

The Negative Impact Of Artificial Intelligence On Ressources And Energy

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Abstract

This study aims to demonstrate the important artificial intelligence on the environmental starting from mitigating the effects of climate change , improving agricultural productivity , managing water resources , and extending to accurate weather forecasting .Artificial intelligence increasingly contributes to enhancing environmental sustainability ,as intelligent systems enable real time and precise monitoring of pollution levels and various emissions .These technologies are also used to analyze large scale environmental data which helps in making effective decisions to reduce environmental risks and improve the efficient use of natural resources .The study also high lights the drawbacks of this modern technology particularly in terms of energy consumption and the waste it generates .it therefore seeks to achieve a balance by promoting the use of this advanced technology in ways that support environmental sustainability.

Keywords Artificial intelligence, renewable energy, sustainable resources Environmental protection, climate change.

1 Introduction

In light of the rapid developments taking place in the digital world ,artificial intelligence has come to play a central role in various fields .There are many applications of AI used in environmental issues ,such as mitigating the effects of climate change ,improving agriculture ,managing water resources ,and forecasting weather .In addition intelligent systems can monitor pollution levels and reduce waste and overall energy consumption .However despite all these advantages ,the use of artificial intelligence it self consumes vast amounts of energy and generates significant and potentially hazardous waste ,which also impacts the environment ,this creates a kind of paradox that calls for achieving a balance leveraging this advanced technology and remarkable progress in ways that serve and preserve the environment and its sustainability

Importance of the Study:

The importance of the this topic is highlighted through the applications of artificial intelligence .The research also examines the relation ship between artificial intelligence and the environmental field ,as well as the sustainability of materials and energy ,thereby contributing to environmental protection .

Methodology:

The nature of this study required us to adopt the descriptive analytical approach ,through which artificial intelligence technology was examined ,along with its applications and how it has been employed in the environmental field .

Problematic:

Accordingly this research paper raises the following question :How can artificial intelligence be employed to protect the environment while minimizing its negative impacts on resources and energy?.

Axis One : Artificial Intelligence In Environmental Protection “Positive Application”

This axis addresses the various advantages of applying artificial intelligence .

1-Prediction Of Climate Changes (Predictive models)

Predictive models play a pivotal role in climate change research by enabling scientists to simulate and forecast future climate scenarios. These models utilize a wide array of data, including historical climate records, satellite observation and atmospheric measurements. The significance of predictive models lies in their ability to help scientists, and communities anticipate the potential impacts of climate change and formulate effective strategies for mitigation and adaptation. (Ahmed Hamdan)

-Significance of machine learning in climate prediction

The growing threats tied to climate change, particularly stemming from extreme weather happenings like floods hurricanes, and droughts, offer a strong rationale for boosting how communities and governing bodies gear up for and tackle environmental crises through better prediction skills. In this regard, machine learning (ML) and methods like convolutional Neural Networks(CNN) and long short term memory (LSTM) networks have implications, potentially helping enhance climate forecasting by using the wealth of past data gathered from satellites and sensors. (Pandya, 2025)

2-Natural Resource Management

AI play significant role in improving water resource management by using advanced technologies to analyze data and predict potential problems before they occur. Predictive models are used to monitor water levels and anticipate periods of drought or floods, which helps in making proactive decisions. Smart Systems also contribute to detecting in water distribution networks and reducing waste, in addition to optimizing irrigation process in agriculture by determining the appropriate amount of water based on soil and crop needs. Thus artificial intelligence helps, rationalize water consumption and preserving this vital resource for future ensure its sustainability, supporting the goals of generations.

2-1-ForPredicting Climate Patterns and Analyzing data

AI can analyze future climate data through machine learning techniques and predictive modeling to anticipate changes in precipitation patterns and temperatures. Using advanced algorithms, it relies on satellite data for weather forecasting. In addition a machine learning model can analyze historical data on rainfall and temperature, along with recent data from meteorological stations, to predict upcoming climate events such as droughts or heavy rainfall.

Through these predictions, authorities responsible for water resource management can identify future water needs and plan more effective strategies for water storage and distribution, consequently this predictive capability enhances the ability of institutions to adapt to climate change contributing to water security and sustainability in line with the goals of the environment protection. (Boudjllel Nacer, 2025)

2-2-Optimizing water resource allocation

Artificial intelligence can improve water distribution through machine models that analyze water consumption data and weather patterns to determine actual and future water needs. For example, in a city facing water scarcity, an AI system can analyze usage data across different sectors such as agriculture, industry and domestic consumption, along with weather data and forecasts, based on these analyses the system can efficiently allocate water among these sectors according to priorities, directing resources to the areas most in need. This approach not only helps meet growing demand but also mitigates the effects of drought by optimizing water distribution and storage strategies.

2-3-Monitoring consumption and detecting water loss

Artificial intelligence plays a vital role in detecting water leaks and improving the efficiency of distribution networks, through advanced data analysis techniques. by using smart sensors and continuous pipeline monitoring. AI based system scan analyze data from water networks to identify leaks early and accurately. For example in a city like London, an AI system is used to analyze sound and vibration data from water pipes to detect leaks that may not be visible. The system compress current data with ideal network models ti identify potential leak locations. This helps direct technical teams to affected areas quickly, reducing water loss and improving overall water use efficiency in the city. (Boudjllel Nacer K. A., 2025)

3-Using artificial intelligence in smart Agriculture

Agronomic experts in France frequently use satellite imagery (land-use maps)to map and make diagnoses of the region's agriculture. Artificial intelligence techniques are used the experts have

knowledge about regional soils, climate , agricultural systems , crapping techniques , and the relation ship ,between landscape and agriculture .The aréopage system was developed to help the agronomic experts analyze satellite images. (Molly W.Stock, 1995)

So there are many many foundational AI technologies that play an important role in smart agriculture,including computer vision ,lot integration , predictive analytics autonomous decision making ,blockchain technology ,edge computing and big data analytics.In essence these fundamental AI technologies are the backbone of the agricultural transformation ,ushering in an era where farming is not only smarter but also more resilient , and responsive to global challenges .They enable farmers with data driven visions , automated decision making secure and traceable transactions , and real time analysis, fostering a future where agriculture is not only more productive but also more sustainable and adaptable to the demands of the 21st century. (Sarang Karim, 2025)

4- Optimizing energy use in smart cities

An intelligent summer home has been considered for the ECOGRID EU project .The authors implemented a molar scalable wireless sensor network in their Villa smart experiment .The energy consumption of the building was modeled by incorporating wireless sensor network interior and outside studies pair and water temperatures, solar radiation sensors , weather conditions, and energy consumption data ,these thermal models are enhanced ,thus providing more accurate projections of inside temperatures .(Maryam Nikpour, 2024)

-Smart cities aim to improve the quality of urban services

Through application of advanced technologies ,with rapid urbanization across the worlds, cities today face immense pressure to manage their resources and provide services effective to the growing population ,it is estimated that by 2025, nearly 70% of the world's population will live in urban areas .Providing essential utilities like electricity , water, transportation etc .to such many people in a sustainable manner is a massive challenge .(Sarah Khan, 2023)

-The internet of things (IOT) technology inherent in smart cities ,promises effective options that will allow cities to be more safe ,inclusive and resilient . In this regard the IOT helps cities to improve good governance and privacy which are important for the socio economic dimensions of urban areas. In addition , the advance of 5G technologies and artificial neural net works.(ANNS) will prompt further innovations . In smart city technologies of the IOT. (Armin Razmjoo, 2022)

-In addition AI provides significant benefits to smart cities by improving traffic management , enhancing public safety through real –time monitoring ,increasing energy efficiency with smart grids and building management optimizing resource management like water and waste , and streamlining citizen services through chat bots and data analysis .

5-Smart Systems to reduce emissions

Artificial intelligence plays a significant role in enabling sustainable cities by reducing energy waste ,lowering pollutant emissions ,and enhancing overall safety and liability ,beyond the issue of global warming ,emissions such as carbon dioxide CO₂,hydrocarbon HC,carbon monoxide CO,particulate matter PM,nitrogen oxides NOX,sulfur dioxide SO₂,as well as fine particles like PM_{2.5} and PM₁₀ can negatively effect lung development in children ,reducing lung capacity and growth over time . (Mohamed Elassy, 2024)

Achieving sustainability requires a balance between addressing today's demands and safe guarding the resources and opportunities of future generations. in the context of urban mobility ,this goal can be advanced through the fusion of intelligent transportation systems (ITS) and 5G connectivity ,which together enable cleaner and more efficient transportation infrastructures .

Axis two :The Negative Impact

This axis addresses the negative impact of artificial intelligence on resources and energy ,as well as the various solutions to achieve a balance between the benefits of using artificial intelligence and its harmful effects.

I-The Negative Impact of artificial Intelligence on resources and energy

The applications and use of artificial intelligence have negative impacts ,as it consumes a large amount of energy and relies on devices that use rare metals ,as a result of this usage , electronic waste is generated ,which has dangerous effects on humans and their environment.

1-Energy consumption as a negative impact of artificial intelligence

Energy consumption is one of the most significant negative impacts of artificial intelligence ,the development and deployment of AI systems ,particularly large scale models require substantial computational power ,which leads to high electricity usage .Training complex machine learning models can take days or even weeks on powerful hardware ,consuming vast amounts of energy ,In addition ,the data centers that host AI applications operate continuously and require significant energy not only for computation but also for cooling systems to prevent overheating .This excessive energy demand often relies on fossil fuel based power sources ,contributing to increased (Sergiusz Pimenow, 2024) greenhouse gas emissions and environmental degradation .As AI technologies continue to expand their growing energy footprint raises concerns about long term sustainability .Therefore,improving energy efficiency and adopting greener alternatives are essential to mitigate the environmental impact of AI .

2-The negative impact of AI on big data

The rapid growth of artificial intelligence has introduced several challenges related to big data ,one of the main negative impacts is the overwhelming dependence on massive data sets which raises concerns about data quality .(Karam M.Al Obaidi, 2022)

Privacy and security AI systems require large volumes of data for training and optimization and if this data is incomplete biased ,or inaccurate it can lead to unreliable or unfair outcomes .Additionally the collection and storage of big data increase the risk of data breaches and unauthorized access ,threatening user privacy .Managing and processing such vast amounts of data also demands significant computational resources ,which can lead to inefficiencies and higher operational costs .Furthermore ,the overreliance on big data may limit transparency ,as complex AI models often operate as “black boxes ”making it difficult to understand how decisions are made .

In conclusion ,while big data is essential for the advancement of AI ,it also introduces critical issues related to data management ,privacy and ethical use ,which must be carefully addressed to ensure responsible and sustainable AI development .

3-Using Rare earth metals in Devices

Rare earth minerals are not only important as essential raw materials used in manufacturing many devices such as smartphones ,disk drives ,and wind turbines but their significance also extends to their pivotal role in a wide range of future industries .They are involved in the production of medical products,including cancer ,treatment drugs ,high tech applications , and military equipment .Moreover they are vital to the future of renewable energy efficient lighting ,electric vehicles and rechargeable batteries .

In addition ,rare earth elements play a fundamental role in green technologies such as wind turbines ,solar panels and components of electric vehicles ,including magnets and sensors these minerals are often described as the “new global energy”.

And the core foundation of high precision industries that are expected to dominate the world and determine which countries will lead technological advancement in the coming decades.

04-Electronic Waste

Electronic waste ,often called –e-waste ,refers to discarded electronic devices such as computers , smartphones , televisions and batteries ,with the rapid growth of technology .The amount of e- waste is increasing every year,creating serious environmental and health problems . Many electronic products contain harmful substances like lead ,mercury, and cadmium,which can pollute soil and water if not disposed of properly .In addition improper recycling methods can expose workers to dangerous chemicals.To reduce the impact of e-waste ,people should reuse and repair devices recycle them responsibly ,and support companies that produce ecofriendly electronics. (Djamila, 2020)

II-Solutions to achieve balance

The development of sustainable artificial intelligence is considered one of the most important challenges and opportunities of the modern era , as it requires achieving a delicate balance between

technological progress and the preservation of the environmental and naturel resources. Intelligent systems consume large amounts of energy during training and operation which makes if necessary to rely on renewable energy sources and improve the efficiency of algorithms .to reduce the carbon foot print ,sustainability in this field also involves taking into account ethical and social dimensions , such as ensuring fairness and avoiding bias, protecting data privacy , and providing equitable access to technology for all communities , by adopting responsible practices in design and development artificial intelligence can contribute to solving major environmental problems , such as climate change and resource management ,making it an effective tool for building a more sustainable and prosperous future

01-Reducing energy consumption

Through more efficient algorithms is a key objective in modern technology development ; by designing optimized algorithms ,systems can perform tasks using fewer computational resources, which directly lowers energy usage .This not only helps in minimizing operational costs but also reduces the environmental impact associated with high energy consumption .Efficient algorithms can process data faster ,require less hardware power ,and improve overall system performance ,as a result focusing on algorithmic efficiency plays an important role in building sustainable and eco friendly technological solutions ,additionally leveraging edge computing instead of cloud based processing can minimize the energy required for data transmission and storage .(Ferreira, 2026)

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02The reliance of artificial intelligence on renewable energy

Artificial intelligence has changed the game in the fields of sustainability and energy management ,Indeed the energy sector has the potential to become more flexible and less costly as AI can improve its optimization and coordination capabilities .From production to consumption, every stage of energy management can be revolutionized through the creation of a centralized system .In this way AI can become the cornerstone of future national and international strategies for energy transition and for mitigating shocks and crises. (Serguisz Pimenow, 2024)

Thus the key trends in renewable energy is the application of AI to enhance the efficiency of geothermal heat pumps .Research indicates that AI can help optimize the performance of these systems.

3-Establishing regulation to reduce AI energy consumption

In this context , we can cite , in 2024 legislative resolution on the high performance computing initiative Euro (HPC) parliament proposed that hosting entities should prepare plans on energy efficiency and environmental sustainability of AI dedicated super computers , prioritizing a lifecycle approach , clean energy and locally generated electricity. (Agnieszka, 2025)

The AI continent action plan announces a future commissions proposal for a cloud and AI development act that will aim to triple EU data centre processing capacity in the next 57 years .Data centre projects will benefit from simplified permitting and other public support measures ,provided that they meet the requirements related to energy and water efficiency , and circularity .A public consultation on the future act is currently on going and the legislative proposed is expected in Q1 2026. (Agnieszka.Widuto, 2025)

4-Fostering green innovation

These include new or improved environmental friendly products and environmentally beneficial services ,including decreased use of materials per unit production , decrease in total carbon dioxide , low energy use per unit of output , decreased soil,water, air pollution or noise and substitution of resources with alternatives those are less polluting or dangerous ,and recycling of waste , water or materials .(Messaouda, 2022)

Conclusion

Artificial intelligence has emerged as a pivotal force in all areas of life ,offering significant advancements in science ,medecine ,production ,and the optimization of resource and energy use ,there by reducing environmental degradation and achieving sustainability .However the use of AI it self consumes a large amount of energy .Therefore this research paper highlights ,various approaches to

making AI more sustainable by relying on renewable energy during its operation ,which helps reduce emissions .

Moreover ,AI and modern technologies generate electronic waste ,which is known for its severe environmental impact .This study emphasizes the importance of recycling this type of waste and also arrives at the following:

1-AI based frameworks demonstrate potential in improving energy efficiency and reducing environmental impacts .

2-Using alternative energy to reduce emissions and minimize environmental impact .

3-AI provides multiple options to transfer the energy sector and increase energy efficiency.

Recommendations

1-Conduct periodic evaluations of the performance of the smart systems in use ,and improve technologies based on the achieved results.

2-Propose policies to support investment in research and development in green artificial intelligence .

3-Using AI to predict the likelihood of equipment failures in order to reduce energy and resource consumption.

4-Assessing the impact of artificial intelligence ,energy consumption .

5-Relying on alternative energy to power artificial intelligence systems.

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