CHAPTER 10

Assessing the Impact of Artificial Intelligence on Climate Change and Environmental Sustainability

ZHALA ALIYEVA
KAMRAN ABDULLAYEV

ABSTRACT

In recent years, climate change and environmental problems have become some of the most important global issues. At the same time, the rapid development of artificial intelligence (AI) has created new opportunities for environmental protection and sustainable development. The main purpose of this study is to examine the impact of AI on climate change and environmental sustainability. The research is based on a qualitative methodology and uses a comparative analysis of scientific articles, international reports, and recent academic studies. The study assumes that AI can help reduce greenhouse gas emissions and improve the efficient use of resources when applied responsibly. The findings show that AI technologies play an important role in renewable energy integration, climate forecasting, smart agriculture, and environmental monitoring. However, the research also identifies challenges such as high energy and water consumption and the growth of electronic waste. The study concludes that sustainable policies and responsible management are necessary to increase the environmental benefits of AI.

Introduction

In recent years, artificial intelligence (AI) technologies have increasingly influenced global systems, affecting economic, social, and environmental processes. The impact of AI is evident across numerous sectors, including healthcare, education, industry, and manufacturing, where it has contributed to improved productivity and operational efficiency. Its adoption offers tangible benefits such as enhanced decision-making, more effective resource allocation, and reduced operational costs. AI has also gained prominence in addressing climate change and promoting environmental sustainability. As climate risks grow and resources become scarcer, the role of AI in supporting sustainable development becomes more critical. Applications in energy management, waste reduction, and water resource optimization are expanding worldwide, and evidence from international initiatives suggests that properly implemented AI solutions can lower greenhouse gas emissions and improve resource efficiency. For instance, according to Microsoft, and PWC (2019), optimizing energy use through AI technologies has the potential to reduce emissions by around 4%, thereby contributing to sustainable development. AI can further assist by improving renewable energy integration, enhancing weather forecasts, and monitoring emissions, which helps both in managing environmental risks and safeguarding communities[1].

Nonetheless, achieving these benefits requires careful attention to the energy demands of AI systems and the infrastructure supporting them. Proper management is essential to ensure that AI's contributions to sustainability do not inadvertently increase environmental burdens. Challenges include high energy and water consumption of AI systems, electronic waste, and social impacts. A UN Environment report notes that " environmental sustainability must be considered in a context where technology creates both opportunities and risks"[2]. This gap highlights the importance of regulation and strategies for the sustainable and responsible use of AI. The International Energy Agency (IEA) states that AI creates both opportunities and risks. "Data center electricity consumption is expected to increase from approximately 415 TWh -in 2024

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[1] Microsoft, and PWC. 2019. "How AI Can Enable a Sustainable Future: Executive Summary." *News Microsoft*. https://news.microsoft.com/wp-content/uploads/prod/sites/53/2019/04/PwC-Executive-Summary.pdf

[2] UNEP. 2024. "Navigating New Horizons: A Global Foresight Report on Planetary Health and Human Wellbeing." United Nations Environment Programme. https://wedocs.unep.org/handle/20.500.11822/45890

to 945 TWh in 2030, highlighting the key role of AI and the increase in annual data center electricity consumption. At the same time, if existing AI applications are widely adopted, they are projected to reduce energy-related emissions by approximately 1,400 million tonnes of CO_2 by 2035-which could outweigh the increase in data center emissions"[3]. As it turns out, the organization emphasizes that AI creates both strategic opportunities in the fight against climate change and risks that must be carefully managed. At the same time, artificial intelligence also creates some economic and environmental challenges. The use of AI requires a large amount of electricity, which increases production costs and puts pressure on energy systems. Data centers also consume water for cooling, which can create problems in regions with limited water resources. In addition, the increase in electronic waste adds extra costs for recycling and waste management. Another issue is that not all countries and companies have equal access to advanced technologies, which may create inequality in development. Therefore, proper planning and regulation are important to reduce these risks and ensure the efficient use of artificial intelligence.

In today's economic climate, given the integration of the national economy into the global economy, enhancing the competitiveness of individual economic sectors is of paramount importance. It should be noted that, as in other post-soviet countries, economic entities within the national economy, due to the administrative-command system, met the directive targets set by official state economic management structures. At that time, principles of economic self-interest and free and healthy competition between state economic entities were absent. The Soviet Union embraced a Marxist approach to competition, as it did to a number of economic categories. Beginning in the 1990s, after gaining economic independence, the Republic of Azerbaijan began to develop a market economy based on free competition and free market relations. n thought has long featured various approaches to the concept of competition. Three main approaches are considered in the economic literature in this area. According to the first approach, the competitive process is viewed as competition in the marketplace. While the first approach views competition as competition in the marketplace, the second approach views competition as a market element that balances supply and demand, and the third approach views competition as a criterion determining the type of industry market. In general, the competitive process, while an important component of the market mechanism, has different characteristics in different market types. To determine

[3] IEA. 2023. "Energy and AI: AI and climate change." International Energy Agency. https://www.iea.org/reports/energy-and-ai/ai-and-climate-change