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Digital transformation linked with green growth and sustainable development

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A B S T R A C T :

This paper explores the "Twin Transition" in Vietnam—the strategic integration of digital transformation and green growth to achieve sustainable development. By analyzing national policies, international contexts, and current implementation statuses, the study highlights positive achievements in smart agriculture, green logistics, and smart urban management, while also identifying significant challenges such as e-waste, limited resources for small and medium enterprises (SMEs), and incomplete legal and technological frameworks. To address these bottlenecks, the paper proposes five comprehensive strategic solutions: perfecting institutional policies and incentive mechanisms, developing green digital infrastructure, promoting the application of digital technologies across key economic sectors, enhancing human resources and social awareness, and strengthening international cooperation. Ultimately, integrating breakthrough technologies like AI, IoT, and Big Data into the roadmap for emissions reduction is emphasized not just as a trend, but as a mandatory survival requirement for Vietnam to resolve environmental issues and enhance its competitiveness in the global value chain.

Theoretical basis of digital transformation, green growth, and sustainable development

1.1. Digital transformation

Concept: Digital transformation is the comprehensive and overall process of change for individuals and organizations in how they live, work, and produce based on digital technologies (such as AI, Big Data, Cloud, IoT, etc.). Nature: Digital transformation is not simply the application or computerization of technology, but a change in mindset, operating models, and organizational culture. Technology acts as a triggering tool, while the core is the transformation of operational methods and the creation of new value.

1.2. Green Growth

Concept: Green growth is a method of promoting economic growth while preserving natural assets, ensuring that the environment continues to provide resources and ecological services for development. This is an important component of sustainable development, aiming towards a low-carbon and circular economy.

1.3. Sustainable Development

Concept: Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs (Definition according to the Brundtland Report, 1987).

Current status of digital transformation linked with green growth in Vietnam

1.4. Context, guidelines, and policies of Vietnam

1.4.1. International and domestic context

International context: The impacts of global climate change, resource depletion, and geopolitical instability have strongly driven nations to shift towards sustainable development models. Concurrently, the Fourth Industrial Revolution (4.0) has exploded, making digital technology the new infrastructure of the economy. The "Twin Transition" trend - integrating Digital Transformation with Green Growth - has become the core competitive key and a mandatory global trend.

Domestic context: Vietnam is one of the countries most severely affected by climate change (especially in the Mekong Delta and the Central coastal strip). At the same time, the economy is in the transitional phase of its growth model from breadth (relying on resources and cheap labor) to depth (relying on productivity, quality, and innovation). Therefore, combining digital technology to green the economy is both an urgent requirement and a breakthrough opportunity for development.

1.4.2. Strategic guidelines and policies of the Party and State in the 2021–2030 period

The Party and State of Vietnam early recognized the strategic importance of digital transformation and green growth, issuing a highly directional system of documents to create a synchronized policy framework for the 2021–2030 period.

The Document of the 13th National Congress of the Party (2021): Pioneering new development thinking by placing digital transformation and green growth at the center. The Congress affirmed the task: "Promoting national digital transformation, developing the digital economy, and digital society..." closely linked with "Building a green, circular, and environmentally friendly economy".

Resolution No. 52-NQ/TW (September 27, 2019) of the Politburo: On a number of guidelines and policies for actively participating in the Fourth Industrial Revolution, creating a premise to promote the application of digital technology to solve problems of resource optimization and environmental protection.

1.5. National strategies on Digital Transformation

In the 2021–2030 period, digital transformation has been identified by the Party and State as a key and breakthrough driver to modernize the economy, enhance national competitiveness, and aim towards sustainable development. The system of national digital transformation strategies issued recently has created a synchronized policy framework, orienting the entire political system, business community, and all citizens to participate in this breakthrough process.

The first important foundation is Decision No. 749/QD-TTg dated June 3, 2020, of the Prime Minister approving the "National Digital Transformation Program to 2025, with an orientation to 2030". The program sets a dual goal: developing the Digital Government, Digital Economy, and Digital Society, while simultaneously forming Vietnamese digital technology enterprises with global capabilities. Notably, this strategy clearly identifies 8 top priority areas for digital transformation, including: Healthcare, Education, Finance - Banking, Agriculture, Transport & Logistics, Energy, Natural Resources & Environment, and Industrial Production. Placing Energy, Agriculture, and Natural Resources & Environment on the priority list shows that right from the beginning, digital transformation has been oriented to be closely linked with the goal of optimally managing resources and protecting the environment.

To concretize and accelerate the development of economic pillars, Decision No. 411/QD-TTg dated March 31, 2022, approving the "National Strategy for Development of the Digital Economy and Digital Society to 2025, with an orientation to 2030" was subsequently issued. The strategy sets a challenging goal: the digital economy will account for 20% of GDP by 2025 and reach 30% of GDP by 2030. The core of this strategy is the shift from traditional IT application to developing an economy based on digital data and digital technology. Therein, developing the digital economy in industries and sectors (greening and digitizing production processes, e-commerce, smart logistics) is considered the focus to breakthrough labor productivity and reduce energy consumption.

Concurrently, Decision No. 942/QD-TTg dated June 15, 2021, approving the "Strategy for E-Government Development towards Digital Government in the 2021–2025 period, with an orientation to 2030" plays a pioneering and leading role. The digital government does not merely stop at providing high-level online public services to reduce social costs and paperwork, but also aims at national governance based on real-time data. This allows for enhancing the efficiency of environmental monitoring, national energy management, and improving the capacity to respond to natural disasters and climate change.

Overall, Vietnam's national strategies on digital transformation do not operate in isolation but form a complete policy ecosystem. The implementation of these strategies acts as a "soft infrastructure", creating a solid technological premise to integrate Green Growth and Sustainable Development goals, bringing Vietnam closer to the "Twin Transition" model in the digital era.

1.6. National strategies on green growth and sustainable development

The system of national strategies on Green Growth and Sustainable Development is a "compass" guiding Vietnam's socio-economic development model for the 2021–2030 period, with a vision to 2050, promoting the transition from resource-based development to one based on knowledge, technology, and low carbon. The pillar documents and commitments include:

National Strategy on Green Growth (Decision 1658/QD-TTg): Sets goals to reduce greenhouse gas emission intensity per GDP, green economic sectors, green lifestyles and consumption, and ensure an equitable, inclusive transition. Science, technology, innovation, and digital transformation are identified as key drivers.

National Action Plan on Green Growth (Decision 882/QD-TTg): Concretizes the strategy into 18 themes and 57 priority task/project groups aiming to green key sectors (energy, industry, agriculture, transport, urban development, water resources) and develop a circular economy.

2030 Agenda for Sustainable Development (Decision 622/QD-TTg): Nationalizes the 17 SDGs into 115 specific targets, ensuring a balance between the 3 pillars: Economy - Society - Environment.

Net Zero Commitment at COP26: Bringing net emissions to "0" by 2050. This commitment plays a major guiding role in promoting the issuance of Power Development Plan VIII, the Climate Change Strategy to 2050, and the legal framework for the carbon credit market.

1.7. Achievements and limitations

Regarding the achieved results, in production and agriculture, there is smart agriculture, optimization of renewable energy using AI/IoT, and process automation to reduce waste. In services and logistics, achievements include green e-commerce, smart transportation, and supply chain management to reduce the carbon footprint. In state and urban management, there is the development of Smart Cities, automated environmental monitoring, and digital carbon credit systems. However, there are limitations and challenges, such as the environmental impacts from the IT sector itself, including e-waste and energy consumption at Data Centers. Additionally, the awareness and resources—both financial and human—of enterprises, especially SMEs, remain limited. Furthermore, the technological infrastructure, as well as institutional and legal frameworks, are not yet fully synchronized for the digital circular economy model.

Solutions to promote digital transformation linked with green growth in Vietnam

To realize the "Twin Transition" goal, making digital transformation a breakthrough driver for green growth and sustainable development, Vietnam needs to synchronously deploy the following five groups of strategic solutions.

1.8. Perfecting institutions, policies, and incentive mechanisms

It is necessary to establish a national criteria set for "green digital transformation" by promulgating KPI indicator sets and identification standards for "green digital transformation enterprises" and "green digital infrastructure" to measure digital technology's contribution to emissions reduction and resource conservation. Green finance and credit policies should provide preferential taxes, land rents, and support for access to preferential capital sources like green credit and green bonds for businesses investing in environmentally friendly technologies, digital circular economy, or carbon reduction projects. Additionally, a policy experimentation mechanism (Sandbox) should be implemented to pilot new economic models such as digital carbon credit trading markets, resource-sharing platform economies, and green technological financial solutions (Green FinTech).

1.9. Developing Green Digital Infrastructure

Greening Data Centers and telecommunications requires mandating a roadmap to transition data centers to use renewable energy like solar and wind power, while applying advanced cooling technologies to lower Power Usage Effectiveness (PUE) indices. For new generation telecommunications networks, it is essential to expand green 5G/6G network coverage and high-speed fiber optic infrastructure integrated with automatic power optimization features based on actual traffic. E-waste management must also be addressed by promulgating regulations to manage the technology product lifecycle and promoting the collection, recycling, and reuse of components to reduce waste and pollution.

1.10. Promoting the application of digital technology in key economic sectors

Smart green agriculture should use IoT sensors and satellite data to monitor soil and weather to optimize fertilizers and irrigation water, and apply Blockchain for agricultural product traceability and emission volume transparency. Green Industry and Production involves building Smart Factories that apply AI and real-time monitoring to cut scrap, detect energy leaks, and forecast maintenance. In Energy and Environment, developing Smart Grids is needed to effectively integrate unstable renewable energy sources, alongside using AI and Big Data to monitor air and water quality and coordinate waste collection. Smart Transport and Logistics requires digitizing the supply chain, optimizing transport routes to reduce empty running distances, and operating intelligent transport systems (ITS) in urban areas to reduce congestion and emissions.

1.11. Enhancing capacity, developing human resources, and social awareness

Training multi-tasking human resources (Hybrid Skills) means integrating digital technology knowledge with environmental management skills and ESG standards in university programs to create a workforce that is both tech-savvy and sustainability-minded. Supporting Small and Medium Enterprises (SMEs) includes organizing training and providing low-cost shared digital toolkits to help them easily practice greenhouse gas inventory and green production processes. Furthermore, promoting green digital consumption and lifestyles involves propagating habits of using energy-saving technologies like cloud data optimization, and encouraging green consumption via green e-commerce and cashless payments.

1.12. Strengthening international cooperation and attracting foreign resources

Technology transfer cooperation involves connecting with pioneering countries such as the EU, Japan, South Korea, and Singapore to receive green technologies, energy management software, and smart city models. Attracting international green finance requires effectively leveraging international commitments like JETP to attract high-quality FDI and green venture capital into digital infrastructure and environmental technologies. Finally, participating in global standards means proactively complying with and contributing to the building of international regulations on digital carbon emission standards, thereby creating competitive advantages for Vietnamese export goods.

Conclusion

Digital transformation linked with green growth ("Twin Transition") is no longer just a trend or a priority strategic choice, but has become a mandatory and survival requirement for every economy in the new era. The integration of breakthrough technologies such as AI, IoT, and Big Data into the roadmap for emissions reduction and resource conservation is the key to shortening the path towards sustainable development. Effectively utilizing digital momentum to "green" the economy not only helps Vietnam solve environmental pollution and climate change problems but also creates new competitive advantages, opening doors to integrate Vietnamese goods and services deeply into the global value chain.

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