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THE ROLE OF AI AND BIG DATA IN DECARBONIZATION: ACCELERATING THE PATH TO NET-ZERO

Dr. Srinivasa Krishna Prasad Buravelli[1]
[1]Vice President - Sales, Business Unit Head, Onward Technolgies Inc., Atlanta, Georgia, USA, ORCID: https://orcid.org/0009-0002-1337-1890
Email Id: krishnaprasadbs@gmail.com

Venkata Narasimha Chandra Sekhar Repaka[2]
[2]Engineering Specialist, Satyam Venture Engineering Services, Detroit, Michigan, USA
ORCID: https://orcid.org/0009-0004-6635-4976
Email Id: rvncsekhar@gmail.com

ABSTRACT
This study examines how Artificial Intelligence (AI) and Big Data drive worldwide decarbonization through speeded efforts towards achieving zero net emissions. This research combines academic and industry literature to discover major AI and Big Data applications in energy and agriculture and transport and urban development sectors yet it emphasizes the obstacles of data governance and digital inclusion and ethical AI utilization. The paper uses secondary qualitative research and thematic analysis to deliver essential findings about responsible technology scale-up. The research supports the development of climate action strategies which combine data-driven analysis with social equity principles.
Keywords: *Artificial Intelligence, Big Data, Decarbonization, Net-Zero, Climate Change, Smart Cities, Carbon Emissions, Digital Innovation, Energy Efficiency, Environmental Sustainability, Climate Policy, Data Governance.*

INTRODUCTION
Climate change stands as the crucial challenge of our contemporary age since it produces extensive effects across ecosystems and economies as well as societies. Global initiatives now focus on reaching the mid-century goal of eliminating total carbon emissions from the atmosphere. Through the Paris Agreement from 2015 countries received guidance to minimize temperature increases to below 2°C with 1.5°C being the preferred level compared to pre-industrial times. The transition toward a low-carbon or decarbonized economy stands as an absolute necessity for achieving the predetermined goals. The essential transformation requires deep structural changes to occur in energy systems as well as transportation and agriculture and manufacturing sectors because they produce the highest greenhouse gas emissions (Alatalo et al., 2025).

The global decarbonization initiative has found crucial support through the development of emerging technologies. Artificial Intelligence (AI) and Big Data Analytics demonstrate exceptional capability to transform our current methods of measuring and managing and reducing emissions. The technologies optimize energy usage while forecasting renewable energy output and identifying industrial system deficiencies and enable data-based policy decisions. Real-time decision automation becomes possible through AI models alongside Big Data which extracts detailed information from extensive amounts of structured and unstructured environmental data (Duan and Kim, 2023). These tools continue to advance and governments along with corporations use them to develop their climate strategies.

The practical deployment of AI and Big Data technologies in decarbonization efforts shows limited progress because researchers have not extensively explored their potential applications. Numerous climate action frameworks use traditional methods of emission tracking and mitigation even though these methods produce delays and inaccurate results and operate inefficiently. The adoption of new technology meets obstacles because of limited data access and difficulties with data sharing as well as ethical constraints and governance requirements (Jouzdani et al., 2025). The mismatch between AI and Big Data implementation and policy development creates barriers to their widespread use for climate action particularly in areas with minimal technology infrastructure and low digital preparedness. The main issue this review examines is the insufficient research on current AI and Big Data applications for decarbonization and their potential for better implementation. An academic review needs to assess the complete role of isolated initiatives and pilot projects from different sectors regarding decarbonization impact and future potential. The global community stands to waste the potential of powerful technological assets to speed up the move toward net-zero unless it gains essential insights.

This study takes on importance because the climate crisis requires intensified collaborative approaches between different fields of expertise. The world faces an essential need to unite technological progress with environmental regulations because nations and companies are setting science-based targets and Sustainable Development Goals (SDGs). This review uses a qualitative secondary approach to examine existing literature and create a structured thematic understanding which demonstrates how AI and Big Data influence decarbonization routes. The research examines both the motivational factors behind and advantages and constraints and barriers of implementing these technologies toward carbon neutrality goals. The research provides essential insights to stakeholders such as policymakers and industry leaders along with environmental advocates and researchers concerning best practices and emerging trends for strategic implementation of future adoption (Komninos, 2022).

This paper establishes that digital innovation needs to be integrated with climate justice initiatives and fair development practices. AI and Big Data applications need to demonstrate both effectiveness and ethical standards as well as inclusivity. The increasing urgency of decarbonization demands that technology advances deliver substantial sustainability benefits while preventing any worsening of social or ecological imbalances.

This assessment aims to shed light on the essential yet inadequately researched function of AI and Big Data systems for decarbonization progress. This review uses academic and industrial and policy-based literature to create a comprehensive understanding of the current situation while emphasizing key findings and outlining research paths for future implementation. The approach enables more data-centered development of innovative solutions that lead to actionable progress toward net-zero.

Aim and Objectives

Aim:

To critically examine the role of Artificial Intelligence (AI) and Big Data in supporting global decarbonization efforts and accelerating the transition toward net-zero emissions through a synthesis of existing academic and industry literature.

Objectives:

1. To explore and analyze how AI and Big Data technologies are currently applied across key sectors (e.g., energy, transport, manufacturing) to monitor, reduce, or manage carbon emissions.
2. To identify the key opportunities, challenges, and policy considerations associated with scaling AI and Big Data solutions for decarbonization at national and global levels.

LITERATURE REVIEW

The global push for net-zero carbon emissions has accelerated worldwide adoption of sophisticated digital technologies in climate strategies. The pursuit of decarbonization has witnessed Artificial Intelligence (AI) and Big Data analytics emerge as fundamental digital tools. This literature review combines academic and industry research to assess how AI and Big Data will contribute to net-zero goal achievement while following the established research objectives. The development of sustainable and resilient urban spaces requires the essential merging of Geographic Information Systems (GIS) with Building Information Modelling (BIM) and Remote Sensing along with Artificial Intelligence according to Li et al. (2024). Real-time carbon emission tracking and infrastructure performance assessment through these technologies proves essential for managing rapid urbanization in carbon footprint management. Duan and Kim (2023) established a knowledge framework that explains the path cities should follow to achieve net-zero status through digital integration systems. Krishna Prasad Buravelli, S. (2024) review establishes three AI-based groups for planning and monitoring and forecasting activities which demonstrate the staged benefits of digital intelligence for urban decarbonization.

The implementation of smart net-zero cities requires a comprehensive digital transformation system according to Jouzdani et al. (2025). The authors discovered digital twin simulations and sensor arrays and machine learning programs form the core of urban energy optimization. The authors demonstrated how AI systems manage energy distribution automatically through real-time data collection of demands and environmental elements which affects GHG emission levels. The connected intelligence frameworks of Net Zero Energy Districts were defined by Komninos (2022) to achieve neutral energy operations at the community level through coordinated energy generation and storage and consumption.

Glavič et al. (2023) presented a complete picture of how chemical and process industries can achieve net-zero emissions through their research in the industrial sector. The authors emphasized that AI-powered process optimization along with predictive maintenance combined with lifecycle carbon assessment provides essential methods for lowering emissions without affecting operational efficiency. The authors suggested that all industries should adopt digital sustainability indicators supported by AI analytics to enhance carbon mitigation accountability and traceability across the industry.

The agricultural sector is undergoing significant transformation through the application of AI and Big Data technologies to obtain climate-smart practices. Neethirajan (2024) studied dairy farming that has reached net-zero through the implementation of AI sensors and precision agriculture instruments which enable real-time observation of animal wellness alongside methane outputs and soil carbon storage rates. The research findings showed that AI technology provides dual benefits for maximizing production output while protecting the environment.

Mondal et al. (2024) investigated AI's economic value for emerging markets through their application of PLS-SEM and fsQCA research methods. The research showed that accessible scalable AI tools with policy backing create a synergy between digital inclusion and climate resilience. The authors demonstrated how AI functions to link different technological systems while developing adaptive capabilities and predictive disaster response methods that lead to decarbonization.

The research conducted by Mohamed et al. (2024) examined the ways digital technologies improve environmental management decision-making processes. AI applications powered by Natural Language Processing (NLP) and deep learning help organizations execute environmental impact assessments while smart permitting systems and real-time emissions monitoring are also possible. Decision-making through these functions becomes essential for regulatory purposes that need both time-sensitive and evidence-based decisions to implement carbon policies. The authors of Norbu et al. (2024) demonstrated how Cyber-Physical Energy Systems (CPES) serve to produce customized decarbonization solutions for multiple communities. CPES achieves dynamic load balancing and renewable energy optimization and low-carbon energy flow prioritization through its combination of AI technology with IoT systems and grid data analytics and user behavior analysis capabilities. AI enhances energy justice and local net-zero strategies through its capabilities.

The research conducted by Alatalo et al. (2025) concentrated on the energy sector through a scoping review. The research found that AI successfully operates in predicting wind conditions and forecasting solar energy generation while optimizing energy storage capabilities. Energy grids that implement reinforcement learning methods achieve better reliability and fast reaction times which supports sustainable energy usage.

The maritime shipping industry which produces substantial GHG emissions has undergone digital transformation. The authors Anantharaman et al. (2025) conducted a bibliometric analysis which revealed the applications of AI technologies for fuel efficiency enhancement and routing optimization as well as mechanical failure prediction. The industry needs these advancements to achieve compliance with International Maritime Organization (IMO) targets for carbon neutrality.

Shaddick et al. (2025) examined both possibilities and barriers that exist when using data science and AI for sustainability purposes. Standardized data formats together with ethical AI and inclusive AI tool access emerged as essential priorities according to their perspective. The review notes Global South data deserts pose sustainability challenges because they create data inequality unless specific initiatives are launched to distribute data resources and establish AI capabilities locally.

The study by Jin and Bae (2023) analyzed Zero-Energy Building (ZEB) applications through AI trend analysis to demonstrate how machine learning supports energy modeling and fault detection in addition to adaptive HVAC systems. The implemented interventions work toward net-zero targets through improved building performance and the development of energy-positive architectural solutions. Multiple studies prove that AI technology and Big Data systems create fundamental infrastructure needed to reduce carbon emissions throughout different industries. Their usage spans from detailed measurement systems to strategic planning at high levels which results in better climate intervention efficiency and accuracy. Multiple authors highlight substantial barriers in AI adoption related to data interoperability problems and privacy risks together with high initial expenses and a lack of skilled professionals who can deploy AI systems.

Li et al. (2024) advocated for joint sector involvement together with standard digital procedures to break through data silos. Neethirajan (2024) emphasized that AI solutions for agriculture show promise yet adoption barriers such as digital illiteracy and financial constraints persist at high levels. The authors Mohamed et al. (2024) stressed that inadequate governance systems could let AI systems perpetuate current biases while showing incorrect environmental priority representations.

The analyzed research delivers an extensive and developing understanding of how AI and Big Data technologies can serve net-zero objectives. Both research objectives are supported by the reviewed studies because they showcase present-day emission monitoring practices alongside future development opportunities for large-scale implementation. The examined insights will guide the thematic analysis sections of this paper to help develop practical policy solutions for speeding up digital decarbonization processes.

METHODOLOGY

This research adopts secondary qualitative methods to study AI and Big Data roles in decarbonization while following the conceptual framework of the review paper. The researcher uses secondary methodology to study the diverse and dynamic nature of climate action technologies because it allows access to extensive academic literature and official reports and whitepapers from industry which enables synthesis of key insights and identification of thematic patterns to build a complete understanding of AI and Big Data's role in net-zero strategies.

This study adopts an interpretivist research philosophy. Interpretivism as a research philosophy focuses on how people subjectively interpret complex technological and social phenomena. Through interpretive research principles the investigator can analyze different viewpoints regarding AI and Big Data applications and their effects on sustainability and decarbonization within this study's framework. Interpretivism approaches provide better results for qualitative research since they analyze contextual meanings and conceptual depth rather than using quantifiable variables like positivist methodologies.

The approach taken is inductive. The study establishes generalized knowledge through the analysis of patterns and observations that emerge from reviewed literature instead of testing pre-established hypotheses. Inductive reasoning proves fundamental for exploratory research studies especially when examining digital decarbonization since its practices and tools and outcomes remain unstable. The analysis of research on AI and Big Data sectoral applications in agriculture and energy alongside construction and transportation enables the identification of foundational themes that describe their capabilities as well as constraints.

The research framework consists of a narrative literature review design. The narrative research approach suits complex interdisciplinary subjects because it enables researchers to unite multiple data types with multiple perspectives into one unified story. This review extracted its literature from peer-reviewed journals including Sustainability, Processes, Climate, Applied Sciences and proceedings IET Powering Net Zero (PNZ 2024) within the timeframe of 2022 to 2025. The research utilized specifically chosen sources to obtain recent findings pertinent to the study context.

The research used four digital platforms namely Scopus, ScienceDirect, Google Scholar, and SpringerLink for gathering data. The research utilized specific keywords including "AI in decarbonization" and "Big Data for net-zero" together with "AI and carbon neutrality" and "digital sustainability" for identifying the most pertinent articles. The research included only English-language studies which were published during the last five years for maintaining their contemporary value. The research included grey literature such as international agency policy reports and relevant conference proceedings to integrate applied perspectives.

The research relied on thematic analysis for its data analysis procedure. The thematic analysis technique serves qualitative researchers to discover and explain recurring data patterns that emerge from their studies. The research used Braun and Clarke's six-phase framework for thematic analysis which included data familiarization and coding followed by theme generation and review and theme definition before writing up. The researchers applied initial code labels to literature segments that discussed particular applications like energy forecasting and emissions monitoring and challenges such as data access restrictions and ethical AI concerns and positive outcomes including improved efficiency and decreased carbon emissions. The researchers grouped these initial codes into larger themes which matched their research goals. The research used triangulation methods to establish validity through multiple source and sector comparisons. The approach served to confirm that reported advantages and obstacles related to AI and Big Data applications in decarbonization matched one another. The selection process together with inclusion criteria and thematic coding maintain transparent findings that researchers can easily replicate. The main ethical concerns in data utilization revolve around maintaining responsible conduct of secondary information. This study uses publicly accessible sources which receive proper documentation for each entry. Since no human participants took part in the research it does not require a formal ethical review. Academic integrity standards were followed by the researcher who maintained fair representation of both arguments and findings from authors.

The selected research method enables a thorough investigation of AI and Big Data potential for decarbonization. The combination of interpretivist philosophy with an inductive approach along with narrative design and thematic analysis allows the paper to synthesize global literature insights effectively for its findings and discussion section.

RESULTS AND DISCUSSION

Various sectors benefit from Artificial Intelligence (AI) and Big Data applications through themes which emerged from the analyzed literature review. Real-Time Monitoring and Predictive Analytics along with Sector-Specific Applications and Use Cases comprise the first and second main themes while Digital Inclusion and Policy Integration and Challenges and Barriers to Implementation complete the analysis.

Real-time monitoring and predictive analytics represent the initial major theme where AI and Big Data work together. Multiple research studies such as Li et al. (2024) and Duan and Kim

(2023) and Jouzdani et al. (2025) demonstrate how smart monitoring platforms transform our capacity to track and predict carbon emission levels. Stakeholders benefit from AI algorithms and GIS and remote sensing technologies which provide frequent detailed data for quick identification of carbon-intensive operations. The combination of predictive models that use machine learning technology allows organizations to create scenario plans for risk assessment and optimize resource distribution for minimized environmental impact.

The second theme demonstrates applications that focus on particular industrial sectors. Neethirajan (2024) explored how artificial intelligence sensors together with data analytical tools minimize methane emissions while optimizing resource usage within dairy farming operations. Alatalo et al. (2025) demonstrated that reinforcement learning models can improve power grid stability and maximize renewable energy integration in energy systems. AI applications in the industrial sector include predictive maintenance and process control together with emissions tracking according to Glavič et al. (2023). Urban cities require digital twins and smart infrastructure according to Komninos (2022) and Jin and Bae (2023) to reach net-zero energy buildings and districts. The mentioned use cases illustrate how AI and Big Data technology unite different sectors to achieve decarbonization goals.

Digital inclusion and policy integration form the third essential theme of this study. According to Mondal et al. (2024) emerging economies need accessible AI tools for improving their climate resilience capabilities. The research demonstrates that digital strategies which include all stakeholders become necessary to allow AI technologies drive decarbonization processes in underdeveloped regions. Mohamed et al. (2024) presented evidence about the increasing necessity of incorporating digital technology into environmental policy structures. The modernization of governance for decarbonization includes AI-permitted systems alongside AI-based regulatory compliance monitoring and environmental impact assessment tools.

The fourth category assesses the implementation obstacles and challenges. Shaddick et al. (2025) together with Norbu et al. (2024) presented findings on the interoperability issues and privacy risks along with ethical considerations related to AI implementation. The implementation of AI faces three major obstacles which are the non-uniformity of data protocols and the risk of model bias alongside restricted infrastructure access and training opportunities for less-developed areas. Financial limitations in agricultural sectors together with urban planning projects prevent the widespread implementation of new technologies.

Research findings demonstrate that AI together with Big Data technologies play a substantial role in leading the way toward decarbonization through multiple interconnected methods. The wide range of applications demonstrates their effectiveness for energy and agricultural systems and urban planning and industrial operations. These technologies will succeed only when wide access is provided alongside strong governance structures and solutions that remove existing systemic barriers. The following chapter uses these identified themes as foundations to explore extensive strategic directions along with potential solutions and their related implications.

The research examined AI and Big Data's contribution to decarbonization through analysis of sectoral implementations and their resulting obstacles. The study findings confirm the research goals because they illustrate how these technologies continue to grow in climate action importance but reveal challenges in their large-scale implementation.

This study investigated the implementation of AI and Big Data technologies throughout major sectors which enable carbon emission management. The review established a wide spectrum of implementations showing these technologies serve as essential elements for improving operational efficiency and real-time decision-making in energy, agriculture, transport, construction and urban planning sectors. The combination of GIS, AI and BIM tools for urban construction carbon monitoring enables resilient city development as described by Li et al. (2024). Neethirajan (2024) showed that dairy farming achieves methane reduction through AI systems which use predictive livestock management and feed optimization. The successful implementation of AI and data analytics within specific industries proves these technologies serve as crucial tools for making operational activities comply with decarbonization objectives.
The presentation highlighted AI's dual functions in energy systems by showing its value for demand forecasting and grid optimization tasks. Alatalo et al. (2025) demonstrated how machine learning models help decrease emissions by optimizing smart energy distribution systems and Norbu et al. (2024) explained the implementation of AI in cyber-physical systems for community-based energy solutions. AI and Big Data have transitioned from being supporting tools into essential elements that drive fundamental infrastructure and service redesign.

The analysis focused on systemic barriers and opportunities and policy implications as part of the second research objective. The recurring problem that emerged during the discussions was related to data fragmentation and quality issues. The variation of carbon data between cities makes smart city decarbonization frameworks less effective according to Duan and Kim (2023). Jouzdani et al. (2025) documented that developing nations face digital immaturity which creates obstacles preventing AI from being used in climate policy.

The predictive capabilities and optimization benefits of AI exist alongside continuous ethical problems and governance challenges. The overuse of AI without clear transparency systems risks destroying public confidence especially when monitoring cities or managing personal energy consumption according to Shaddick et al. (2025). The analysis demonstrates the necessity for developing strong digital governance systems that unite AI applications with climate justice and equitable development standards.

The expensive and energy-intensive process of training AI models creates a paradox because it may work against climate targets if not addressed properly. Jin and Bae (2023) in their examination of AI in Zero Energy Buildings agree with the necessity for green AI solutions along with energy-efficient algorithmic development.

CONCLUSION AND RECOMMENDATIONS

The review investigates how Artificial Intelligence (AI) and Big Data contribute to worldwide decarbonization initiatives through various dimensions. Digital technologies from academic and industrial and policy-based sources demonstrate how they transform conventional emissions reduction methods in the energy sector as well as agriculture and manufacturing and urban development sectors. The research results prove that AI and Big Data operate as crucial elements for implementing net-zero targets.

AI brings effective real-time surveillance together with automated choices and resource management optimization which gives a strategic advantage in carbon neutrality efforts. Multiple examples show how energy grid forecasting together with low-carbon agriculture and smart city infrastructure achieve measurable operational efficiency and emissions control benefits. Big Data helps policymakers and businesses gain system-wide environmental understanding through its ability to combine multiple environmental data sources for evidence-based decision making. The combination of these tools delivers exact climate strategies to help both developed and developing regions achieve better adaptation and mitigation results.

The review uncovered essential obstacles which need to be solved. The adoption of AI for sustainability faces obstacles such as disorganized data systems and weak computer abilities in developing countries and expensive deployments and unclear rules for ethical AI applications. AI and Big Data benefits will be distributed inequitably if no specific intervention measures are implemented leading to further marginalization of populations exposed to climate risks. Furthermore, concerns about the carbon footprint of large-scale AI model training call for the development of energy-efficient and "green AI" solutions.

Based on the insights gathered, several recommendations can be made to enhance the impact and accessibility of AI and Big Data in decarbonization:

1. **Invest in Digital Infrastructure and Capacity Building** Governments and international bodies must prioritize digital infrastructure development, particularly in low-income and climate-vulnerable regions. This includes not only hardware and connectivity but also the training of local talent in AI, data science, and climate informatics.
2. **Promote Open and Interoperable Data Ecosystems** Standardizing environmental data formats and fostering open-access platforms will facilitate cross-sectoral collaboration and knowledge transfer. Policymakers should support initiatives that encourage transparent data sharing between public and private entities.
3. **Develop Ethical Guidelines for AI in Climate Governance** Regulatory frameworks must be established to ensure AI tools are used responsibly, particularly where they intersect with personal data, surveillance, or resource allocation. These guidelines should be rooted in the principles of transparency, accountability, and inclusivity.
4. **Support Green AI Research and Innovation** Funding should be directed toward the development of low-energy AI algorithms, such as federated learning or edge AI, that reduce the environmental cost of computation. This is vital to ensuring that the tools used to fight climate change do not become contributors to it.
5. **Integrate AI and Big Data in Nationally Determined Contributions (NDCs)** As countries revise their NDCs under the Paris Agreement, there is a clear opportunity to institutionalize the role of digital technologies in emissions accounting, monitoring, and reporting mechanisms.

In conclusion, AI and Big Data hold immense potential to accelerate progress toward net-zero goals. By proactively addressing the challenges of digital inequality, ethical risk, and energy consumption, stakeholders can ensure that these tools are applied in ways that are effective, just, and sustainable.

REFERENCES

1. Alatalo, J., Heilimo, E., Rantonen, M., Väänänen, O. and Sipola, T., 2025. Reducing Emissions Using Artificial Intelligence in the Energy Sector: A Scoping Review. *Applied Sciences*, *15*(2), p.999.
2. Anantharaman, M., Sardar, A. and Islam, R., 2025. Decarbonization of Shipping and Progressing Towards Reducing Greenhouse Gas Emissions to Net Zero: A Bibliometric Analysis. *Sustainability*, *17*(7), p.2936.
3. Duan, Z. and Kim, S., 2023. Progress in research on net-zero-carbon cities: a literature review and knowledge framework. *Energies*, *16*(17), p.6279.
4. Glavič, P., Pintarič, Z.N., Levičnik, H., Dragojlović, V. and Bogataj, M., 2023. Transitioning towards net-zero emissions in chemical and process industries: a holistic perspective. *Processes*, *11*(9), p.2647.
5. Jin, B. and Bae, Y., 2023. Prospective research trend analysis on zero-energy building (ZEB): An artificial intelligence approach. *Sustainability*, *15*(18), p.13577.
6. Jouzdani, F.M., Javidroozi, V., Shah, H. and Mateo Garcia, M., 2025. A Systemic Digital Transformation for Smart Net-Zero Cities: A State-of-the-Art Review. *J*, *8*(1), p.11.
7. Komninos, N., 2022. Net zero energy districts: connected intelligence for carbon-neutral cities. *Land*, *11*(2), p.210.
8. Krishna Prasad Buravelli, S. (2024). Analyzing Skill Development in the Context of Automotive Digital Transformation. *Global Journal of Business and Integral Security*. Retrieved from https://gbis.ch/index.php/gbis/article/view/479
9. Li, J., Shirowzhan, S., Pignatta, G. and Sepasgozar, S.M., 2024. Data-Driven Net-Zero Carbon Monitoring: Applications of Geographic Information Systems, Building Information Modelling, Remote Sensing, and Artificial Intelligence for Sustainable and Resilient Cities. *Sustainability*, *16*(15), p.6285.
10. Mohamed, A.M.O., Mohamed, D., Fayad, A. and Al Nahyan, M.T., 2024. Enhancing decision making and decarbonation in environmental management: a review on the role of digital technologies. *Sustainability*, *16*(16), p.7156.
11. Mondal, S., Das, S. and Vrana, V.G., 2024. Exploring the Role of Artificial Intelligence in Achieving a Net Zero Carbon Economy in Emerging Economies: A Combination of PLS-SEM and fsQCA Approaches to Digital Inclusion and Climate Resilience. *Sustainability*, *16*(23), p.10299.
12. Neethirajan, S., 2024. Net zero dairy farming—advancing climate goals with big data and artificial intelligence. *Climate*, *12*(2), p.15.
13. Neethirajan, S., 2024. Net zero dairy farming—advancing climate goals with big data and artificial intelligence. *Climate*, *12*(2), p.15.
14. Norbu, S., Couraud, B., Challinor, J., Flynn, D., Gibbons, G., Andoni, M., Robu, V., Taha, A. and Imran, M., 2024, December. Cyber-physical energy systems: enabling tailored decarbonization and net-zero pathways for communities. In *IET Powering Net Zero (PNZ 2024)* (Vol. 2024, pp. 28-34). IET.

15. Shaddick, G., Topping, D., Hales, T.C., Kadri, U., Patterson, J., Pickett, J., Petri, I., Taylor, S., Li, P., Sharma, A. and Venkatkrishnan, V., 2025. Data science and AI for sustainable futures: Opportunities and challenges. *Sustainability*, *17*(5).