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Balancing Digital Growth and Ecological Limits: Environmental Taxation and Ecological Stability under the Load Capacity Curve Framework

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Abstract

As the global economy rapidly shifts toward digital transformation and sustainable development, understanding the environmental consequences of technological and financial expansion has become increasingly important. This study investigates the impact of Artificial Intelligence (AI) innovation, environmental taxation, and financial accessibility on environmental sustainability in Nordic economies within the framework of the Load Capacity Curve (LCC) hypothesis. Using balanced panel data covering the period from 1990 to 2022, the analysis also incorporates economic growth and urbanization as additional determinants of ecological sustainability, measured through the Load Capacity Factor (LCF). To address Cross-Sectional Dependence (CSD) and heterogeneity across countries, the study employs advanced panel econometric techniques, including second-generation unit root tests, panel cointegration analysis, and the Panel Autoregressive Distributed Lag (ARDL) model to estimate both short-run and long-run relationships. The findings validate the LCC hypothesis by revealing a U-shaped relationship between income and environmental sustainability. Moreover, AI innovation and environmental taxation significantly enhance ecological capacity, whereas financial accessibility and urbanization intensify ecological pressure. Robustness tests further confirm the reliability of the results, offering important policy insights for achieving sustainable and technology-driven economic development.

Keywords: Artificial intelligence, Environmental taxation, Financial accessibility, Load capacity factor, Nordic economies.

1 | Introduction

Environmental degradation has emerged as one of the most pressing global challenges, driven by the combined effects of rapid economic expansion, rising urban populations, and intensified resource

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consumption [1]. While economic growth has historically been associated with improved living standards, it has also contributed to increased energy demand, environmental pollution, and depletion of natural resources [2], [3]. In recent decades, both developed and developing economies have experienced substantial growth in greenhouse gas emissions, largely attributed to industrialization, financial expansion, and technological transformation [4]. Urbanization further amplifies these pressures by increasing demand for infrastructure, transportation, and energy-intensive activities [5]. Although various indicators, such as carbon emissions and ecological footprint, have been widely used to assess environmental quality, they often capture only the demand side of environmental pressure and fail to account for the regenerative capacity of ecosystems [6], [7]. This limitation has led to growing interest in more comprehensive measures that incorporate both environmental demand and supply. In this context, the concept of environmental sustainability requires a broader analytical framework to effectively assess the balance between human activities and the ecological system's capacity to sustain them over time.

To address the limitations of conventional environmental indicators, recent literature has increasingly emphasized the use of the Load Capacity Factor (LCF) as a more comprehensive measure of environmental sustainability. The LCF captures the balance between ecological demand and nature's regenerative capacity by integrating both ecological footprint and biocapacity into a single indicator [8]. A value greater than 1 indicates that an ecosystem can sustain human demand, whereas a value below 1 reflects an ecological deficit and environmental stress [9]. Building on this measure, the Load Capacity Curve (LCC) hypothesis extends the traditional Environmental Kuznets Curve framework by examining how economic growth influences ecological balance rather than focusing solely on emissions. The LCC suggests a non-linear relationship in which environmental pressure initially intensifies with economic expansion but improves after a certain income threshold due to technological progress, structural transformation, and stronger environmental policies [10], [11]. This framework provides a more nuanced understanding of sustainability dynamics by capturing both the degradation and recovery phases of environmental systems.

In this context, several economic and technological factors play a decisive role in shaping environmental sustainability outcomes [12], [13]. Among them, Artificial Intelligence (AI) innovation has gained considerable attention due to its potential to enhance energy efficiency, optimize resource allocation, and support environmentally friendly production processes [14], [15]. AI-driven systems can improve monitoring, forecasting, and decision-making, thereby reducing waste and environmental pressure. At the same time, environmental taxation has emerged as a key policy instrument to internalize pollution's external costs and encourage cleaner production and consumption [16]. By increasing the cost of environmentally harmful activities, such taxes can incentivize firms and households to adopt greener alternatives. Conversely, financial accessibility, while essential for economic development, may exert mixed environmental effects by facilitating higher consumption, industrial expansion, and investment in energy-intensive sectors [17], [18]. Similarly, urbanization introduces structural changes that often increase energy demand, expand infrastructure, and increase environmental stress [19]. The combined influence of these factors creates a complex and dynamic relationship with environmental sustainability, necessitating a comprehensive empirical investigation.

The Nordic region provides a compelling context for examining these relationships, given its strong commitment to environmental sustainability, advanced technological development, and well-established financial systems. Countries such as Denmark, Sweden, Finland, and Norway are widely recognized for their leadership in renewable energy adoption, environmental governance, and climate policy implementation [20]. At the same time, these economies are characterized by high levels of digital innovation, including rapid advancements in AI, as well as broad access to financial services [21], [22]. Environmental taxation has also been extensively utilized in these countries as a policy tool to reduce emissions and promote green transitions [23]. Despite these achievements, the region continues to face environmental challenges arising from urban expansion, resource consumption, and economic activity. This apparent paradox, where environmentally advanced economies still experience ecological pressure, makes the Nordic countries an ideal setting to reassess the drivers of environmental sustainability. Examining this region offers valuable insights into whether technological progress, fiscal instruments, and financial development can collectively support long term ecological balance.

Despite the growing body of literature on environmental sustainability, several important gaps remain. First, a large proportion of existing studies relies on traditional indicators such as carbon emissions or ecological footprint, which primarily capture environmental pressure from the demand side and overlook the regenerative capacity of ecosystems [24], [25]. As a result, the use of the LCF as a more comprehensive sustainability measure remains relatively limited, particularly in advanced economies. Second, while previous research has examined the individual roles of economic growth, financial development, or technological innovation, there is a lack of integrated analysis that simultaneously considers AI innovation, environmental taxation, and financial accessibility within a unified framework. Third, empirical evidence focusing specifically on the Nordic region remains scarce, despite its global prominence in sustainability practices and policy innovation. Moreover, the combined effects of these emerging drivers on ecological balance have not been sufficiently explored using advanced panel econometric methods that address Cross-Sectional Dependence (CSD) and heterogeneity [26], [27]. These gaps highlight the need for a more comprehensive and methodologically robust investigation to better understand the determinants of environmental sustainability.

2 | Literature Review

The literature on environmental sustainability has increasingly shifted from narrow pollution-based indicators toward broader measures that capture the interaction between human demand and ecological capacity [28], [29]. Earlier studies mainly relied on carbon emissions and ecological footprint to evaluate environmental pressure. Still, these indicators provide only a partial understanding of sustainability because they do not fully account for nature's regenerative capacity [30], [31]. In response, recent studies have introduced the LCF as a more comprehensive indicator, as it reflects whether an economy's ecological resources can support its environmental demand. Alongside this shift, the LCC hypothesis has gained attention as a useful framework for examining the non-linear relationship between income growth and environmental sustainability [7]. However, the existing literature remains fragmented, particularly regarding the combined role of technological innovation, environmental taxation, financial accessibility, and urbanization. While these factors have been studied separately, their joint influence on ecological capacity remains underexplored. Therefore, this review discusses the relevant literature on economic growth, AI innovation, environmental tax, financial accessibility, and urbanization in relation to environmental sustainability.

The relationship between economic growth and environmental sustainability remains one of the most debated issues in environmental economics. Traditional growth models suggest that higher income levels often increase energy demand, resource extraction, industrial activity, and waste generation, thereby placing greater pressure on ecological systems [32], [33]. In this regard, many studies have found that economic expansion may reduce environmental quality, especially when growth depends heavily on fossil energy, material consumption, and urban industrial development [34]. However, the LCC perspective offers a more balanced explanation, suggesting that the environmental effects of growth may change after a certain income threshold [35]. At early stages, growth may reduce the LCF by increasing ecological footprint, but at later stages, higher income can support cleaner technologies, stronger environmental regulation, and more efficient resource use [36]. This argument implies a possible U-shaped association between income and LCF. Therefore, examining both Gross Domestic Product (GDP) and GDP squared is essential to determine whether economic growth in advanced economies contributes to ecological degradation or supports long-term environmental recovery.

AI innovation has emerged as a transformative force with significant implications for environmental sustainability. Existing studies show that AI-driven technologies can enhance energy efficiency, improve resource allocation, and support real-time environmental monitoring, thereby reducing ecological pressure [37–39]. Through applications such as smart grids, predictive maintenance, and optimized supply chains, AI can lower energy consumption and emissions while increasing productivity [40]. Moreover, technological innovation associated with AI can facilitate structural transformation toward cleaner industries and accelerate the adoption of renewable energy systems [41]. However, the environmental impact of AI is not entirely unidirectional. Some studies point out that the expansion of digital infrastructure, data centers, and computational processes may increase energy demand and carbon intensity, especially in the absence of green energy sources [42], [43]. As a result, the net effect of AI on environmental sustainability depends on the balance between efficiency gains and additional energy use. Despite growing interest in this area, empirical evidence examining the relationship between AI innovation and LCF remains limited, particularly within advanced regional contexts.

Environmental taxation is widely recognized as an effective policy instrument for improving environmental quality by internalizing the external costs associated with pollution and resource depletion [20]. The theoretical foundation of environmental taxes lies in their ability to discourage environmentally harmful activities by increasing the cost of emissions and encouraging firms and households to adopt cleaner technologies and sustainable practices [44]. A substantial body of empirical research suggests that well-designed environmental taxes can reduce emissions, promote energy efficiency, and support the transition toward low-carbon economies [45], [46]. However, the effectiveness of such taxes is often context-dependent. Some studies report that environmental taxation significantly enhances ecological performance.

In contrast, others find limited or even adverse effects due to factors such as weak policy enforcement, structural rigidities, or the shifting of tax burdens across sectors [47], [48]. In addition, the interaction between environmental taxes and other economic factors, such as technological innovation and financial systems, can influence their overall impact. Despite the growing importance of fiscal instruments in environmental policy, limited research has examined their role within the LCC framework, particularly in advanced economies.

Financial accessibility plays a crucial role in shaping economic activity and, consequently, environmental outcomes. On one hand, improved access to financial services can support sustainable development by facilitating investments in green technologies, renewable energy projects, and environmentally friendly infrastructure [49], [50]. Access to credit and financial instruments enables firms to adopt cleaner production methods and enhances households' ability to invest in energy-efficient technologies [51]. On the other hand, expanded financial accessibility may also intensify environmental pressure by stimulating consumption, industrial expansion, and resource-intensive economic activities [52]. Empirical evidence on this relationship remains mixed. Some studies suggest that financial development improves environmental quality by promoting technological innovation and efficient resource allocation.

In contrast, others argue that it contributes to ecological degradation, particularly in economies where financial resources are directed toward high-emission sectors [53], [54]. The environmental impact of financial accessibility, therefore, depends on the structure and orientation of financial systems. Despite its importance, limited research has explored how financial accessibility influences the LCF, especially when considered alongside emerging factors such as AI and environmental taxation.

3 | Data and Methodology

This study uses a balanced panel dataset covering the Nordic countries from 1990 to 2022. The LCC framework and the growing literature on environmental sustainability guide the selection of variables. The dependent variable is the LCF, which captures the balance between ecological demand and biocapacity and provides a comprehensive measure of environmental quality. Economic growth is proxied by GDP and its squared term to examine the non-linear relationship between income and environmental sustainability. AI innovation is measured using patent-based indicators that reflect technological advancement in digital systems. Environmental taxation is included as a policy variable to assess its role in regulating ecological pressure, while financial accessibility is represented through indicators related to financial system depth and access. Urbanization is incorporated to capture structural changes in population distribution and resource demand. All variables are transformed to logarithms to ensure consistency, reduce heteroskedasticity, and facilitate elasticity-based interpretation of the estimated coefficients.

This study adopts a comprehensive panel econometric framework to examine the dynamic relationship between environmental sustainability and its key determinants within the LCC perspective. The empirical analysis begins with testing for CSD to account for potential interlinkages among Nordic economies, followed by Slope Homogeneity (SH) tests to determine parameter variability across countries. Given the presence of CSD, both first- and second-generation panel unit root tests are employed to ensure the stationarity properties of the variables. After confirming the order of integration, panel cointegration techniques are applied to verify the existence of a long-run equilibrium relationship among the variables. To estimate both short- and long-run dynamics, the Panel Autoregressive Distributed Lag (ARDL) model is used for its flexibility in handling variables integrated at different orders and its ability to capture adjustment processes through the error correction mechanism. The model allows for heterogeneity across cross-sections while maintaining consistent long-run estimates.

Furthermore, robustness of the results is assessed using alternative estimators such as Fully Modified Ordinary Least Squares, Dynamic Ordinary Least Squares, and Fixed Effects with robust standard errors. Finally, the Dumitrescu and Hurlin causality test is applied to explore the direction of causal relationships among the variables. Accordingly, this study is executed in five well-defined phases, as shown in *Fig. 1*.

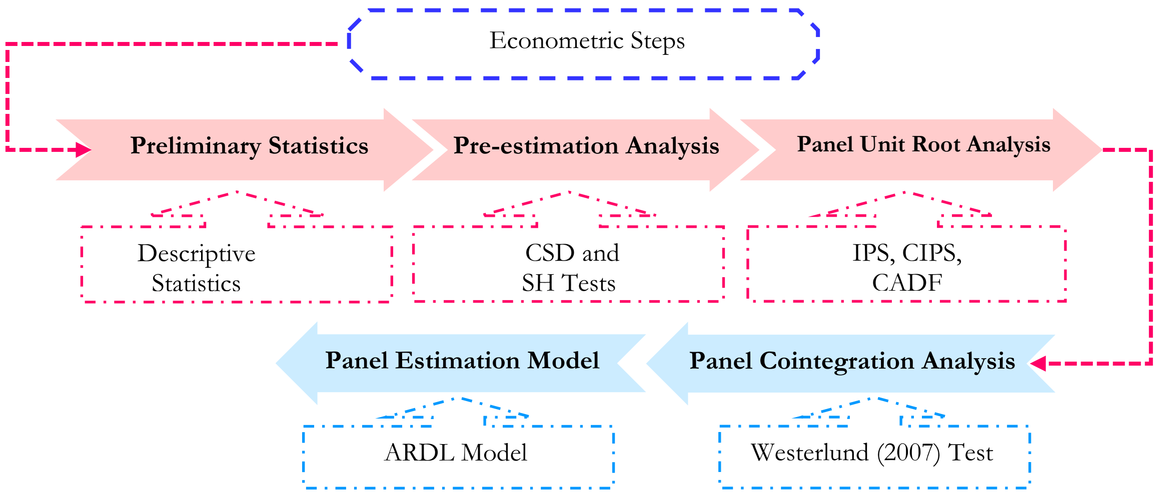

Fig. 1. Schematic illustration of the estimation procedure.

4 | Results and Discussion

Table 1 presents the descriptive statistics of the variables used in the study. The results show that the mean value of the Logarithm of Load Capacity Factor (LLCF) is 0.041, indicating that the Nordic economies maintain a moderate level of ecological capacity during the study period. The logarithm of Gross Domestic Product (LGDP) has a mean of 10.914. At the same time, Squared Logarithm of Gross Domestic Product (LGDP2) records a higher mean value of 119.125, reflecting the squared transformation of income used to test the LCC hypothesis. The average value of the Logarithm of Artificial Intelligence Innovation (LAI) is 3.214, suggesting a steady level of AI-related innovation across the region. The Logarithm of Environmental Taxes (LENT) and the Logarithm of Financial Accessibility (LFA) show moderate variation, indicating differences in environmental taxation and financial accessibility across Nordic economies. The logarithm of Urbanization (LURBA) shows a high mean value, reflecting the region's highly urbanized nature. Overall, the standard deviation values suggest reasonable dispersion across the variables, while the minimum and maximum values confirm sufficient variation for panel estimation.

Table 1. Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
LLCF	110	0.041	0.574	-0.914	0.889
LGDP	110	10.914	0.326	10.138	11.602
LGDP2	110	119.125	7.104	102.779	134.607
LAI	110	3.214	0.537	1.946	4.018
LENT	110	5.463	4.218	-0.972	9.486
LFA	110	3.958	0.391	3.287	4.783
LURBA	110	4.461	0.056	4.329	4.556

The presence of CSD is examined using the Pesaran CD test, and the results are reported in *Table 2*. The findings indicate that the CD statistics for all variables are statistically significant at the 1% level. The corresponding probability values are below the conventional threshold, leading to the rejection of the null hypothesis of cross-sectional independence. It suggests that shocks or structural changes in one Nordic country are likely to be transmitted to others, reflecting the region's high degree of economic and environmental interdependence. Such interlinkages may arise due to shared policy frameworks, integrated financial systems, and similar technological advancements. The existence of CSD implies that first-generation panel techniques may produce biased estimates. Therefore, it becomes necessary to employ second-generation unit root and cointegration methods that explicitly account for this dependence structure. These results justify the use of advanced econometric approaches in the subsequent analysis to ensure robustness and reliability of the findings.

Table 2. CSD test.

Variables	CD Statistic	P-value
LLCF	4.12***	0.000
LGDP	10.87***	0.000
LGDP2	11.94***	0.000
LAI	5.73***	0.000
LENT	6.28***	0.000
LFA	7.15***	0.000
LURBA	13.02***	0.000

Note: *** denotes significance level at 1%.

To examine whether the slope coefficients are homogeneous across the Nordic countries, the Pesaran and Yamagata SH test is applied. The results are presented in *Table 3*. The estimated test statistics are statistically significant at the 1% level, as indicated by the corresponding probability values below the conventional threshold. Therefore, the null hypothesis of SH is rejected, implying that the relationship between the explanatory variables and the LCF differs across countries. This outcome reflects structural heterogeneity among Nordic economies, which may arise from differences in environmental policies, technological adoption, financial systems, and levels of urban development. The rejection of homogeneity suggests that a common slope assumption is not appropriate for this dataset. Consequently, econometric techniques that allow for cross-sectional heterogeneity are better suited to capture country-specific dynamics. These findings further support the use of the Panel ARDL approach, which accommodates heterogeneity in short-run adjustments while maintaining consistent long-run estimates. Overall, the results highlight the importance of considering heterogeneous effects when analyzing environmental sustainability in a 7multi-country framework.

Table 3. SH test.

Test	Statistic	P-value
Delta test	3.462***	0.001
Adjusted Delta test	4.118***	0.000

Note: *** denotes significance level at 1%.

To ensure the validity of the econometric analysis, the stationarity properties of the variables are examined using both first- and second-generation panel unit root tests. Given the presence of CSD, reliance on second-generation techniques becomes essential to obtain reliable results. The findings from the Im–Pesaran–Shin (IPS) test indicate that only the AI innovation variable is stationary at the level, while the remaining variables become stationary after first differencing. Cross-sectionally Augmented Im–Pesaran–Shin (CIPS) and Cross-sectionally Augmented Dickey–Fuller (CADF) tests further confirm this pattern, showing that most variables are integrated of order one, while AI innovation is integrated of order zero. These results imply that the variables exhibit mixed integration orders, with none exceeding second-order integration. It satisfies the key requirement for applying the Panel ARDL model, which allows for a combination of I(0) and I(1) variables. The consistency across different unit root tests strengthens the reliability of the findings and confirms the absence of spurious relationships in the dataset. Overall, the results justify proceeding with cointegration analysis to explore the existence of long-run equilibrium relationships among the variables.

Table 4. Unit root test.

Variable	IPS		CIPS		CADF	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
LLCF	-2.114	-6.592***	-2.087	-5.218***	-1.902	-4.386***
LGDP	-2.083	-3.387***	-2.041	-3.451***	-0.214	-4.207**
LGDP2	-2.057	-3.462***	-2.015	-3.498***	-1.084	-5.402***
LAI	-3.318***	-8.521***	-3.276**	-5.108***	-3.295***	-4.012***
LENT	-2.041	-4.103***	-2.118	-3.764***	-1.438	-4.512***
LFA	-0.264	-3.438***	-1.598	-3.382***	-0.603	-3.245***
LURBA	-0.612	-4.098***	-2.031	-4.102***	-1.721	-4.155***

Note: *** and ** denote significance level at 1% and 5%, respectively.

After confirming the stationarity of the variables, the next step is to examine the existence of a long-run equilibrium relationship among them. For this purpose, the Pedroni panel cointegration test is employed, and the results are reported in *Table 5*. The test provides both within- and between-dimension statistics to assess cointegration across the panel. The findings reveal that several key statistics, particularly the Panel PP statistic and Panel ADF statistic, are statistically significant at the 1% level, leading to the rejection of the null hypothesis of no cointegration. Similarly, the Group PP and Group ADF statistics in the between-dimension analysis also indicate strong evidence of long-run relationships among the variables. Although a few statistics, such as the Panel v and Panel rho statistics, are not significant, the majority of the results consistently support the presence of cointegration. These outcomes confirm that the variables move together in the long run, indicating a stable equilibrium relationship between environmental sustainability and its determinants. This argument provides a strong justification for proceeding with the Panel ARDL estimation to capture both short-run dynamics and long-run effects.

Table 5. Panel cointegration test results.

Statistic	Value	Prob.
Panel v-Statistic	0.412	0.336
Panel rho-Statistic	0.684	0.742
Panel PP-Statistic	-4.028***	0.000
Panel ADF-Statistic	-3.517***	0.000

Note: *** denotes significance level at 1%.

The results of the Panel ARDL model are presented in *Table 6*, capturing both the long- and short-run dynamics of environmental sustainability in the Nordic region. The long-run estimates reveal that economic growth (LGDP) exerts a negative, statistically significant effect on the LCF, indicating that the initial stages of economic expansion contribute to ecological pressure. However, the coefficient of GDP squared (LGDP2) is positive and significant, confirming the validity of the LCC hypothesis. It suggests that beyond a certain income threshold, economic growth supports environmental recovery through technological advancement and structural transformation [8]. AI innovation (LAI) demonstrates a positive and significant relationship with LCF in both the short run and long run, highlighting its role in enhancing energy efficiency and promoting sustainable practices. Similarly, environmental taxation (LENT) shows a positive and significant impact, indicating that fiscal policy instruments effectively improve ecological quality by discouraging pollution-intensive activities. In contrast, Financial Accessibility (LFA) exhibits a negative and statistically significant effect, suggesting that increased financial expansion may stimulate environmentally harmful economic activities [24]. Urbanization (LURBA) also negatively affects LCF, reflecting the environmental pressure associated with rapid urban growth and increased resource demand [26]. In the short run, the error correction term is negative and significant, confirming the existence of a stable long-run equilibrium and indicating a moderate speed of adjustment toward equilibrium after short-term shocks. Overall, the findings provide strong empirical support for the LCC framework and highlight the contrasting roles of technological innovation, fiscal policy, and economic structure in shaping environmental sustainability.

Table 6. Panel ARDL results.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long Run				
LGDP	-0.289**	0.118	-2.451	0.016
LGDP2	0.094***	0.031	3.032	0.003
LAI	0.136***	0.042	3.214	0.002
LENT	0.481***	0.152	3.165	0.002
LFA	-0.872***	0.129	-3.451	0.000
LURBA	-0.523**	0.211	-2.478	0.014
Short Run				
ECT(-1)	-0.462***	0.168	-2.750	0.007
D(LGDP)	-0.301	0.198	-1.520	0.072
D(LGDP2)	0.652***	0.204	3.196	0.001
D(LAI)	0.241**	0.119	2.025	0.045
D(LENT)	0.398**	0.182	2.187	0.031
D(LFA)	-0.138**	0.067	-2.060	0.041
D(LURBA)	-0.812*	0.439	-1.850	0.066
C	5.184***	1.624	3.191	0.002

Note: *** and ** denote significance level at 1% and 5%, respectively.

The main empirical findings of the study are visually summarized in *Fig. 2*.

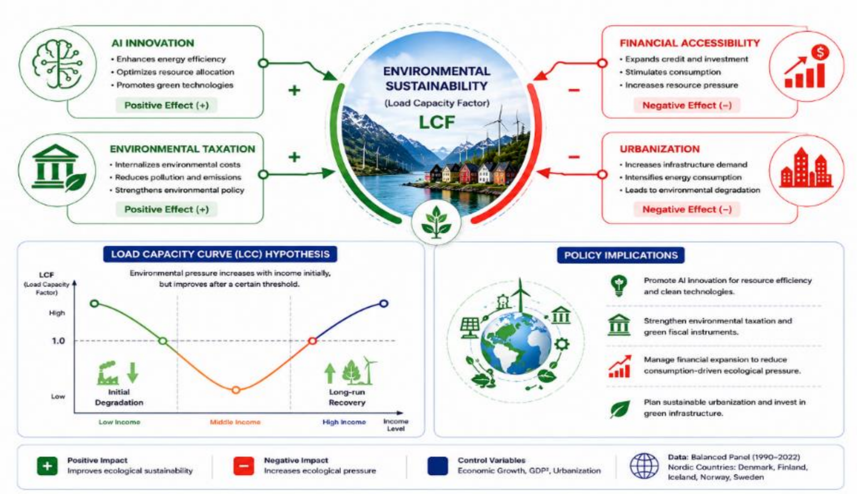

Fig. 2. Graphical summary of the findings.

5 | Conclusion and Policy Recommendations

This study examines the dynamic relationship between AI innovation, environmental taxation, financial accessibility, urbanization, and environmental sustainability in the Nordic region within the LCC framework. Using advanced panel econometric techniques, the findings confirm the existence of a long-run equilibrium relationship among the variables and provide strong empirical support for the LCC hypothesis. The results reveal that economic growth initially exerts pressure on environmental quality. Still, its squared term contributes positively to ecological recovery in the long run, indicating a transition toward sustainable development at higher income levels. Furthermore, AI innovation and environmental taxation are found to enhance environmental sustainability, highlighting the importance of technological progress and policy intervention in improving ecological outcomes. In contrast, financial accessibility and urbanization negatively affect the LCF, suggesting that unregulated financial expansion and rapid urban growth can intensify environmental degradation. The error correction mechanism confirms a stable adjustment toward the long-run equilibrium following short-term shocks.

The findings of this study provide important guidance for policymakers aiming to strengthen environmental sustainability in advanced economies. First, the LCC confirmation suggests that economic growth alone is insufficient to ensure ecological balance. Governments should therefore accelerate the transition toward sustainable growth by promoting green technologies, clean energy adoption, and resource-efficient production systems. In this regard, AI emerges as a key driver, and policymakers should encourage its development and application in environmental monitoring, smart energy management, and sustainable industrial processes through targeted incentives and research support. Second, environmental taxation is an effective tool for improving ecological outcomes. Authorities should design well-structured and progressive environmental tax systems that discourage pollution-intensive activities while supporting green innovation. Revenue generated from such taxes can be reinvested in renewable energy, environmental infrastructure, and public awareness programs. However, the negative impact of financial accessibility highlights the need for regulatory frameworks that guide financial flows toward environmentally sustainable investments. Financial institutions should be encouraged to prioritize green financing and limit support for high-emission sectors. Similarly, urbanization policies should focus on sustainable urban planning, including efficient public transportation, green buildings, and preservation of natural ecosystems. Integrating environmental considerations into financial and urban development strategies is essential for achieving long-term sustainability.

Despite its contributions, this study has several limitations. First, the analysis is limited to Nordic countries, which may restrict the generalizability of the findings to other regions with different economic and institutional structures. Second, the measurement of AI relies on patent-based indicators, which may not fully capture actual adoption and practical implementation. Third, potential interaction effects among variables are not explicitly examined. Future research can extend this study by incorporating broader country samples, alternative proxies for AI and finance, and interaction terms to explore deeper mechanisms influencing environmental sustainability.

Authors' Contributions

T. T.: writing-original draft, methodology, data curation, conceptualization, software, and visualization, and validation. M. O. F.: validation, writing-review and editing, and formal analysis. K. M.: writing-review and editing, formal analysis, and investigation. S. I. T.: writing-review and editing, formal analysis, and investigation. The authors have read and agreed to the published version of the manuscript.

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Data Availability

The data is available on request from the corresponding author.

Conflict of Interest

There are no competing interests to declare.

Consent for Publication

The authors have given consent for the publication of this manuscript.

Ethics Approval and Consent to Participate

The authors confirm that this research did not involve human participants or animal subjects.

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