternatives being available. Corporations and states play a pivotal role in perpetuating large-scale environmental damage through various projects that harm the environment, pollute the air and deplete non-renewable resources. Such environmental destruction has been historically accepted as collateral damage in the pursuit of profit.[27] The primary beneficiaries of ecocide are often a minority seeking profit, while any societal benefits are overshadowed by the high social costs. Ecocide law represents an ecologically-centred response to the significant environmental harm caused by corporations and other entities on an unprecedented scale. This movement seeks to transform the current paradigm from anthropocentrism to an ecological perspective, emphasising the importance of ecological limits in limiting human economic activities. By recognising ecocide as a legal principle and criminal offence, defined with substantial potency, we can hold those responsible for severe ecological destruction accountable.[28]

Ecocide is indeed not a recent concept and has roots dating back to the 1970s. It was even under consideration for inclusion in the Rome Statute, which instituted the International Criminal Court (ICC), as late as 1996, but was ultimately excluded without a formal vote.[29] Numerous campaigns have been launched over the years to advocate for the recognition of ecocide as a criminal offence, resulting in the proposal of several draft laws addressing this issue. Several countries have incorporated various forms of ecocide as a criminal offence, although these provisions are often centred around acts committed during times of warfare. However, these legal frameworks may lack well-defined processes for evaluating crucial criteria, such as the intent behind ecologically harmful actions.[30] Since the last decade, there has been an ongoing movement to establish it as the fifth crime against peace within the jurisdiction of the ICC. In 2021, a

[27] Richard A. Falk, *Environmental Warfare and Ecocide-Facts, Appraisal and Proposals,* 4 BULL. PEACE PROPOS. 80, 84 (1973); Mark Allan Gray, *The international crime of ecocide*, 26 *CALIF. WEST. INT. LAW J.* 215, 216-225 (1996).

[28] Polly Higgins, Damien Short & Nigel South, *Protecting the planet: a proposal for a law of ecocide*, 59 CRIME, LAW SOC. CHANG. 251, 255 (2013).

[29] Ibid.

[30] Liana Georgieva Minkova, *The Fifth International Crime: Reflections on the Definition of "Ecocide",* 25 J. GENOCIDE RES. 62, 66 (2023); Gaius Emamuzou Okwrzuzu, *Revivification of Efforts to Criminalize Ecocide in International Law: Emerging Trend*, 13 NATL. LAW SCH. INDIA REV. 52, 53-60 (2015).

panel of experts, the Independent Expert Panel (IEP) assembled by the Stop Ecocide Foundation, put forward a proposed definition of ecocide and recommended its incorporation in the Rome Statute. This would involve the addition of a new Article, Article 8ter, to the statute to specifically address and define ecocide as a criminal offence. The proposed definition of ecocide is as follows:[31]

(1) "Unlawful or wanton acts committed with knowledge that there is a substantial likelihood of severe and either widespread or long-term damage to the environment being caused by those acts.

(2) For the purpose of paragraph 1:

a. 'Wanton' means with reckless disregard for damage which would be clearly excessive in relation to the social and economic benefits anticipated;

b. 'Severe' means damage which involves very serious adverse changes, disruption or harm to any element of the environment, including grave impacts on human life or natural, cultural or economic resources;

c. 'Widespread' means damage which extends beyond a limited geographic area, crosses state boundaries, or is suffered by an entire ecosystem or species or a large number of human beings;

d. 'Long-term' means damage which is irreversible or which cannot be redressed through natural recovery within a reasonable period of time;

e. 'Environment' means the earth, its biosphere, cryosphere, lithosphere, hydrosphere and atmosphere, as well as outer space."

The potential introduction of ecocide laws and the recognition of the rights of nature are concepts that can be integrated into our existing legal systems. It is important to acknowledge that we already confer legal rights to non-human entities in the form of corporations, so the idea of extending similar rights to plants, animals and entire ecosystems is not unprecedented. Currently, there's a prevailing belief that nature is distinct from humans and is regarded merely as a

[31] Independent Expert Panel, *Legal definition of ecocide*, *STOP ECOCIDE INTERNATIONAL*, (June 2021), https://www.stopecocide.earth/legal-definition.

resource to exploit without inherent value. The establishment of an ecocide law, aimed at addressing the most severe and deliberate environmental crimes, represents a significant step toward curbing ecological offences. Such law goes beyond being just another legal regime; it represents a pathway toward transitioning into a society where all technologies and practices are aligned with the preservation and well-being of life on Earth. It carries the potential to act as a catalyst for a profound transformation, reevaluating our relationship with nature by recognising nature's inherent value and rights. It underlines the global community's commitment to protecting the environment and holding individuals, corporations and governments accountable for actions that cause severe harm to ecosystems and the planet as a whole. In essence, it signifies a pivotal shift in cultural perspective towards prioritising the well-being of the environment and the sustainability of our planet.[32]

B. Intersection of Artificial Intelligence with Ecocide

The interplay between AI and environmental harm is indeed intricate and multifaceted. These technologies have the potential to act as both by significantly contributing to environmental damage and serving as tools to mitigate it. AI has the potential to reduce emissions across a number of industries, but it can also lead to increased emissions if not properly regulated and governed. Even though they are usually indirect when acting as a facilitator, AI can have significant and wide-ranging negative effects on the environment. These damages have caused enduring alterations in societal consumption patterns, creating a complex relationship between environmental degradation and the way society assigns value in the production and distribution of goods and information.[33]

When considering AI in the context of ecocide, it becomes apparent that AI's systematic depletion of natural resources, driven by the extraction of raw materials, including minerals, fossil fuels, timber and water for the production and operation of AI technologies, can be viewed as contributing to ecocide.[34] The development and utilisation of AI systems are associated with substantial

[32] Rob Comber & Elina Eriksson, *Computing as Ecocide*, LIMITS (Jun 06, 2023), https://limits.pubpub.org/pub/a8h46wqy/release/1.
[33] Rita Li, *The Environmental Impact of AI. Global Research and Consulting Group Insights*, GRC INSIGHTS (May 08, 2023), https://insights.grcglobalgroup.com/the-environmental-impact-of-ai/.
[34] *Supra* note 7.

environmental consequences, with profound implications for ecological sustainability. The massive energy consumption of AI infrastructures, the e-waste generated by obsolete devices and the algorithms that inadvertently amplify resource consumption, as mentioned above, are a few examples of AI's ecological footprint. For instance, AI-powered precision agricultural systems, utilising computer vision and robotics, have the potential to harm up to 100,000 plants in an hour.[35] These systems can inadvertently harm the environment by causing significant plant casualties, potentially leading to decreased biodiversity and the proliferation of monocultures. However, these same AI techniques can also be utilised for the conservation of ecosystems, such as algorithmic monitoring to detect and prevent both legal and illegal deforestation. Therefore, the responsibility for environmental harm caused by such technologies may not solely rest with the technologies themselves but also with the industries applying them.[36]

It is important to note that AI lacks inherent consciousness or intentions; it operates solely based on pre-programmed instructions and is handled and controlled by natural persons. While it can be a powerful tool for influential entities like governments or corporations, enabling them to shape extensive discussions and even sway voting behaviours on a large scale, it is often used within the context of late capitalism for exploitative practices rather than benefiting ecosystems and communities.[37] Consequently, the key issue lies not in AI itself, but in how it is employed, emphasising the need for careful scrutiny of its usage. In light of these considerations, integrating ecocide laws into the AI landscape becomes a compelling proposition. This integration can be instrumental in ensuring that AI technologies are implemented in a manner that aligns with environmental sustainability and responsible practices within the industries that utilise them. Ecocide law would establish a framework for holding

[35] John Koetsier, *Self-Driving Farm Robot Uses Lasers To Kill 100,000 Weeds An Hour, Saving Land And Farmers From Toxic Herbicides*, FORBES (Nov. 2, 2021), https://www.forbes.com/sites/johnkoetsier/2021/11/02/self-driving-farm-robot-uses-lasers-to-kill-100000-weeds-an-hour-saving-land-and-farmers-from-toxic-herbicides/?sh=3f8c857e4070.

[36] Jonas Roupe, *Artificial Intelligence in Service to Life on Earth: Ecocide law as a framework for governance,* 2022 *INSIGHT REPORT* 5.

[37] Eric Nost & Jenny Elaine Goldstein, *A political ecology of data,* 5 *ENVIRON. PLAN. E: NAT. SPACE*. 3, 5-6 (2021).

both AI developers and users responsible for the environmental impacts of their creations. This could involve promoting sustainable AI development, incentivising energy-efficient algorithms, fostering circular technology ecosystems to align technological advancement with ecological preservation and ensuring a harmonious coexistence between AI and the natural world.[38]

The environmental harms associated with AI, characterised by their far-reaching and severe consequences, can align with the concept of ecocide. Ecocide typically involves severe, widespread, or long-term damage to the environment. When assessing the environmental consequences of AI, it is reasonable to consider them within the framework of ecocide due to the severity, widespread nature and potential long-term effects of these harms on the environment. These harms are often committed with awareness of the potential ecological consequences, as major corporations and developers are generally cognizant of the environmental implications associated with AI technologies. The responsibility for the development of AI, which encompasses computing power, energy consumption and infrastructure, predominantly lies with a handful of major corporations. Given the extensive attention and discourse surrounding AI's ecological impact, it is reasonable to assume that these corporations possess some level of awareness regarding the potential environmental consequences. This awareness implies that, to some extent, the environmental harm associated with AI could be considered intentional or wanton, or at least, as a result of willful disregard for its ecological consequences, as these entities may knowingly contribute to the harm despite being informed about it. Many major AI corporations openly acknowledge the environmental consequences tied to resource extraction and argue against wanton resource exploitation in light of perceived economic benefits to society. These economic advantages, while not confined to specific locations, may inadvertently come at the expense of marginalised communities or become entangled in the complex web of moral responsibility across various geographic regions.[39]

For transaction verification, AI devices based on blockchain technology usually require a significant amount of processing power. Although the possibility of more energy-efficient blockchain technology has been discussed, any efficiency

[38] *Supra* note 2.
[39] *Supra* note 30.

improvements have usually been offset by increasing demand and mining activities. The growing demand for technology has led to a swift rise in computational intensity, energy consumption and carbon emissions, reaching a significant level of severity. Moreover, it is important to acknowledge that the environmental impacts of AI are not restricted to particular regions but rather are distributed globally. However, similar to Bitcoin mining, this impact is not dispersed equally and tends to be concentrated in areas with low energy costs. In essence, AI's environmental damage is widespread, but it shows geographic disparities primarily affecting areas where energy is more affordable and readily available.[40]

Further, the role of AI can be viewed as complex, involving not only the development of AI technologies but also the broader infrastructure that supports them, like energy supplies and data centres. The material basis for AI systems is this infrastructure, which is analogous to underwater cables and hydropower dams within the framework of AI. The socio-material characteristics of AI extend to its environmental ramifications, encompassing both direct and indirect consequences. These impacts have the potential to exceed acceptable thresholds for resource consumption, resulting in short-term and long-term damage to ecosystems.[41] This emphasises the importance of understanding the material aspects of AI, particularly its infrastructure and how it exerts a long-lasting influence on the environment. Specifically, within the context of data centres, where data is collected, processed and stored, the substantial energy requirements necessary for cooling the multitude of computing devices have resulted in an increased demand for valuable natural resources, especially water. Estimates regarding the storage capacity and throughput of surveillance data centres reveal a staggering water consumption of over 7.5 million litres per day. This level of water usage in data centres is equivalent to the daily water consumption of more than 10,000 individuals at the average consumption rate. This level of water consumption is equivalent to the daily water usage of more than 10,000

[40] Udit Gupta, et al., *Chasing Carbon: The Elusive Environmental Footprint of Computing*, 42 IEEE MICRO. 37, 38-40 (2022).
[41] Chris Preist, et al., *Understanding and Mitigating the Effects of Device and Cloud Service Design Decisions on the Environmental Footprint of Digital Infrastructure*, 2016 CHI: *CONFERENCE ON HUMAN FACTORS IN COMPUTING SYSTEMS* 1324.

individuals at the average consumption rate.[42] It is reasonable to assert that these environmental impacts can be characterised as severe, although whether they qualify as wanton may depend on the perceived societal advantages derived from the surveillance industry.

Decision-makers can get information regarding these environmental damages because the development of such data centres usually involves some degree of environmental evaluation. Since these environmental effects are frequently very localised, it may be difficult to classify them as widespread when taken into consideration separately. However, when viewed collectively, especially considering the proliferation of data centres across various geographic sites, the extent of environmental harm becomes a more pressing concern. The enduring consequences stemming from AI's infrastructure-related impacts are likely to exert a profound and lasting influence on multiple generations.[43] Additionally, the widespread integration of AI and the extensive utilisation of electronic and digital equipment have played a pivotal role in the exponential escalation of e-waste within the AI domain. While it is challenging to characterise the environmental repercussions of e-waste as widespread, as the immediate effects are often localised or regional, there is potential for long-term damage resulting from such e-waste. The long-term ramifications of these practices, which involve elevated levels of heavy metals exceeding established standards, have the potential to inflict enduring damage on the environment.

From the above discussion, AI can be recognised as a potential contributor to ecocide as its ecological impact is in line with the ecocide definition. However, addressing the potential categorisation of AI as a contributor to ecocide introduces concerns about the allocation of criminal liability, especially in cases of algorithmic errors leading to environmental crimes. In other words, assigning criminal liability in cases of algorithmic errors becomes challenging because it's hard to establish clear 'fault' on the part of corporations that rely on these algorithms for their operations. A question arises as to who should be held responsible for the ecological impacts of AI, especially considering the intricate web of contributors and users in the computing ecosystem. Is it the person who initially releases the AI code or the users who employ it? For instance, if a

[42] *Supra* note 18; Mei Hogan, *Data flows and water woes: The Utah Data Center*, 2 *BIG DATA SOC.,* (2015).
[43] *Supra* note 39.

company introduces a robot that unintentionally causes harm to thousands of plants due to the computer vision code it uses, should the developer of that code be considered responsible? If open-source computer vision code is employed by individuals for actions causing biodiversity damage, who should be held accountable for the offence of ecocide resulting from the use of AI devices? In such a case, it is asserted that developers of AI systems should be held accountable for any harm caused by their creations, applying the doctrine of strict liability. This doctrine assigns responsibility without requiring proof of fault, emphasising holding individuals or entities accountable for the harm caused, regardless of their intentions or whether they breached any specific legal standards. In essence, this approach means that developers should be held responsible if any harm is caused by their AI systems, regardless of intent or breach of any legal standards.[44]

IV. Conclusion

AI and ecocide law together have the potential to significantly improve how we approach environmental preservation and sustainable decision-making. Indeed, AI furnishes us with intelligence and information regarding current events in our world, the complex interactions between many factors and even predictions about what will happen in the future. On the other hand, ecocide law functions as a legal framework that can proactively shape behaviour and prevent harmful or destructive decisions from being taken in the first place. When these two forces are aligned, they reinforce a beneficial shift in our collective behaviour. By directing its use and applications towards decisions and actions that safeguard the environment, ecocide law effectively directs AI to contribute to a safer and more sustainable future rather than contributing to increased vulnerability. In this way, AI becomes a powerful tool in promoting responsible and environmentally conscious decision-making, ultimately leading to a world where technology and legal frameworks work together to safeguard our planet.

AI has the potential to significantly impact corporate environmental monitoring by providing new opportunities for risk assessment and compliance. The advantages of AI in improving business environmental compliance are significant, despite persistent challenges such as determining liability in cases of algorithmic failures. The potential recognition of ecocide as a crime could usher

[44] Karen Yeung, *Responsibility and AI*, 05 *COUNCIL OF EUROPE* 98 (2019).

in a profound shift in the utilisation of natural resources in the realm of AI and computing. This is because it would direct AI to contribute to a safe future rather than making people more vulnerable. It would require us to see nature as an equal stakeholder in our technological advancements, pushing for more sustainable and environmentally conscious practices within the industry. By prohibiting ecocide, this law not only puts a stop to harmful actions but also paves the way for innovative solutions, investments and the responsible use of AI that are dedicated to preserving life on Earth as a whole. It signifies a shift towards prioritising the well-being of the planet and harnessing technology and legal frameworks to ensure a sustainable and thriving future for all, where innovation and ecology coexist harmoniously.