

AI AND THE ENVIRONMENT AND SUSTAINABILITY

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Artificial intelligence now revolutionizes how we achieve environmental sustainability. It provides novel tools to fight against climate change, protection of ecosystems, and efficiency in resources. A portion of the most essential challenges the planet is facing could be resolved with the help of AI. The potential of AI is invaluable to process large amounts of data and provide insight into real solutions.

Probably the most valuable contribution of AI to sustainable development is the optimization of energy consumption and the integration of renewable energy into the grid. Machine learning algorithms analyze large amounts of data from the grid to predict energy demand more accurately and optimize energy distribution. For example, Siemens applies AI to increase the ratio of renewable energy sources such as solar and wind power through weather forecasting and energy production forecasting.¹ These innovations stabilize energy networks and make renewable energy more reliable, reducing dependence on fossil fuels.

Artificial Intelligence is changing how we understand the climate system, from the way we perceive and react to its elements. Research presented by the World Economic Forum found that AI is being used in creating solutions for energy storage, capturing carbon, among other climate adaptation strategies, or to instigate trends that would clean up the environment.² This would help improve forecasting of extreme weather events with the help of machine learning models. AI contributes to developing carbon capture technology since it can test the efficiency of materials involved in carbon capture and determine the best and most widespread solutions suitable for carbon capture. Beyond climate change, AI has been applied to environmental monitoring and conservation. The analysis of satellite imagery via AI-powered platforms traces deforestation areas and finds illegal mining and logging. Other platforms, such as Global Forest Watch, use machine learning algorithms on near real time satellite data to supply observations to policymakers and conservationists.³

Similarly, AI is making it easier to monitor animal populations, yielding significant dividends for wildlife convergence projects. The camera trap photos, audio recordings, and even drone footage are analysed by using AI to identify species and track their movements. To save time spent in manual identification, the Zoological Society of London uses artificial intelligence techniques for analysing camera trap photos.⁴ Applications like SMART integrate AI and GIS data in increasing anti-poaching activities, with predictive algorithms acting to evaluate patterns of illegality against poaching.⁵ Different artificial intelligence techniques have further been helpful for marine environments that are affected by pollution and overfishing. As evident from different groups such as OceanMind, AI algorithms have been employed in monitoring marine life and in the detection of unlawful fishing activities. Artificial intelligence devices also track fishing boats to help them follow environmental

¹ "Siemens: AI for Renewable Energy" *Sustainability at Siemens*, <https://www.siemens.com/global/en/company/sustainability.html>

² "How to manage AI's energy demand-today, tomorrow and in the future" *World Economic Forum*, April 25, 2024, <https://www.weforum.org/stories/2024/04/how-to-manage-ais-energy-demand-today-tomorrow-and-in-the-future>

³ "Monitoring forests in real-time" *Global Forest Watch*, <https://www.globalforestwatch.org>

⁴ "Conservation programs with AI" *Zoological Society of London*, <https://www.zsl.org>

⁵ "Spatial monitoring and reporting for conservation" *SMART Conservation Tools*, <https://smartconservationtools.org/en-us/>

regulations, thus assuring more sustainability in the management of fishery resources. In addition, artificial intelligence has been fundamentally instrumental in developing sustainable agriculture.⁶ Technologies like precision farming tap into machine learning to make farm work productive, with higher yields on minimized quantities of pesticide and wasted water. Such detection systems, like Blue River Technology, enhance agricultural practices to minimize their environmental impacts.⁷ Artificial intelligence finds ever-growing application in recycling facilities due to the automation it offers in the process of sorting out waste. The results have shown improved productivity through recovering more materials and reduced contamination within recycling streams. AI is simplifying routes of garbage collection to reduce carbon dioxide emissions, fuel consumption, and operational costs across cities. It also applies to demand estimation in the growing, worldwide problem of water shortage and resource management, optimization in water distribution, and monitoring trends in consumption. With the evolution of AI technologies, its role has been revolutionary towards sustainability.

According to UNESCO, AI also has the potential to make human activity greener and be able to contribute to a circular economy.⁷ While the potential of AI in environmental sustainability is huge, there are still challenges. Energy consumption for training large-scale AI models, especially those that require a great deal of computation, raises concerns about their environmental impact. In this respect, energy-efficient AI algorithms are being developed and renewable energy is being used for powering AI infrastructure. Ethical considerations such as data privacy, surveillance concerns, and equitable access to AI technologies, must be addressed to make sure that AI has a positive impact on the environment. Despite these challenges, AI's potential to drive environmental sustainability is undeniable. AI has been invaluable in efforts towards combating climate change to guarantee a more sustainable future through advanced improvement of climate forecasting, which encourages effective resource management to support conservation and optimise energy systems. However, if the promise is ever to be completely fulfilled, there will need to be joint actions on the part of governments, businesses, and civil society through ethical and technical problems that these great technologies raise. If AI is further developed and put to responsible use, it can play a critical role in creating a resilient, sustainable world.

⁶ "All solutions for sustainable fishing" *OceanMind*, <https://www.oceanmind.global>

⁷ Artificial intelligence for sustainable development" *UNESCO*, 23 April 2023, <https://www.unesco.org/en/articles/unesco-launches-study-artificial-intelligence-sustainable-development-igf-2019>

