



Optimization of Carbon Dioxide Emissions Reduction Using Artificial Intelligence: A Review for Industrial and Electric Vehicle Perspectives

Omnia M. Osama^{1*}, Marwa M. Eid², El-Sayed M. El-Rabaie³

¹Department of Communications and Electronics, Delta Higher Institute of Engineering and Technology, Mansoura, Egypt

²Faculty of Artificial Intelligence, Delta University for Science and Technology, Mansoura 35111, Egypt

³Faculty of Electronic Engineering, Menoufia University, Department of Electronics and Communications, Menouf 32952, Egypt

Emails: Omnia.osama@dhiet.edu.eg; mmm@ieee.org; srabie1@yahoo.com

Abstract

Artificial intelligence systems are revolutionizing how industries reduce carbon dioxide emissions in numerous business fields. This study combines research on how artificial intelligence merges with carbon reduction methods, specifically in industrial procedures and electric vehicle manufacturing, with an environmental sustainability focus. Multiple empirical studies and advanced AI models provide insight into sustainability effects caused by AI systems and emission decrease processes. AI technology performs three essential functions to enhance energy optimization, promote eco-friendly research, and improve environmental prediction accuracy. The identified information provides essential guidance to policymakers and industrial leaders about AI applications for achieving zero emissions and sustainability targets. The review presents evidence that AI technology can redefine sustainability throughout vehicle production while managing transportation and other fields thus helping solve escalating climate issues and drive eco-friendly developments.

Keywords: AI; Carbon emission reduction; Industrial processes; Electric vehicles; Sustainability; Energy efficiency

1. Introduction

One of the genuine tools produced for global challenges is artificial intelligence (AI), which revolutionizes processes in reducing carbon dioxide emissions in various industries. AI structures are, largely, emerging to offer better solutions integrating the value of incorporating and optimizing energy efficiencies, stimulating environmentally friendly innovation, and improving accuracy in predicting emissions as the timeliness of energy generation vis-a-vis climate change gets critical. The review thus looks into the interface between AI and strategies to reduce carbon emissions, especially concerning their application in industrial processes and the production of electric vehicles (EVs). The review comprises empirical studies and advanced AI models analyzing the effects of AI on sustainability while outlining major propositions for emission reduction

mechanisms. The findings will serve as a source of advice for what the policy and industrial leaders can do so that AI may help achieve net-zero emissions and sustainability.

The document extensively reviews artificial intelligence (AI) collaboration with carbon reduction methods with a focus on environmental sustainability outcomes. Due to increasing climate change and environmental deterioration, interests have risen between industries to embrace technological approaches that lower their carbon emissions. AI-powered solutions play a central role within the automotive industry to optimize procedures while enabling electric vehicle (EV) emission reduction as well as energy management and precise carbon emission prediction [1], [2].

The research document demonstrates how AI leads to better energy efficiency with more innovative green practices while making carbon emission measurement more precise. Research conducted in China demonstrates that implementing AI systems follows a pattern where low and high implementation levels emit more carbon than moderate amounts. AI creates higher emissions during its initial period because of its heavy resource usage. However, it minimizes overall emissions through improved energy efficiency, optimized factor market distributions, and industrial format changes during its technological maturity stage. Resource-based cities and highly industrialized areas show strong evidence of this phenomenon whereas it remains weak within non-resource cities and regions with lower industrialization levels [1], [3].

The introduction section defines AI's part as a catalyst for achieving net-zero emissions in manufacturing productions. According to recent studies, researchers have utilized Chinese manufacturing firm data to confirm how artificial intelligence enables digital transformation toward low-carbon development. Emission reductions get boosted by combining green technological innovation with management practices and product development initiatives. The strategic connection proves that AI technology builds clever manufacturing methods to meet environmental sustainability standards.

The work studies sophisticated AI prediction models for vehicle carbon dioxide emissions through deep learning structures that include LSTM and BiLSTM models. The predictive models demonstrate high accuracy levels when they analyze datasets consisting of complete vehicle parameters that include engine characteristics, fuel inefficiency measurements, and fuel options. The study indicates that AI-powered predictive systems can be policy support tools that help administrators establish databased environmental regulations [4].

This introduction explores the manufacturing and transportation sectors' usage of industrial intelligence systems while examining their general effects on business carbon utilization. Implementing industrial intelligence produces better production performance, simultaneously decreasing carbon emissions and total emission levels. The Yangtze River Delta alongside the Pearl River Delta shows more improvement than the Beijing-Tianjin-Hebei areas. Empirical evidence demonstrates that industrial intelligence generates specific results between various sectors and geographical areas [5].

The introduction stresses that sustainable development goals need the integration of pollution control initiatives with carbon reduction frameworks. Integrating AI with climate finance reduces carbon unevenness between nations by transforming how country energy operations and industrial distribution work. The research presents AI-supported energy management systems for EVs and reviews their capability to enhance thermal energy usage and operational performance in various climate conditions [6].

The research proves that artificial intelligence is a powerful tool to advance carbon emission reduction throughout the manufacturing and transportation industries. AI technologies create multiple promising methods to reach international sustainability objectives by helping energy sustainability and building predictive emission forecasting systems. The complete impact of AI depends on overcoming challenges that include the need to resolve regional differences while addressing restrictions on technology along with the requirement to integrate policies. Research should move forward by implementing methods to scale AI applications while improving data precision and developing joint relationships between stakeholders for creating thorough carbon-neutral strategies. Businesses adopting sustainable methods and AI-based solutions help decrease global temperature rise while creating a sustainable environment for future generations.

2. Literature Review

Convergence of AI-carbon-reduction strategies has become a central theme in environmental sustainability. With growing concerns about climate and environmental degradation, industries worldwide are turning to

technology to help reduce their carbon footprints. Within the automotive sector, AI-powered solutions are examined for optimizing operations and reducing emissions in producing electric vehicles (EVs), energy management, and forecasting carbon emissions. This literature review presents various studies indicating how AI can improve energy efficiency, promote green innovation, and ensure higher accuracy in predicting carbon emissions. The findings highlight that AI can transform dimensions of sustainability in various industries, particularly vehicle manufacturing and transportation.

AI is a tool for energy transformation and global promotion of green and low-carbon goals. This study primarily referenced as [7] empirically analyzed the impact of AI on carbon emissions (CE) and its mechanism through an analysis of panel data consisting of 285 prefecture-level cities in China for 2011-2022. The results revealed an "inverted U-shaped" relationship between AI and CE, denoting that AI first increases emissions and then reduces these emissions, a finding that was corroborated by several robustness tests. The study identifies three main channels through which AI affects CE: improving energy efficiency, optimizing the allocation of factor markets, and restructuring industrial composition. The heterogeneity analysis shows that in resource-based cities, low-carbon pilot regions, and highly industrialized areas, the inverted U-shaped dynamic is significant, while in non-resource cities, non-pilot regions, and regions with lower industrialization, it is not.

Carbon dioxide emissions have become a universal phenomenon during the industrial era, and net-zero emissions in manufacturing are essential for combating climate change while offering avenues to sustainable development. The paper marked as [8] presented an examination by Hungarian authors into an artificial intelligence (AI) factor affecting carbon emissions in the manufacturing industry through an analysis of data from Chinese A-share listed manufacturing firms from 2012 until 2021, using a fixed-effects regression model. The paper underlines AI as a principal digital transformation driver toward low-carbon development inside organizations. It shows that such integration of AI technology can significantly reduce carbon emissions. In addition, it realized that green technological innovation, management innovation, and product innovation buffer and amplify the positive effect of AI adoption on emission reduction. This demonstrates the strategic relevance of intelligent manufacturing and would add value theoretically, focusing on AI deployment with environmental sustainability considerations in industrial contexts.

Indeed, burning fossil fuels results in very massive emissions of carbon dioxide (CO₂), which causes alteration in the atmosphere and enables the disturbance of climatic parameters. The paper [9] presented an advanced artificial intelligence technique to develop a predictive modeling framework for vehicle-related CO₂ emissions. The authors built deep learning models based on long short-term memory (LSTM) architecture and bidirectional LSTM (BiLSTM) architectures using a Kaggle dataset containing parameters such as vehicle class, engine size, fuel type, and different metrics for fuel consumption. The authors divided the dataset into two subsets, as training part (80%) and the testing part (20%), and asked for comparison in performance using various metrics such as mean square error (MSE), root MSE (RMSE), Pearson's correlation coefficient (R %), and the coefficient of determination (R²). The performance of the BiLSTM model was found to outperform that of the LSTM model as it achieved maximum predictive accuracy with an R² of 93.78, demonstrating its robustness on CO₂ emissions estimations. Furthermore, correlation analysis was conducted to find the most influencing features concerning emissions. The study thus presented a novel and efficient AI strategy for accurate emission forecasting, helpful in developing a decision-support tool for policymakers toward data-driven environmental regulations.

Herein, the investigation into the influence of industrial intelligence on corporate carbon performance is aided by micro-level data generated from examining 1072 listed manufacturing companies in China's A-share market from 2012 to 2021. As outlined in the analysis undertaken in [10], industrial intelligence brings the combination of AI, IoT, and big data analytics into the world of industry, significantly improving corporate carbon performance as measured through carbon intensity and total emissions. The net effect favors emission reduction, with production efficiency improvements demonstrating superior influence. Moreover, it found that this reduction effect is pronounced in the case of heavy and moderate carbon-intensity sectors, where it is such that a slight increase is observable in low-intensity-reducing sectors. Further regional differences observed included a more significant gain in carbon reduction effects in the Yangtze and Pearl River Delta regions than in the Beijing-Tianjin-Hebei regions. This indicates a differentiated impact of industrial intelligence across sectors and regions, which can be highly beneficial in forming industrial policies directed toward environmental sustainability and strategic corporate planning.

The site notes that the coordinated promotion of the pollution abatement and carbon reduction agenda is intended to build a more beautiful China. As noted here in [11], this study evaluated the members' synergistic effect of industrial intelligent transformation on environmental sustainability with a two-way fixed-effect model using a panel data of 30 Chinese provinces from 2006 to 2020. Industrial robots were employed in enterprises; hence, carbon emissions have been significantly reduced, in addition to concentrations of delicate particulate matter. Thus, it proves the co-benefits of pollution and carbon reduction. The robustness of the findings is confirmed after doing the instrumental variable tests on endogeneity. Mechanisms indicated for this co-synergy are promoted green technology innovation and energy efficiency induced by industrial intelligence. Thus, this is the transformative potential of digital technologies for ecological sustainability and offers empirical support for policies aimed at carbon neutrality about green economic and societal development.

Whether AI technology can help reduce the carbon burden remains a substantial area of research. In [12] the authors have studied AI technology as defined by the number of AI patents and carbon emissions for thirty countries over the period 2005-2020. The empirical findings were that AI indeed reduces carbon emissions, and throughout this research, this finding has remained robust, resisting the pressure of endogeneity and various other robustness checks. Mechanism analysis follows that AI increases energy efficiency leading to reductions in per capita carbon emissions and energy intensity of primary energy sources. AI also reduces carbon emissions through skill-biased and routine-biased technological change. The opportunities of AI for emission reductions due to less stringent governmental regulatory settings represented an important amplification of its effectiveness. Findings also emphasized that AI exercised a more important cloud on carbon-mitigating effects in developing countries behind AI leaders, with lower incomes and higher fossil fuel dependency. Notably, AI in energy management contributed to significant reductions in carbon emissions. These understanding pathways highlight the necessity to promote global innovation and diffusion of AI-related machines to meet international climate change mitigation goals.

This study investigates the potential role of AI in reducing emission disparities between countries, thereby developing a fair and inclusive approach to addressing carbon emissions inequality. The authors of the article [13] used a generalized method of moments (GMM) model to analyze AI's asymmetric effects on carbon inequality with panel data of 74 countries from the year 2000 to 2019. The study concluded a powerful negative causal relationship between AI development and carbon inequality, establishing that AI can be a viable strategic lever in Favor of emission equity. Interestingly, the ability of AI to suppress carbon inequality was accentuated with increasing levels of inequality, thereby demonstrating its effectiveness when applied in the worst-hit areas. In addition, this study elucidates a synergistic effect climate finance has with AI, i.e., climate finance supports AI to reduce emission inequalities further. Mechanism analysis also indicated that AI mitigates carbon inequality through energy and industrial structure changes, which are important channels for mitigating carbon inequality. These findings give significant policy recommendations on how digital innovation and finance can be leveraged for climate action to be equitable and inclusive.

With increasing worldwide proclivity toward environmental protection and sustainable development, the clean transport representative, electric vehicles (EVs), are gradually coming to the limelight. The study in [14] introduces an intelligent energy management system for EVs, utilizing AI algorithms to optimize thermal energy application and operational efficiency. The system uses machine learning and deep learning models to analyze real-time driving data dynamically, thus facilitating adaptive decision-making regarding energy demand forecasting and heat recovery under different working conditions. A thoroughgoing thermal management system that includes vehicle dynamics and environmental inputs further to refine the thermal strategies for batteries and motors is also proposed. Experimental validation showed the adaptability and stability of the system under diverse climatic scenarios with substantial energy savings. These results emphasize the potential of AI-assisted energy management solutions in enhancing electric vehicle operation efficiency and sustainability.

The work in reference [15] examines the intricate and developing relations between AI and electric vehicle (EV) market development using a wavelet-based quantile-on-quantile regression (QQR) method. The analysis assesses the dynamic and asymmetric impacts of AI index (AII) on electric vehicle indicator (EVI) on varying quantile levels and over different time horizons. Their short-term finding reveals that AI positively influences the EV market under low-low and high-high quantile contexts, thus showing a synergistic effect when both sectors are either growing or flat. However, when AII is high with low EVI-and vice versa-cross-quantile adverse impact suggests crowding out by sustained momentum in one discouraging progress in the

other-somewhat due to competition for resources and a pending safety discussion. Furthermore, the mid-to-long-term investigation points to diminishing bidirectionality between AII and EVI, stemming from investor speculation and persisting incompatibility. Therefore, this means that while AI is set up to act as a spillover input for the innovation of EV technology, developing this potential into practical mutual benefit will require bringing in the legal policy architecture, including some strategic frameworks consistent with various timelines in the emergence of technologies.

As outlined in [16], the study introduces an algorithmic framework designed to enhance the precision of carbon emission predictions from individual vehicles by integrating machine learning (ML) and deep learning (DL) methods. Given the growing urgency of environmental sustainability and climate change mitigation, the research addresses limitations in traditional estimation techniques that often lack scalability and adaptability to complex, high-dimensional data. The proposed model effectively captures non-linear dependencies between real-time vehicle data—attributes, driving behaviors, and fuel types—and corresponding emission outputs by employing advanced ML and DL approaches. This integrative method enables the model to learn nuanced emission dynamics, thus improving prediction accuracy. Moreover, the framework is positioned as a vital tool for informing data-driven interventions in the transportation sector, offering actionable insights for reducing the carbon footprint at both individual and systemic levels.

As stated by the authors of reference [17], the automotive industry's transformation towards a zero-carbon ecosystem comprising the entire lifecycle of electric vehicle (EV) production- from raw material sourcing to end-of-life disposal- is warranted. The paper aims to provide an innovative, disruptive framework for zero-carbon vehicle manufacturing through decoupling carbon dioxide emissions from automobile production processes originating from innovative designs or innovative processing and operational technologies. The paradigm in question consists of two core spheres: improved energy efficiency and lower carbon intensity in its utilization. Some of the technological enablers for sustainable manufacturing identified are dynamic and distributed predictive scheduling algorithms, open sensing and visualization systems, and power-aware high-performance computing clusters. Adding to that is the prediction of the digital twin emergence, predictive analytics, and scalable, self-adaptive monitoring frameworks as relevant enablers for a zero-carbon industrial future. Such approaches also support macroeconomic initiatives that separate economic growth from carbon emissions. Finally, this paper calls for collaborative engagement by all the stakeholders involved in the co-development of roadmaps and strategies that will capitalize on the described technology in the transition of automotive manufacturing to carbon neutrality, thus yielding real benefits for the environment and society.

The research summary presented in **Table 1** highlights how artificial intelligence (AI) controls carbon emissions throughout different industries by focusing on manufacturing procedures and electric vehicle (EV) development. The examined research papers establish AI participation in emission reduction through various channels consisting of improved energy efficiency, industrial transformation, and sophisticated predictive systems. AI adoption asymmetrically influences emissions levels through a dual impact that initiates an upward trend before establishing lasting reductions, according to the findings presented in [7] and [8]. Two AI models, namely BiLSTM ([9]) and integrated ML/DL frameworks ([16]), aid transportation sector personnel make more accurate emissions predictions to support evidence-based policy choices. AI applications in industrial intelligence, along with EV energy management system automation ([14]), demonstrate the sustainability optimization ability of technology according to [10] and [11]. Research indicates that resource competition, the requirement for scalable solutions, and the existence of worldwide disparities continue to be essential issues that must be addressed. Research proves that AI technology possesses strong transformative abilities in carbon neutrality achievement yet requires proper policy coordination and intensive sector cooperation between industries.

Table 1: Summary of Literature Review

<i>Reference</i>	<i>Focus Area</i>	<i>Key Findings</i>	<i>Methodology</i>
[7]	Impact of AI on carbon emissions (CE) in Chinese cities	Found an "inverted U-shaped" relationship between AI and CE; AI initially increases emissions but later reduces them through energy efficiency, factor market	Panel data analysis of 285 prefecture-level cities in China (2011-2022).

		optimization, and industrial restructuring.	
[8]	AI's role in low-carbon manufacturing (Chinese firms)	AI significantly reduces carbon emissions in manufacturing, with green innovation (technological, management, product) amplifying this effect.	Fixed-effects regression model using data from Chinese A-share listed firms (2012-2021).
[9]	Predictive modeling for vehicle CO ₂ emissions	BiLSTM models outperformed LSTM in predicting emissions (R ² = 93.78), offering accurate tools for policy decisions.	Deep learning (LSTM/BiLSTM) on the Kaggle dataset (vehicle parameters, fuel consumption).
[10]	Industrial intelligence (AI, IoT, big data) and corporate carbon performance	Industrial intelligence reduces carbon intensity and total emissions, especially in heavy/moderate carbon sectors and regions like the Yangtze/Pearl River Deltas.	Analysis of 1072 Chinese A-share-manufacturing firms (2012-2021).
[11]	Industrial robots and environmental sustainability in China	Industrial robots reduced carbon emissions and particulate matter, driven by green tech innovation and energy efficiency.	Two-way fixed-effect model on panel data from 30 Chinese provinces (2006-2020).
[12]	Global AI patents and carbon emissions	AI reduces emissions via energy efficiency and skill/routine-biased tech changes, with more potent effects in developing countries with high fossil fuel dependency.	The empirical analysis of 30 countries (2005-2020) addresses endogeneity and robustness.
[13]	AI and carbon inequality across nations	AI development reduces carbon inequality, especially in high-inequality regions, synergized by climate finance and structural changes in energy/industry.	Generalized Method of Moments (GMM) on 74 countries (2000-2019).
[14]	AI-driven energy management for electric vehicles (EVs)	AI-optimized thermal energy use and operational efficiency in EVs, validated under diverse climates with significant energy savings.	Machine/deep learning models analyzing real-time driving data.
[15]	AI and EV market dynamics	Short-term synergy between AI and EV growth, but mid-to-long-term challenges due to resource competition; policy frameworks needed for alignment.	Wavelet-based quantile-on-quantile regression (QQR) analyzing AI index and EV indicator.
[16]	ML/DL for vehicle emission prediction	Integrated ML/DL models improved emission prediction accuracy by capturing non-linear	Advanced machine/deep learning frameworks on high-dimensional vehicle data.

[17]	Zero-carbon EV lifecycle (production to disposal)	dependencies in real-time vehicle data. Proposed AI-enabled disruptive technologies (e.g., digital twins, predictive analytics) to decouple emissions from manufacturing, emphasizing stakeholder collaboration.	Conceptual framework and technological roadmap for sustainable automotive manufacturing.
------	---	---	--

Carbon reduction efforts can benefit greatly from AI technologies in many sectors, especially the automotive sector. The reviewed papers indicate that AI applications can provide immense assistance in reducing carbon emissions, enhancing energy efficiency, and optimizing production processes. However, challenges need addressing, such as technology constraints, better veracity in data, and the unwanted effect of possibly creating a crowding-out effect. Future research must concentrate on fine-tuning the application of these AI applications, bringing these applications to scale, and considering their interaction with more comprehensive environmental policies in the future. The complementary relationship between AI innovations and sustainable practices is one of the topics that should be addressed to achieve global carbon reduction goals and eventually lead to a sustainable future.

3. Discussion

Artificial Intelligence represents a revolutionary tool for dealing with global carbon emission problems, demonstrating its most significant impact on industrial facilities and transportation systems. The research shows how AI effectively improves energy efficiency and green innovation capabilities and enhances emission forecasting accuracy. A study of cities throughout China demonstrates that Artificial Intelligence deployment has a pattern of inverse U-shape regarding carbon emissions. At its early stage, AI upgrades carbon emissions but transitions to reduce them substantially because of improved industrial operations and energy optimization strategies. Environmental sustainability benefits require integrating AI technology within sustainability plans because of this evolving relationship [18].

The manufacturing industry heavily depends on AI because it accelerates digital transformation toward low-carbon development. The adoption of AI by Chinese manufacturing companies leads to emission reductions because AI fosters green technological innovation and enables better management practices and product development tactics. Due to these findings, intelligent manufacturing operations gained strategic value because they achieve productivity while supporting environmental sustainability. AI speeds up the creation of green technologies, letting companies reach net-zero emissions targets without sacrificing their competitive business performance worldwide [19].

The dedicated employ of artificial intelligence in predictive modeling demonstrated its capability to calculate the carbon dioxide emissions from various vehicles accurately. Deep learning architectures, including LSTM and BiLSTM, provide accurate results when processing complete datasets that contain vehicle information such as engine specifications, fuel, characteristics, and fuel usage measurement. The predictive models work as decision-making systems that deliver environmental policies supporting official regulation through databased emission trend analysis. The achieved predictive framework success indicates that AI is critical in developing sustainable transportation solutions [20].

Modern businesses have achieved better carbon performance by adopting industrial intelligence systems that blend artificial intelligence technology with the Internet of Things and enormous data analysis capabilities. Various studies demonstrate that industrial intelligence increases efficiency and decreases carbon emissions intensity and total emissions released during production. The enhancement rate in carbon management shows that advancements that are more considerable occur in the Yangtze and Pearl River Delta regions compared to the Beijing-Tianjin-Hebei regions during the observation period. The evidence demonstrates why organizations need customized strategies that resolve regional and sector-based obstacles to achieve optimal carbon reduction through industrial intelligence applications [21].

Reducing international carbon inequality becomes more powerful thanks to the combination of AI technology and climate finance initiatives. Research confirms how AI technology decreases emissions between regions because it changes energy systems and industrial structures, particularly in developing countries that use more fossil fuels. The collaborative force between AI and climate finance demonstrates why organizations must unite toward achieving fair climate solutions. Public officials should use financial approaches alongside digital innovations to solve sustainability challenges worldwide [22].

The evaluated research shows artificial intelligence can help carbon reduction yet its future success depends on solving technology limitations and coordinating between policy areas and regions worldwide. Additional research should concentrate on implementing large-scale AI systems while improving technical data accuracy and developing joint efforts among stakeholders to create complete carbon-neutral plans. Industrial organizations can establish a sustainable future through AI and sustainable practices that will help them combat climate change for future generations [23].

4. Conclusion

The analyzed study confirms that artificial intelligence functions powerfully to decrease carbon emissions throughout manufacturing sectors along with transportation systems. AI technologies provide extensive opportunities to pursue global sustainability goals because they deliver power sustainability features and predictive emission modeling capabilities. The ability of AI makes it an essential tool that industries need to achieve their environmental impact reduction goals.

The complete realization of AI's potential to fight climate change demands the resolution of multiple vital obstacles. Implementing AI requires three main strategies: closing gaps between different regions, solving technological limitations, and establishing effective policy integrations. The sustainable use of AI depends on addressing these primary challenges because they determine its capacity to offer equal and efficient benefits no matter the situation.

Future investigations should concentrate on enlarging AI systems for wider application reach, and they need to boost the accuracy of AI model input data. Better data precision and more expansive application fields will result in improved carbon emission control and better reliability for sustainability programs that use Artificial Intelligence. Further development depends on continuous spending for data systems and AI exploration initiatives.

Strategic development toward carbon neutrality demands stakeholders to join forces between researchers, policymakers, and industry leaders. Company partnerships will enable the successful creation and deployment of AI-based solutions to support universal sustainable practice implementation. A cooperative method between stakeholders becomes vital to achieve major cuts in worldwide carbon emissions.

The reduction of global temperature rise requires businesses to unite sustainable practices by implementing AI-based solutions. Attractive outcomes result when AI technologies connect with existing sustainable practices because this produces stronger environmental conservation methodologies. Company success in reaching sustainable targets depends on implementing this merged approach.

Monoglossic businesses succeed in reducing temperature rise through their implementation of sustainable practices with AI-based systems, which create sustainable conditions for future generations. All people require a greener, environmentally responsible future that will be achieved through the proactive deployment of AI technologies and sustainable practices. The sustainability pledge protects Earth to ensure its safety for future generations.

References

- [1] G. M. I. Alam et al., "Deep learning model based prediction of vehicle CO2 emissions with eXplainable AI integration for sustainable environment," *Sci Rep*, vol. 15, no. 1, p. 3655, Dec. 2025, doi: 10.1038/S41598-025-87233-Y.
- [2] "Why more AI firms should invest in carbon removal solutions | World Economic Forum." Accessed: Apr. 05, 2025. [Online]. Available: https://www.weforum.org/stories/2025/02/ai-s-energy-problem-why-carbon-removal-can-t-wait/?utm_source=chatgpt.com.

- [3] X. Niu, C. Lin, S. He, and Y. Yang, "Artificial intelligence and enterprise pollution emissions: From the perspective of energy transition," *Energy Econ*, vol. 144, p. 108349, Apr. 2025, doi: 10.1016/J.ENERCO.2025.108349.
- [4] L. Chen et al., "Artificial intelligence-based solutions for climate change: a review," *Environ Chem Lett*, vol. 21, no. 5, pp. 2525–2557, Oct. 2023, doi: 10.1007/S10311-023-01617-Y.
- [5] A. H. Al-Nefae and T. H. H. Aldhyani, "Predicting CO2 emissions from traffic vehicles using a hybrid machine learning approach," *J. Clean Prod.*, vol. 340, p. 130645, Jan. 2022, doi: 10.1016/j.jclepro.2021.130645.
- [6] A. S. Devi et al., "Internet-of-Vehicles Network for CO2 Emission Estimation and Reinforcement Learning-Based Emission Reduction," *IEEE Access*, vol. 12, pp. 20345–20356, 2024, doi: 10.1109/ACCESS.2024.3441949.
- [7] J. Liu, H. Shen, J. Chen, X. Jiang, and A. W. Siyal, "Artificial Intelligence and Carbon Emissions: Mediating Role of Energy Efficiency, Factor Market Allocation and Industrial Structure," *Energies*, vol. 18, no. 5, p. 1102, Feb. 2025, doi: 10.3390/EN18051102.
- [8] W. Liu, C.-H. Wu, Y. Chen, and S. Jin, "Artificial Intelligence and Carbon Emissions in Manufacturing Firms: The Moderating Role of Green Innovation," *Processes*, vol. 11, no. 9, p. 2705, Sep. 2023, doi: 10.3390/PR11092705.
- [9] T. Mi and T. Li, "Industrial Intelligence and Carbon Emission Reduction: Evidence from China's Manufacturing Industry," *Sustainability*, vol. 16, no. 15, p. 6573, Jul. 2024, doi: 10.3390/SU16156573.
- [10] Q. Cao, C. Chi, and J. Shan, "Can artificial intelligence technology reduce carbon emissions? A global perspective," *Energy Econ*, vol. 143, p. 108285, Mar. 2025, doi: 10.1016/J.ENERCO.2025.108285.
- [11] C. Zhao, Y. Li, Z. Liu, and X. Ma, "Artificial intelligence and carbon emissions inequality: Evidence from industrial robot application," *J. Clean Prod.*, vol. 438, p. 140817, Jan. 2024, doi: 10.1016/J.JCLEPRO.2024.140817.
- [12] Y. Wang, "Intelligent energy management and operation efficiency of electric vehicles based on artificial intelligence algorithms and thermal energy optimization," *Thermal Science and Engineering Progress*, vol. 55, p. 102900, Oct. 2024, doi: 10.1016/J.TSEP.2024.102900.
- [13] J. Gu, Z. Wu, Y. Song, and A. C. Nicolescu, "A win-win relationship? New evidence on artificial intelligence and new energy vehicles," *Energy Econ*, vol. 134, p. 107613, Jun. 2024, doi: 10.1016/J.ENERCO.2024.107613.
- [14] S. Greene, H. Jia, and G. Rubio-Domingo, "Well-to-tank carbon emissions from crude oil maritime transportation," *Transp Res D Transp Environ*, vol. 88, Nov. 2020, doi: 10.1016/J.TRD.2020.102587.
- [15] S. Syed, "Zero Carbon Manufacturing in the Automotive Industry: Integrating Predictive Analytics to Achieve Sustainable Production," *Journal of Artificial Intelligence and Big Data*, vol. 3, no. 1, pp. 17–28, Nov. 2023, doi: 10.31586/JAIBD.2023.1179.
- [16] H. Lv, B. Shi, N. Li, and R. Kang, "Intelligent Manufacturing and Carbon Emissions Reduction: Evidence from the Use of Industrial Robots in China," *Int. J. Environ. Res. Public Health*, vol. 19, no. 23, p. 15538, Nov. 2022, doi: 10.3390/IJERPH192315538.
- [17] T. Ding, J. Li, X. Shi, X. Li, and Y. Chen, "Is artificial intelligence associated with carbon emissions reduction? Case of China," *Resources Policy*, vol. 85, p. 103892, Aug. 2023, doi: 10.1016/J.RESOURPOL.2023.103892.
- [18] H. Xu, Z. Cao, and D. Han, "Towards Sustainable Development: Can Industrial Intelligence Promote Carbon Emission Reduction," *Sustainability*, vol. 17, no. 1, p. 370, Jan. 2025, doi: 10.3390/SU17010370.

- [19] A. H. Al-Nefaie and T. H. H. Aldhyani, "Predicting CO2 Emissions from Traffic Vehicles for Sustainable and Smart Environment Using a Deep Learning Model," *Sustainability* 2023, vol. 15, p. 7615, May 2023, doi: 10.3390/SU15097615.
- [20] T. Mi and T. Li, "Industrial Intelligence and Carbon Emission Reduction: Evidence from China's Manufacturing Industry," *Sustainability*, vol. 16, no. 15, p. 6573, Jul. 2024, doi: 10.3390/SU16156573.
- [21] H. Lv, B. Shi, N. Li, and R. Kang, "Intelligent Manufacturing and Carbon Emissions Reduction: Evidence from the Use of Industrial Robots in China," *Int. J. Environ. Res. Public Health*, vol. 19, no. 23, p. 15538, Nov. 2022, doi: 10.3390/IJERPH192315538.
- [22] J. Liu, H. Shen, J. Chen, X. Jiang, and A. W. Siyal, "Artificial Intelligence and Carbon Emissions: Mediating Role of Energy Efficiency, Factor Market Allocation and Industrial Structure," *Energies*, vol. 18, no. 5, p. 1102, Feb. 2025, doi: 10.3390/EN18051102.
- [23] C. Zhao, Y. Li, Z. Liu, and X. Ma, "Artificial intelligence and carbon emissions inequality: Evidence from industrial robot application," *J. Clean Prod.*, vol. 438, p. 140817, Jan. 2024, doi: 10.1016/J.JCLEPRO.2024.140817.