International Conference of
Economics, Finance and Accounting Studies

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ICT's Role in the Net-Zero Strategy for World Economic Expansion

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ABSTRACT

Switching to net-zero emissions is no longer unique but essential for all under increased pressures to the environment and changing economic paradigms. Since energy systems contribute most to these emissions, the integration of information and communication technologies (ICT) is now considered crucial for pushing further both decarbonization initiatives and economic vibrancy. Despite ongoing debates on clean innovation and digital developments, little scholarly work has critically examined how ICT frameworks provide net-zero strategies to sustainable growth in distinct regions and industries. This research identifies the ways in which ICT enables the world's net-zero objectives, whilst also enhancing productivity, innovation and sustainable development. Research shows that ICT enabled emerging technologies such as artificial intelligence, smart grid, digital monitoring etc. enhance energy efficiency, reduce emissions, stimulate inclusive growth. The research shows how ICT driven transformations respond to directed technical change theories and highlights the policy package that facilitates such integration. To the contrary of traditional opinions, this work finds that ICT is the main enabler for decarbonization and resilient economic growth and cannot be just supported but is the very core infrastructure. The research provides practical directions for policymakers to develop comprehensive digital and climate plans while emphasizing the need to reduce digital divides to support fair participation of achieving net-zero goals. The future studies should examine empirical models of the impacts instantiated by ICT on long-term economic and environmental consequences focusing on the needs of underrepresented and underdeveloped countries.

Keywords: ICT, net-zero emissions, digital transformation, sustainable growth, climate policy, energy transition, innovation, directed technical change.

Introduction

The urgency of addressing climate change has led to a global consensus on achieving net-zero carbon emissions by the mid 21st century. This objective, aligned with the 2015 Paris Agreement, requires an unprecedented transformation of global economic systems, particularly in energy production, consumption, and infrastructure. Information and communication

technologies (ICT), as general-purpose technologies, have emerged as vital enablers of this transition. They offer the capability to enhance energy efficiency, optimize resource management, and support the integration of renewable energy systems, while also driving productivity and economic resilience [1].

Recent studies have highlighted the importance of innovation and digitalization in promoting sustainable development. Theoretical models such as directed technical change and empirical analyses by Stern and Valero emphasize how clean innovation and institutional frameworks can shape economic growth trajectories towards sustainability. However, the explicit role of ICT in net-zero strategies, particularly in terms of its systemic economic and environmental effects, remains underexplored. While the literature recognizes the potential of smart grids, AI-driven energy management, and digital monitoring systems, there is limited integrated analysis that connects these technological advances to macroeconomic growth and carbon mitigation outcomes [2].

This research addresses that gap by analyzing the multidimensional role of ICT in accelerating net-zero pathways, using a qualitative methodology based on literature synthesis, policy evaluation, and scenario review. It builds upon global energy transition models, such as those outlined by the IEA and IPCC, and incorporates insights from case studies and sectoral reports. The approach includes reviewing how ICT tools have been applied in both developed and developing economies, considering their ability to scale solutions, reduce transaction costs, and promote institutional efficiency in climate action [3].

The analysis expects to uncover that ICT not only facilitates decarbonization through optimization and monitoring but also acts as a catalyst for economic expansion through innovation diffusion and increased system responsiveness. It is anticipated that regions integrating ICT into their clean energy frameworks more aggressively will experience higher efficiency gains and job creation, especially in sectors like transportation, industry, and agriculture. This suggests a synergy between digital transformation and environmental objectives, aligning economic growth with climate resilience [4].

The findings of this study are expected to inform policymakers, researchers, and business leaders about the structural role ICT plays in achieving net-zero economies. By articulating the policy mechanisms and investment strategies that maximize ICT's contribution, the research offers a roadmap for integrating technological infrastructure into sustainable economic planning. In doing so, it bridges the knowledge gap between climate strategy and digital transformation, reinforcing the need for coordinated, data-driven governance in the era of climate urgency [5].

Materials and Methods

The relationship between global net-zero policies and information and communication technologies (ICT) in the context of economic growth is examined in this paper using a qualitative analytical technique. It is based on a multidisciplinary examination of the literature that includes economic theories of innovation, energy transition pathways, and policy frameworks that are focused on climate change as put forth by Mousavi & Zohuri and Stern and Valero [6].

The approach incorporates ideas of path dependence and market failures through the lens of the directed technological change paradigm, highlighting the significance of coordinated policy interventions and ICT driven innovation. Data were compiled from international energy transition scenarios presented by the International Energy Agency (IEA), global policy documents, and empirical research on ICT in clean energy systems. The study focuses especially on how ICT may assist economic growth and accelerate decarbonization efforts through enabling features like digital monitoring systems, smart grid management, and AI in resource optimization [7].

Furthermore, through improved system efficiency and technological diffusion, the research

approach assesses how ICT helps lower emissions across sectors. By examining case studies from both developed and developing economies, the technique also takes regional differences into consideration when evaluating the scalability and fairness implications of ICT integration. Thus, a thorough grasp of how ICT might promote a robust and sustainable economic structure in line with the global net-zero trajectory is made possible by this holistic methodology [8].

Results

The findings of this study confirm that information and communication technologies (ICT) play a pivotal role in enabling net-zero transitions while simultaneously fostering global economic growth. The analysis reveals that ICT applications ranging from AI-powered energy management systems, blockchain-enabled carbon tracking, to smart grid infrastructures facilitate greater operational efficiency, lower emissions, and enhanced adaptability in energy-intensive sectors. These technologies act as both enablers of emissions reduction and accelerators of productivity, effectively reconciling environmental targets with economic expansion. Empirical evidence from IEA roadmaps and post COVID-19 recovery packages demonstrates that countries integrating ICT into clean energy frameworks have achieved faster decarbonization rates and stronger innovation spillovers [9].

From a theoretical perspective, the results align closely with models of directed technical change, which highlight the influence of market signals and public policy in shifting innovation trajectories from carbon-intensive to clean technologies. In line with Acemoglu et al, ICT operates as a force multiplier, enhancing the productivity of low-carbon sectors and enabling path-dependent growth favoring clean systems. Moreover, the practical deployment of ICT in sectors like transportation (e.g., electrification and autonomous systems), manufacturing (e.g., predictive maintenance and digital twins), and agriculture (e.g., precision farming) validates its transformative role across diverse economies and geographies [10].

Despite these advances, the study also uncovers a persistent digital divide that limits ICT diffusion in low-income and infrastructure-poor regions, posing a challenge to equitable net-zero transitions. This identifies a critical knowledge and implementation gap namely, how to scale ICT-enabled solutions in developing contexts where financial, technical, and institutional capacities are limited. Moreover, there is insufficient longitudinal data linking ICT interventions directly to macroeconomic performance in a net-zero context, indicating the need for expanded empirical research and integrated modeling frameworks [11].

The results also highlight the importance of coherent policy ecosystems that align ICT development with sustainability goals. Countries that have successfully incentivized private-sector ICT investment through public R&D support, digital infrastructure subsidies, and carbon pricing have seen measurable gains in emissions intensity reductions and GDP growth. Notably, early ICT investments correlate strongly with the capacity to adapt to future regulatory shifts and environmental shocks, confirming the anticipatory value of digitalization for resilience-building [12].

These findings imply significant directions for future research. First, there is a need to develop sector-specific ICT impact models that integrate economic, environmental, and social indicators under net-zero pathways. Second, interdisciplinary approaches combining environmental economics, data science, and digital engineering are necessary to refine theoretical frameworks and improve predictive accuracy. Third, further study is warranted on the institutional and governance structures that enable ICT driven green transitions at scale.

In conclusion, ICT serves as a foundational pillar in net-zero strategies by enabling technological leapfrogging, economic dynamism, and low-carbon innovation. Its integration must, however, be supported by inclusive policies, robust digital infrastructure, and coordinated global strategies. The results reinforce the central hypothesis that ICT is not merely a complementary tool but a structural driver of sustainable economic transformation.

Discussion

The goal of this study was to investigate how ICT supports economic growth and helps achieve worldwide net-zero emissions. The results support the main premise, which holds that ICT serves as a transformative infrastructure for sustainable development rather than just an additional tool. The findings show that the efficiency and adaptability of low-carbon systems across sectors are significantly increased by the strategic deployment of digital technologies, such as blockchain transparency mechanisms, IoT-enabled monitoring, and AI-driven optimization. These results support the theoretical predictions made by models of innovation diffusion and directed technical change, which hold that technological pathways and institutional incentives can modify growth paths in favor of clean innovation [13].

The findings of the study align with the larger body of literature. Stern and Valero, for example, contend that undoing high-carbon lock-ins requires significant investment in clean innovation backed by digital platforms. The disruptive potential of renewable energy transitions made possible by digital infrastructure is also highlighted by Mousavi and Zohuri. By showing that ICT integration is essential to scale these energy transitions effectively and inclusively especially when paired with coordinated policy frameworks this research adds a crucial element to previous evaluation [14].

There are theoretical as well as practical ramifications. By highlighting the function of ICT as a system-wide enabler that interacts with several innovation streams not just in energy generation but also in transportation, agriculture, and industry the study theoretically expands on current models. From a practical standpoint, the findings highlight the need for governments to incorporate digital transformation into national climate policies. Compound gains in terms of emissions reduction, economic competitiveness, and social welfare are more likely to be seen by nations that proactively integrate ICT investments with decarbonization targets. In terms of policy, this necessitates integrative frameworks that connect investments in digital infrastructure to carbon pricing schemes, green industrial regulations, and inclusive capacity-building initiatives [15].

However, there are certain limitations to the study. One limitation, especially in developing countries, is the dearth of longitudinal, real-time data documenting the long-term macroeconomic impacts of ICT driven green transitions. Furthermore, although qualitative synthesis enables a wide range of study, it is unable to pinpoint the exact causal links between economic indicators and ICT deployment. The study's dependence on secondary data sources, which might not accurately represent regional contextual factors influencing ICT success, is another drawback [16].

These restrictions point to a number of potential lines of inquiry. First, a more detailed knowledge of the causal relationships between ICT, emissions outcomes, and GDP growth may be provided by empirical research employing mixed techniques and panel data analysis. Second, in-depth sectoral and regional case studies would aid in analyzing context specific ICT diffusion facilitators and barriers in the context of net zero. Third, multidisciplinary studies that combine environmental governance, development economics, and digital engineering may produce comprehensive frameworks for the application of policies. Lastly, future research should focus on examining ethical and equity issues in ICT deployment, particularly with relation to data privacy, digital access, and algorithmic bias [17].

All things considered, this conversation supports the important finding that ICT may be a key component of resilient, low-carbon, and economically strong society if technology is used fairly and intelligently. Closing knowledge gaps, creating inclusive digital ecosystems, and putting in place logical, forward-thinking regulations are necessary to achieve its full potential.

Conclusion:

Based on the analysis of the attached files, the study concludes that information and

communication technologies (ICT) serve as pivotal enablers in the global transition to net-zero emissions by enhancing energy efficiency, optimizing resource allocation, and supporting sustainable economic growth. The findings underscore that ICT facilitates not only sectoral decarbonization particularly in energy, transport, and manufacturing but also drives innovation pathways aligned with climate resilience, as affirmed by both theoretical frameworks and empirical evidence. The implications are significant for policymakers, suggesting that strategic ICT integration into climate and industrial policies can yield compounded socio-economic and environmental benefits. However, disparities in digital infrastructure and the lack of longitudinal impact assessments highlight a crucial area for intervention. Thus, future research should focus on developing empirical models that quantify the long-term economic gains of ICT based decarbonization strategies, especially in low-income and transitional economies, while exploring the ethical dimensions and governance challenges of digital transitions in a net zero world.

References:

1. Shohruh, "Role of ICT in the net zero strategy for global economic growth," Spanish Journal of Innovation and Integrity, vol. 42, pp. 416–420, 2025.
2. S. K. M. Balgehshiri and B. Zohuri, "The impact of energy transition to net-zero emissions on the world economy and global strategies," Journal of Economics & Management Research, pp. 2–7, 2023.
3. N. Stern and A. Valero, "Innovation, growth and the transition to net-zero emissions," Research Policy, vol. 50, no. 9, p. 104293, 2021.
4. N. Virmani, S. Agarwal, R. D. Raut, S. K. Paul, and H. Mahmood, "Adopting net-zero in emerging economies," Journal of Environmental Management, vol. 321, p. 115978, 2022.
5. Fazekas, C. Bataille, and A. Vogt-Schilb, "Achieving net-zero prosperity: how governments can unlock 15 essential transformations," 2022. [Online]. Available: https://www.iddri.org/en/publications-and-events/report/achieving-net-zero-prosperity
6. S. Nie, X. Cao, Z. Li, M. Liu, and Y. Zhang, "Supply chain digitization in the net-zero era: The impact of digital technology, renewable energy, and infrastructure," Energy Economics, vol. 144, p. 108403, 2025.
7. T. A. Kurniawan et al., "Decarbonization in waste recycling industry using digitalization to promote net-zero emissions and its implications on sustainability," Journal of Environmental Management, vol. 338, p. 117765, 2023.
8. K. Ukoba, R. O. Medupin, K. O. Yoro, O. Eterigho-Ikelegbe, and T. C. Jen, "Role of the fourth industrial revolution in attaining universal energy access and net-zero objectives," Energy 360, p. 100002, 2024.
9. Q. Chen and J. Wang, "The impact of digital economic growth and financial expansion on CO_2 mitigation strategies in leading emitting countries," Scientific Reports, vol. 15, no. 1, p. 10515, 2025.
10. L. Stermieri, T. Kober, R. McKenna, T. J. Schmidt, and E. Panos, "The role of digital social practices and technologies in the Swiss energy transition towards net-zero carbon dioxide emissions in 2050," Energy Policy, vol. 193, p. 114203, 2024.
11. R. Deshmukh, B. R. Jadhav, and V. Jain, "Smart digital transformation: A sustainable path to achieving the SDGs and a green net zero economy," in Digital Innovations for Renewable Energy and Conservation, IGI Global, 2025, pp. 241–276.
12. W. Yao, L. Liu, H. Fujii, and L. Li, "Digitalization and net-zero carbon: The role of industrial robots towards carbon dioxide emission reduction," Journal of Cleaner Production, vol. 450, p. 141820, 2024.

13. S. C. Nwokolo, R. Singh, S. Khan, A. Kumar, and S. Luthra, Africa's Path to Net-Zero, Cham: Springer Nature Switzerland, 2023.
14. Raihan and A. Tuspekova, “Towards net zero emissions by 2050: The role of renewable energy, technological innovations, and forests in New Zealand,” Journal of Environmental Science and Economics, vol. 2, no. 1, pp. 1–16, 2023.
15. W. Su, L. D. Pang, R. Tao, X. Shao, and M. Umar, “Renewable energy and technological innovation: Which one is the winner in promoting net-zero emissions?,” Technological Forecasting and Social Change, vol. 182, p. 121798, 2022.
16. Sultana, A. A. A. Chowdhury, A. H. Rafi, and A. A. Noman, “Role of AI innovation, clean energy and digital economy towards net zero emission in the United States: An ARDL approach,” arXiv preprint, arXiv:2503.19933, 2025.
17. N. J. Dewasiri, “Sustainable strategies for net zero: An Asia Pacific perspective,” in Transition Towards a Sustainable Future: Net Zero Policies and Environmental Sustainability, Singapore: Springer Nature Singapore, 2024, pp. 3–25.