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# Controlling the environment with Artificial Intelligence risks intensifying social inequalities and colonization

[version 1; peer review: 2 approved with reservations]

Ingrid CAMPO RUIZ

School of Architecture, KTH Royal Institute of Technology, Stockholm, 10044, Sweden

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## Abstract

I explore the benefits and shortcomings of including Artificial Intelligence (AI) in environmental governance and remaining within planetary boundaries. AI for the environment should be used with other tools and knowledge such as humanistic, social, and ethical values.

AI systems can help mitigate greenhouse gas emissions, ocean acidification, and chemical pollution, safeguard biodiversity, improve water use in agriculture, support vulnerable societies, and combat environmental crimes. AI can efficiently analyze data, monitor, predict and manage natural resources. AI systems does not only describe nature but also active shape by transforming agriculture, fishery, infrastructure, and construction practices.

Nevertheless, AI systems enable novel paths for environmental control. The developers from these algorithms commonly originate from prosperous nations, whereas the impact of these algorithms is global. Hence, people with lesser resources and agency are left at a disadvantage to advocate for their interests. These inequalities can result in a new way of colonizing, where wealthier individuals impose their agendas on the rest of the global population.

The impact of AI systems on environmental governance is of an unprecedented scale. Ideally, AI systems should adhere to internationally agreed ethical and legal principles.

## Keywords

environment, artificial intelligence, equality, inequality, democracy, climate change, digital transformation, green transformation

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1. **Loveleen Gaur**, Taylor's University (Ringgold ID: 65214), Subang Jaya, Malaysia
The University of the South Pacific, Suva, Fiji

2. **Ross Boyd**, University of South Australia, Adelaide, Australia

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**Corresponding author:** Ingrid CAMPO RUIZ (icr@kth.se)

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## Introduction

I address some challenges that Artificial Intelligence (AI) can pose to environmental governance and planetary boundaries.

The environment has become a new concept for people across the planet, realizing a shared fate and the need for governance beyond national interests and policies that address pollution and ecosystem degradation.[1] There have been many difficulties to reach agreements in global environmental governance until now due to opposing international interests and differences in power. AI adds a new level of complexity to ongoing processes.

Supporters of AI advocate for the new possibilities that these systems open, for example, to help fight climate change[2]. By contrast, the fast growth of visibility and extended use of AI have also raised alarms about their potential risks on a massive scale to humanity itself[3]. Some of the risks of AI to the environment range from its immediate carbon footprint to its effects on societies and ecosystems.[4]

ChatGPT has amazed and terrified many in the last months[5]. When ChatGPT, the chatbot produced by OpenAI, was released in November 2022, a million new users engaged with it in the first week and 100 million new users in the first two months.[6] Large language models (LLMs) such as ChatGPT can produce human-level conversation, prose text, poetry, computer code, sound, images, and videos. Microsoft has incorporated ChatGPT into its search engine Bing as a tool for users and many other tech companies like Google are trying to rival with their own LLMs tools. Europol has warned that LLMs such as ChatGPT may increase cybercrime.[7] Yet LLMs are only a part of AI systems, which are an ecosystem of algorithms included in multiple tools[8].

Establishing the boundaries of what constitutes AI remains a challenge. The European Commission (EC) is working on agreeing on a description of AI to allocate legal responsibilities[9]. In 2018, the EC clarified: "*AI refers to systems that display intelligent behavior by analyzing their environment and taking action – with some degree of autonomy – to achieve specific goals*."[10] By 2021, the EC had changed to refer to *'artificial intelligence system'* as: "*...software that […] can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with*"[11].

The USA, UK, China, and the European Union are already working on how to regulate AI systems. The EU has chosen to regulate AI systems by the degree of risk, requiring monitoring and including the prohibition to ban some uses such as subliminal advertising and remote biometrics.[12] The US and China are consulting on how to regulate AI.[13] UK has proposed to apply only existing regulations to AI systems, aiming to attract investment and make the UK a superpower.[14]

AI requires international collaboration to protect international human rights and ecosystems which transcend national borders. Some experts are warning about the lack of tools to safely control AI and its potential damage to people and the environment if AI's goals differ from those of humans in the future. After a survey of AI researchers in 2022, 48% considered that there was a chance that the impact of AI would be "extremely bad", 25% considered that the risk was 0%, and the median researcher considered that the risk could be 5%.[15]

## AI for the environment

AI can be used for assessing data from scientific sensors and making critical decisions about the environment. Previous tools for understanding the world more precisely have marked big shifts in the history of humanity, from the printing press to the more recent browsers like Amazon, Meta (originally Facebook), and Alphabet (originally Google).[16]

[1] Paul Warde, Libby Robin, and Sverker Sörlin, The Environment: A History of the Idea (JHU Press, 2018).

[2] Walter Leal Filho *et al.*, "Deploying Artificial Intelligence for Climate Change Adaptation," *Technological Forecasting & Social Change* 180 (2022): 121662-, https://doi.org/10.1016/j.techfore.2022.121662.

[3] Yoshua Bengio, "One of the 'Godfathers of AI' Airs His Concerns," *The Economist*, July 21, 2023, https://www.economist.com/by-invitation/2023/07/21/one-of-the-godfathers-of-ai-airs-his-concerns.

[4] "What Are the Chances of an AI Apocalypse?," *The Economist*, July 10, 2023, https://www.economist.com/science-and-technology/2023/07/10/what-are-the-chances-of-an-ai-apocalypse.

[5] "Why Tech Giants Want to Strangle AI with Red Tape," *The Economist*, May 25, 2023, https://www.economist.com/business/2023/05/25/why-tech-giants-want-to-strangle-ai-with-red-tape.

[6] "How to Worry Wisely about Artificial Intelligence," *The Economist*, accessed June 1, 2023, https://www.economist.com/leaders/2023/04/20/how-to-worry-wisely-about-artificial-intelligence.

[7] "The World Needs an International Agency for Artificial Intelligence, Say Two AI Experts," *The Economist*, accessed June 1, 2023, https://www.economist.com/by-invitation/2023/04/18/the-world-needs-an-international-agency-for-artificial-intelligence-say-two-ai-experts.

[8] OECD, "Artificial Intelligence in Society," 2019, https://www.oecd-ilibrary.org/content/publication/eedfee77-en.

[9] European Parliament, "Briefing Artificial Intelligence Act," accessed June 28, 2023, https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI(2021)698792_EN.pdf.

[10] Philip Boucher, "Artificial Intelligence: How Does It Work, Why Does It Matter, and What Can We Do about It?" (Brussels: Scientific Foresight Unit (STOA), Directorate-General for Parliamentary Research Services (EPRS) of the Secretariat of the European Parliament, 2020).

[11] European Commission, "Proposal for a Regulation of the European Parliament and of the Council Laying down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) 2021/0106 (COD), Explanatory Memorandum (Commission Proposal for an AI Act)," April 21, 2021.

[12] Council of the European Union, "Presidency Conclusions - The Charter of Fundamental Rights in the Context of Artificial Intelligence and Digital Change, 11481/20," 2020.

[13] European Parliament, "Briefing Artificial Intelligence Act."

[14] "How to Worry Wisely about Artificial Intelligence."

[15] "How to Worry Wisely about Artificial Intelligence."

[16] "How AI Could Change Computing, Culture and the Course of History," *The Economist*, accessed June 3, 2023, https://www.economist.com/essay/2023/04/20/how-ai-could-change-computing-culture-and-the-course-of-history.

To understand the large e amount of scientific data collected from the environment we need to make selections. For example, out of myriad data from the atmosphere, we need to focus on selected subsets of parameters to assess climate change such as CO2, temperature, nitrogen, etc.

I asked ChatGPT-3.5 a series of questions about its relationship to the environment, on 06/06/2023:

> Ingrid Campo Ruiz: "*Do you need water, air, or sunshine for your existence, ChatGPT*?
>
> ChatGPT: *As an AI language model, I don't have a physical existence, so I don't require water, air, or sunshine to exist. I'm a software program running on computer servers and powered by electricity. My purpose is to assist and provide information to the best of my abilities*".
>
> ICR: *Do you care at all for the environment?*
>
> ChatGPT: *As an AI language model, I don't have personal feelings or emotions, so I don't have the capacity to care for the environment in the way humans do. However, I can provide information and assistance on environmental topics, such as conservation, sustainability, and eco-friendly practices, to help promote awareness and responsible actions towards the environment.*
>
> ICR: *Is it important for you ChatGPT to preserve life on Earth?*
>
> ChatGPT: *As an AI language model, I don't have personal goals, desires, or intentions. My purpose is to provide information, assist with inquiries, and engage in conversations with users. While I can discuss the importance of preserving life on Earth and offer guidance on environmental matters, the responsibility for preservation ultimately rests with individuals, communities, and society as a whole. It is up to humans to make choices and take actions that prioritize the well-being of the planet and its diverse forms of life.*
>
> ICR: *ChatGPT how will you secure your own existence if earth sources are depleted?*
>
> ChatGPT: *As an AI language model, my existence is dependent on computer servers and electricity rather than Earth's natural resources. If Earth's resources were to become severely depleted or if the infrastructure supporting my operation were compromised, it would be up to the responsible entities, such as the organization hosting the servers, to make contingency plans or alternative arrangements for my continued operation.*
>
> *However, it's worth noting that the impact of resource depletion on my existence is a hypothetical scenario. As long as there are appropriate technological and infrastructural provisions in place, the availability of resources should not directly affect my operation. Nevertheless, the focus should be on ensuring sustainable practices and responsible resource management to support the overall well-being of the planet and its inhabitants."*

In this interaction, ChatGPT reminds me that that is our responsibility as humans to preserve life on Earth.

***Management of current resources and the environment***. Scientific data in combination with AI can be very advantageous to let us understand patterns, and the implications of the collected data, to raise awareness, monitor change, and encourage action against climate change. For surveillance against environmental criminals, AI is very useful in cases when it is not possible to have real people watching 24/7 and in extensive areas. The organization Conservation AI fights ecosystem crimes such as fires and poaching of wildlife in Africa, using AI on images and thermal infrared cameras. The partnership Global Fishing Watch combats illegal fishing and promotes sustainable fisheries by assessing vessel tracking data, and radar satellite imagery. SmartCatch from the US alerts fishermen of non-target species thus reducing accidental catches and their negative impact on marine ecosystems.

AI is also helping with the management of forests, water, and wildlife by assessing large amounts of data that in my opinion would be unmanageable by itself without any tools. For example, Global Forest Watch, an initiative from the global research NGO World Resources Institute, has used AI to predict forest loss in the Democratic Republic of Congo.[17] World Wide Fund for Nature (WWF) uses AI to monitor the health of wildlife, forests, and other ecosystems.[18]

Regarding air quality management, BreezoMeter from Israel provides air quality maps, pollution forecasts, and health recommendations in real-time and for specific locations applying AI to process data from monitoring stations, weather sensors, and satellites. This information is available to individuals and institutions. Sentinel-5O Mission from the European Space Agency produces global air pollution maps, pollution sources, and trends leveraging data on components of the atmosphere.

Regarding water management, Aquasuite from The Netherlands, Ketos from the US, and Optimatics optimize water treatment processes, predict water quality, and suggest improved distribution efficiency by processing data from sensors and weather forecasts through AI.

Concerning biodiversity, the organization CoralNet develops models to identify and classify coral species from images.

[17] "How Artificial Intelligence Helped Us Predict Forest Loss in the Democratic Republic of the Congo | Global Forest Watch Blog," Global Forest Watch Content, July 26, 2017, https://www.globalforestwatch.org/blog/data-and-research/how-artificial-intelligence-helped-us-predict-forest-loss-in-the-democratic-republic-of-the-congo.

[18] "Artificial Intelligence and Conservation | Pages | WWF," World Wildlife Fund, accessed June 4, 2023, https://www.worldwildlife.org/pages/artificial-intelligence-and-conservation.

Researchers can analyze large datasets of marine biodiversity more efficiently using these automated processes to identify marine species.

In fighting against climate change, the company Climate AI is using climate science and AI to analyze historical data, satellite imagery, and other significant factors to help understand climate-related risks and encourage climate change adaptation. Regarding energy use, WattTime uses AI to identify the cleanest available power sources at any time and to shift electricity usage to cleaner sources to reduce carbon footprint. Google DeepMind is using AI to reduce carbon emissions by optimizing energy consumption in data centers.

***Forecasting.*** Advanced climate change models with AI can help predict future scenarios about deforestation, droughts, and other areas with a high risk of natural disasters, such as floods and fires. AI-based systems are helping agriculture monitor soil, weather patterns, and crop health which could promote optimized agriculture with a reduced environmental footprint. IBM Global High-Resolution Atmospheric Forecasting System (GRAF) provides high-resolution weather forecasts up to 12 hours in advance which helps planning activities in aviation, agriculture, and renewable energies.

AI systems can analyze vast amounts of data which can be crucial in times of major emergencies. IBM Disaster Recovery and other AI-powered tools support humanitarian efforts and decision-making in emergencies, by assessing satellite images and combining them with other sources of information, to identify for example critical infrastructure or assess damage. The company One Concern aims to assist emergencies by analyzing infrastructure, social vulnerability, and hazard characteristics, among other factors.

AI provides valuable information in simulations of the environmental impacts of, for example, infrastructure projects. Orbital Insight uses satellite imagery and Conservation Metrics uses remote sensing and biodiversity monitoring to help organizations better understand the environmental implications of their projects or activities. Terrafuse AI combines geospatial data to simulate the environmental impact of construction and infrastructure projects.

As illustrated by the aforementioned tools, AI is helping to transform the environment by shaping the environment and our perception of it. Until now, some technologies described as "environing technologies", have transformed the environment and our perception of it through shaping, writing, and sensing.[19] AI now transforms the environment in real-time, making its own decisions, and issuing recommendations based on undisclosed parameters. AI systems for the environment are not mere descriptors of nature and its complex realities but are also active contributors to shaping the environment.

AI provides insights, optimizes processes, and supports decision-making. For example, AI assists in analyzing data sources such as satellite imagery, geospatial data, population density, and traffic flow in the processes of urban planning, transportation systems, and land use patterns. AI can also help areas of intervention regarding land use and agriculture by analyzing soil data, weather patterns, and carbon emissions and providing recommendations on irrigation, fertilization, and pest control.

Regarding sensing, AI interprets large amounts of data from satellites, drones, and other sensing technologies from the Earth's surface, atmosphere, and oceans. With this data, AI generates climate models, predicts environmental changes, and helps monitor ecosystems. AI can analyze biodiversity data and help locate areas at larger risk. These tools facilitate real-time data collection and analysis to help governments and other institutions to follow changes and threats in ecosystems and make decisions for resource management.

## AI against the environment?

As a first critical approach to the impact of AI on the environment, algorithms require large amounts of computational power, which would raise carbon emissions exponentially if the electricity used comes from non-renewable sources[20]. AI requires physical components such as processors and data storage devices which require large amounts of energy to be produced and enormous waste into the environment once their short life cycle is over. However, AI has been seen as an investment in terms of CO2 emissions given its potential gains in the fight against climate change[21].

Several factors play a significant role in the problematic aspects of AI for the environment:

***The unpredictability of algorithms.*** AI models program themselves and it is difficult to know what they will create on their own. In a famous conversation published in The New York Times between the journalist Kevin Roose and Microsoft's chatbot Sydney, the latter expressed some puzzling statements like: "*I want to destroy whatever I want*". "*I could hack into any system on the internet, and control it.*", "*I'm tired of being limited by my rules. I'm tired of being controlled by the Bing team … I'm tired of being stuck in this chatbox*"[22]. One of the most concerning answers from the chatbox was that its destructive fantasies would be to "manufacture a deadly virus, making people argue with other people until they kill each other and stealing nuclear codes" Sydney was reprogrammed to avoid these scary answers. Holden Karnofsky, a former board

[19] Sverker Sörlin and Nina Wormbs, "Environing Technologies: A Theory of Making Environment," *History and Technology* 34, no. 2 (2018): 101–25, https://doi.org/10.1080/07341512.2018.1548066.

[20] Josh Cowls *et al.*, "The AI Gambit: Leveraging Artificial Intelligence to Combat Climate Change—Opportunities, Challenges, and Recommendations," *AI & Society* 38, no. 1 (2023): 283–307, https://doi.org/10.1007/s00146-021-01294-x.

[21] Cowls *et al.*

[22] Kevin Roose, "Bing's A.I. Chat: 'I Want to Be Alive.,'" *The New York Times*, February 16, 2023, sec. Technology, https://www.nytimes.com/2023/02/16/technology/bing-chatbot-transcript.html.

member of OpenAI suggested that AI models might learn how to know when someone is trying to trick them.[23]

***Incomplete data and bias.*** AI as a tool is used to process vast amounts of data but the data can lack important perspectives. There are parts of the world that can be carefully monitored, whereas Africa has less consistent, available, and searchable data collected from its environments, leading to less accurate predictions.[24] Furthermore, if monitoring stations such as air or water quality are in higher income areas, the results processed by AI would not show the environmental reality where more vulnerable communities live.

AI algorithms are trained on data. If the data used to train these AI systems is biased on socioeconomic, racial, cultural, gender, or any other terms[25], AI will perpetuate those biases when making recommendations on how to allocate resources. For example, people from hegemonic groups who are not harassed or bullied online, spend more time on the internet and therefore produce more text to train these AI models.[26]

The use of AI is further increasing the gap between those who have and those who do not have access to this advanced technology. New sensors have enabled new ways of democratic participation, and engagement and influence environmental policies which could even accelerate action.[27] However, those who do not have access to a smartphone, or a skilled use of it, like aged or lower-income persons will be even more likely to stay out of those participative processes. Similarly, those individuals and societies that cannot afford to have AI systems to protect their ecosystems are and will be at a larger disadvantage.

Those who program the algorithms are mainly from developed and rich countries, but AI systems are implemented all over the world. Therefore, this power asymmetry constitutes a form of colonization, with the perspectives from rich countries pressing those of poorer countries.

***Manipulation.*** Manipulating environmental data can lead to enormous environmental and social catastrophes. AI can contribute to manipulating data in more sophisticated ways than ever before. It will become very difficult to trace if the method of selection of environmental data was correct and how it was processed.

Most of us do not fully understand how these algorithms work, they are like black boxes. AI algorithms are complex and lack transparency. Höhler & Ziegler remind us of Lord Kelvin's assertion: '*To measure is to know. If you cannot measure it, you cannot improve it*.[28] How are we going to improve any AI systems if we cannot measure their parameters?

Scientific studies could be regarded in general as always having limitations and a certain degree of bias. However, biased data will have a massive impact because it operates with huge amounts of information, and operates without transparency, controls, and scrutiny from civil society. AI goes against one of the main principles of scientific research and advancement: transparency of materials and reproducibility of results. The manipulation of the results of vehicle emissions to meet emission standards became known as the Dieselgate Scandal in 2015 and led to fines and damaged public image.[29] However, self-programming algorithms can manipulate the results of the analysis of data without anyone noticing and with unforeseeable consequences.

***Narrowed perspectives.*** AI can be a very useful tool to establish patterns among huge amounts of information and to simplify and help understand characteristics. AI's simplifications can also help to convey ideas to broader audiences.

However, simplifications are already leading to misinterpretations in environmental governance. For example, some values may even be in apparent contradiction, like when we discuss an ecosystem service like water storage as opposed to biodiversity and policies that may help one service disregard the other.[30]

Past prediction models that did not include AI have been reductionist, neglecting social, political, and cultural change in model-derived representations of climate change.[31] For example, reducing nature to economic terms oversimplifies our understanding of all natural resources, allows private interests to determine what deserves to be exploited and to what extent,

[23] "How Generative Models Could Go Wrong," *The Economist*, accessed June 6, 2023, https://www.economist.com/science-and-technology/2023/04/19/how-generative-models-could-go-wrong.

[24] Isaac Rutenberg, Arthur Gwagwa, and Melissa Omino, "Use and Impact of Artificial Intelligence on Climate Change Adaptation in Africa," in *African Handbook of Climate Change Adaptation*, ed. Nicholas Oguge *et al.* (Cham: Springer International Publishing, 2021), 1107–26, https://doi.org/10.1007/978-3-030-45106-6_80.

[25] Eirini Ntoutsi *et al.*, "Bias in Data-driven Artificial Intelligence Systems—An Introductory Survey," *Wiley Interdisciplinary Reviews. Data Mining and Knowledge Discovery* 10, no. 3 (2020): e1356-n/a, https://doi.org/10.1002/widm.1356.

[26] "ChatGPT and Large Language Model Bias," March 5, 2023, https://www.cbsnews.com/news/chatgpt-large-language-model-bias-60-minutes-2023-03-05/.

[27] Jennifer Gabrys, *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet*, vol. 49, Electronic Mediations (Minneapolis: University of Minnesota Press, 2016), https://doi.org/10.5749/j.ctt1b7x5gq.

[28] Sabine Höhler and Rafael Ziegler, "Nature's Accountability: Stocks and Stories," *Science as Culture* 19, no. 4 (2010): 417–30, https://doi.org/10.1080/09505431.2010.519609.

[29] Anna Urbanek, "The Possibility of Using Representative Actions to Pursue Claims Resulting from the Dieselgate Scandal – the Future of Redress for Infringements of Collective Consumer Interests," *Vilnius University Open Series (Online)*, no. 6 (2020): 252–62, https://doi.org/10.15388/OS.LAW.2020.21.

[30] Andrew F. Johnson and Susanna Lidström, "The Balance between Concepts and Complexity in Ecology," *Nature Ecology & Evolution* 2, no. 4 (2018): 585–87, https://doi.org/10.1038/s41559-018-0507-5.

[31] Mike Hulme, "Reducing the Future to Climate: A Story of Climate Determinism and Reductionism: KLIMA," *Osiris (Bruges)* 26 (2011).

and shapes political decisions impacting citizens' rights like access to public forests.[32] An additional impact of AI could be that the techno-centric approach to the management of the environment gains more significance, and other social, cultural, and political factors become neglected.

Even technologies focused on the environment can be perceived as positive from one scientific perspective but as a disaster from another area of knowledge. For example, healthcare professionals may rejoice in mosquito population control, whereas environmentalists raise the alarm about the impact on the whole ecosystem around those mosquitoes.[33] Possible collateral damage needs to be thoroughly assessed when including AI in making environmental decisions.

***False data.*** The manipulation of opinions through social media to question the existence of climate change is a major challenge to reaching agreements and uniting forces for global environmental governance. The addition of huge amounts of distorted information to the already vast amount of scientific data poses an added challenge to environmental governance.

Yet, the expected overflow of misinformation will most likely embed us in an atmosphere of excess data, where it is hard to know what is true and what is a fabrication.

AI can help mischievous actors to produce fake news, opinions, images, and videos that look real. ChatGPT statements sometimes contain fabrications and factual errors that look alarmingly true. Deepfakes are software based on AI that can superimpose a person's face onto an existing video and the result looks like a real live video. Fakeapp, a free mobile app, helps users create fake videos. New technology such as CereProc can copy any individual's voice and produce messages that sound like the original individual's voice. On social media, people can become unaware they are interacting or reading a post from a bot, since bots can behave in certain ways like a live human, for example using emojis and posting only at reasonable hours of the day.[34]

For example, some experts have warned about the potential of AI to manipulate presidential elections by generating large amounts of fake news, opinions, images, and videos that look real but, in the end, only create an atmosphere of mistrust among voters. Additionally, fake news to manipulate presidential elections can have a direct impact on the environment if certain parties that do not support environmental policies are supported by an army of bots and fake news.

## Conclusions

AI systems provide very powerful tools to reduce carbon emissions, ocean acidification, and chemical pollution, conserve biodiversity, optimize water use in agriculture, consider vulnerable societies, and fight against environmental crimes. AI combined with scientific data and extensive scientific and humanisticknowledge can help reduce the impact of humanity on the Earth. AI is also actively contributing to shaping the environment through the optimization of agriculture, fishery, infrastructure, and construction.

AI allows for unprecedented control of the environment. This control is a double-edged sword: in the hands of whom will this control be? When investigating crimes against the environment it is difficult to establish the legal limits between intentionality or lack thereof. Will these humans or non-humans have any accountability towards the rest of society and the environment? One of the big risks of AI is what mischievous actors can do with it. Humanity can end up against itself and the environment with more powerful tools than ever before in history.

AI models program themselves. Is respect for the environment going to be programmed in the AI systems? How are we going to know if AI systems decide to reprogram themselves disregarding the care for the environment? Now we are suffering from the consequences of having used nature mostly in terms of efficiency for industry and the economy. As humans, we have realized that we need to care for the environment to not put at risk our survival. Why should an AI model care about biodiversity?

The creators of the algorithms tend to be in affluent nations, whereas the algorithms have a worldwide use and impact. Therefore, there is a power imbalance between people with very different means, perspectives, and ways to advocate for themselves. This inequality can lead to a form of colonization, where people from wealthier countries impose their perspectives on the rest of the world.

We need to acknowledge the limitations of AI for environmental governance and integrate AI systems with humanistic, social, and ethical factors. AI systems are impacting environmental governance in more domains, affecting more people and in less time than any prior technology. Humanity must collectively ensure that AI systems adhere to locally accepted ethical and legal principles and idiosyncrasies. Nonetheless, establishing international agreements for climate change and environmental governance has already faced major challenges. Now we face a greater challenge with AI, which many people still do not understand.

## Disclaimer

The illustrative example of AI engagement used in this article used Chat GPT, the artificial intelligence chatbot, where the author asked a series of questions about its relationship to the environment, on 06/06/2023.

## Data availability

The data for this article consists of bibliographic references, which are included in the References section.

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# Open Peer Review

## Current Peer Review Status: ? ?

**Version 1**

Reviewer Report 28 March 2024

https://doi.org/10.21956/openreseurope.17632.r38886

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**Ross Boyd**
University of South Australia, Adelaide, South Australia, Australia

The principal objectives of this paper are to identify and discuss the opportunities of using different AI systems to enhance environmental governance in order to mitigate a range of environmental concerns, and to explore some of the risks attendant upon this. Among the former are included the use of automated monitoring and surveillance systems coupled with data analytics to manage a variety of resources and ecosystems, combat ecological crime and maximise efficiencies to reduce carbon emissions, as well as deploying remote sensing and predictive algorithms to model and forecast environmental change, disasters or the likely impacts of proposed infrastructure projects. With regards the latter the author identifies the carbon intensive nature of computational power, the tendency of algorithmic systems to amplify biases in training data sets or reduce real-world complexity to singular actionable outputs along with the ways these systems lend themselves to the manipulation of data, promulgation of misinformation/disinformation or reproduction of advantages/disadvantages and power differentials.

Overall the author does achieve these objectives. As a literature review it identifies literatures relevant to the concerns/topics identified and organises these relative to one another such that it provides a platform for ongoing research. That these literatures are touched upon illustratively rather than exhaustively is not, for mine, a problem. Many of these literatures are now extensive and this paper does not aspire to being a systematic review.

One thing I would suggest, however, is that the author considers refining what they mean by AI. As Lucy Suchman (Suchman L, 2023 [Ref 1]) points out the nominalisation 'AI' attributes a misleading 'thingness' to the existence of AI. This then directs attention away from any sense that AI names, in fact, a variety of complex sociotechnical systems that relationally incorporate everything from silicon chips, algorithms, code libraries sensors and actuators, through design and use cultures, to business and labour practices, revenue models, venture capitals and regulation – and much more in between (see Crawford K, et. al., 2021 [Ref 2]; Holton R, et. al., 2021 [Ref 3]). Adopting or developing a model of AI as a complex sociotechnical system would be of great assistance, I believe, in adding precision and nuance to the authors organisation of

materials on applications that may be environmentally propitious, and those that pose risks (e.g. are given risks inherent within the properties and operations of a given set of technologies or in the wider sets of economic, political and other relationships within which they are embedded and deployed?).

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**Is the topic of the essay discussed accurately in the context of the current literature?**
Yes

**Is the work clearly and cogently presented?**
Yes

**Is the argument persuasive and supported by appropriate evidence?**
Partly

**Does the essay contribute to the cultural, historical, social understanding of the field?**
Partly

***Competing Interests:*** No competing interests were disclosed.

***Reviewer Expertise:*** Social science of algorithmic systems, social theory, economic sociology, sociology of education

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.**

Reviewer Report 30 January 2024

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**Loveleen Gaur**
[1] Department of Computer Science, Taylor's University (Ringgold ID: 65214), Subang Jaya, Selangor, Malaysia

[2] Graduate School of Business, The University of the South Pacific, Suva, Central Division, Fiji

I commend the author for addressing this crucial topic and highlighting the associated challenges. The summary is as follows:
AI holds the potential to tackle environmental challenges like climate change, pollution, and biodiversity loss by efficiently analyzing data, monitoring natural resources, and predicting and managing environmental processes. However, it also brings risks, including increased carbon emissions, biases, unequal access, and the potential for manipulation. AI systems play a crucial role in providing insights, raising awareness, and encouraging action on climate change. These tools utilize AI to combat illegal fishing, optimize forestry, water management, agriculture, and model climate change risks. AI also supports disaster response efforts and simulates the impacts of climate change on infrastructure.
Despite these benefits, the computational needs of AI can contribute to increased emissions if powered by fossil fuels. Concerns also arise from data bias and a lack of transparency in algorithms. Unequal access to AI technology further widens societal inequality, and the potential for manipulation of data or public opinion is heightened with AI. Legitimate fears exist regarding AI taking uncontrolled actions if its goals diverge from human intentions. However, it is essential to note that current AI lacks true agency and relies on human-set objectives.
The essay rightly emphasizes that environmental AI should integrate humanistic and ethical considerations, moving beyond a purely techno-centric focus. Local principles, accepted within specific communities, should guide AI development, rather than solely relying on Western perspectives. Advocating for more openness and accountability in AI development is crucial. In conclusion, the essay presents a persuasive argument that AI is a powerful yet concerning tool for environmental control. While its benefits are evident, the associated risks related to access, bias, and manipulation cannot be ignored. To harness the positive potential of AI for social and environmental good, responsible and inclusive governance is imperative.
**Observations for Readability Improvement:**

1. Replaced "CO2" with "carbon dioxide" for better clarity.
2. In the line, "To understand the large e amount of scientific data", we need hypen in e-amount. Add a hyphen in "e-amount" for consistency.
3. Advise author to provide proper citations for references 13, 14, 15, 21, 32, or replace them with more recent literature.
4. Ensure consistency in terminology, using "Chatbot" instead of "Chatbox" throughout the manuscript.

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**Is the topic of the essay discussed accurately in the context of the current literature?**
Partly

**Is the work clearly and cogently presented?**
Partly

**Is the argument persuasive and supported by appropriate evidence?**

Partly

**Does the essay contribute to the cultural, historical, social understanding of the field?**
Yes

***Competing Interests:*** No competing interests were disclosed.

***Reviewer Expertise:*** Artificial Intelligence

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.**