Jurnal Ilmu Pendidikan (JIP)
Vol. 31, Issue 2, December 2025, pp. 365-375

How Can Green Innovation Strategy Enhance Higher Education Green Performance? Insights from Indonesia

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ARTICLE INFO

Article history
Received August 9, 2025
Revised Dec 11, 2025
Accepted Dec 30, 2025

Keywords
Education sustainability
Green innovation strategy
Higher education green performance
Strategic management

ABSTRACT

This study aims to describe the implementation of a green innovation strategy (GIS) to enhance university performance. A qualitative case study approach was employed. The research was conducted at a private higher education institution in Indonesia over a period of 91 days. 9 participants selected through purposive sampling took part in the study. Triangulation was adopted to compile holistic data on contextual phenomena. Thematic analysis was carried out with the support of NVivo. The findings shows that the GIS was implemented through: (1) the formulation of a GIS aligned with the university's vision and characteristics; (2) the implementation of the GIS; and (3) a strong environment-based managerial focus. Taken together, these three components have been shown to improve three green higher education performance indicators; Academic-Tridharma Indicators, Operational-Campus Environment Indicators, and Campus Governance and Participation Indicators. Thethe se results are highly valuable because they capture the successful enhancement of Higher Education Green Performance amid the widespread lag in performance improvements among universities, and also highly relevant to the targets of developing sustainable campuses. This opens up the possibility for the study to be adapted by other higher education in various developing countries around the world.

I. Introduction

The performance of higher education institutions in Indonesia remains suboptimal, despite a sharp increase in the number of institutions and student participation over the past few decades. Rosser (2023) shows that the gross higher education participation rate rose from around 2.9% in 1970 to more than 36% in 2018. However, quality indicators such as research productivity, citation impact, international collaboration, and faculty qualifications remain behind those of many universities in other countries. The position of Indonesian universities in global rankings remains weak. In 2020, no Indonesian university was listed among the top 500 in the Times Higher Education (THE) or Shanghai Ranking, and only three universities entered the QS World University Rankings (Rosser, 2023). An efficiency evaluation of research using Data Envelopment Analysis involving 191 universities in the Mandiri and Utama categories shows that only about 41% of Indonesian higher education institutions are truly efficient when considering the combination of financial and human resource inputs relative to publication outputs and other outcomes, indicating a substantial room for improvement that is urgently needed in most institutions (Dimyati & Hermanu, 2023).

Efforts to improve university performance have, in fact, been pursued through various policy and managerial instruments. The government has implemented performance-based funding schemes, clustering of higher education institutions, and research assessments that combine dimensions of resources, management, outputs, and revenue to stimulate higher scientific productivity (Dimyati & Hermanu, 2023). At the institutional level, universities have begun adopting modern performance management systems (PMS) that link strategy, key performance indicators, and intellectual capital

http://dx.doi.org/10.17977/um048v31i2p365-375

management to enhance performance across the three pillars of higher education (Tjahjadi et al., 2019). However, studies on performance management in Indonesian universities still identify various weaknesses, including governance that is not yet fully professional, fragmented use of information technology, and human resource development that is not well integrated with accreditation targets and key performance indicators (Indriati et al., 2023; Rosser, 2023). This is reflected in findings that strategies for deploying information technology and upgrading human resource competencies have not been fully translated into excellent service performance and institutional performance in many private universities (Indriati et al., 2023).

Meanwhile, in many developing countries, recent literature shows that numerous organizations have succeeded in improving performance by implementing a green innovation strategy (GIS). In general, GIS is understood as a set of strategic directions and decisions that integrate business objectives with environmental protection through product, process, and management system innovations that reduce emissions, minimize waste, and increase resource efficiency (Soewarno et al., 2019). Studies on manufacturing firms in Indonesia, Taiwan, and China, for example, find that green innovation strategies supported by a green organizational identity and environmental legitimacy can enhance green innovation performance and generate competitive advantages such as access to new markets, improved corporate reputation, and opportunities for premium pricing (Cao & Chen, 2019; Huang & Li, 2018; Soewarno et al., 2019). In small and medium-sized enterprises in developing countries, integrating green strategy with corporate social responsibility and green innovation has been shown to contribute to sustainable performance across economic, social, and environmental dimensions (Le, 2022). A systematic review of more than 200 articles also confirms that GIS implementation, although challenging, can yield "environment-inclusive" benefits, including resource efficiency, reduced environmental risk, and enhanced institutional legitimacy, when managed as a long-term strategic process (Qin et al., 2025).

However, this empirical evidence comes almost entirely from the economic and business sectors, not from higher education. The studies mentioned above focus on manufacturing firms, green supply chains, and small and medium manufacturing enterprises in various developing countries, whereas public organizations such as universities are relatively rarely used as research subjects in green innovation studies (Cao & Chen, 2019; Huang & Li, 2018; Le, 2022; Qin et al., 2025; Soewarno et al., 2019). In Indonesia, research on GIS has thus far been concentrated on manufacturing firms facing environmental regulatory pressures and demands from green consumers, not on higher education institutions (Soewarno et al., 2019). Yet universities are characterized by highly complex activities ranging from campus operations, curriculum, and research to community engagement, all of which are potentially closely linked to sustainability agendas. This gap opens opportunities to develop new approaches for enhancing university performance that are oriented not only toward traditional indicators but also toward contributions to sustainable development.

GIS that is aligned with international sustainable development agendas, such as the Sustainable Development Goals (Cai & Wolff, 2022), holds considerable potential as one answer to the performance challenges of Indonesian higher education institutions (Al-Filali et al., 2023). From the perspectives of dynamic capability theory and the resource-based view, a green strategy can be viewed as a strategic resource that is difficult to imitate because it combines technological capabilities, a green organizational culture, and supportive stakeholder relationships (Le, 2022; Soewarno et al., 2019; Yang et al., 2023). For universities, the implementation of this strategy can be realized through the development of green campuses, the integration of sustainability themes into curriculum and research, the efficient management of physical assets and energy, and the development of low-carbon, technology-based academic services. Such efforts have the potential to enhance research and teaching performance, strengthen reputation and accreditation, and attract external funding that increasingly requires clear environmental commitments (Dimyati & Hermanu, 2023; Indriati et al., 2023; Tjahjadi et al., 2019). However, given the novelty of the GIS discourse in Indonesian higher education, no empirical reports have yet been found on the systematic application of this strategy within national universities, whether public or private, in the available research corpus.

Building on this gap, the present study aims to provide an in-depth description of a case of GIS utilization to improve the performance of a private higher education institution in Indonesia. The focus on a private university is particularly relevant because such institutions face a dual pressure: intense competition in the higher education market and resource constraints, alongside the need to meet increasingly complex accreditation standards and key performance indicators (Indriati et al., 2023; Rosser, 2023; Yang et al., 2023). By adopting a green innovation lens, this study seeks to examine how green strategies are formulated, integrated into governance and performance management systems, and implemented in operational and academic practices in one private university. At the same time, the research investigates the changes that occur in key performance indicators, such as research productivity, the quality of academic services, operational efficiency, and the achievement of other institutional targets, after the strategy is put into practice (Dimyati & Hermanu, 2023; Tjahjadi et al., 2019).

Theoretically, this study is expected to contribute to the literature on higher education management and green

innovation by bridging two streams of scholarship that have thus far developed relatively independently. On the one hand, studies on the performance of Indonesian universities have highlighted the importance of performance management systems, intellectual capital, leadership, learning orientation, and strategic flexibility as determinants of organizational performance (Indriati et al., 2023; Tjahjadi et al., 2019; Yang et al., 2023). On the other hand, the green innovation literature has shown that GIS, when supported by green organizational identity, environmental legitimacy, and resource alliances with partners, can enhance sustainable organizational performance across sectors (Cao & Chen, 2019; Huang & Li, 2018; Le, 2022; Qin et al., 2025; Soewarno et al., 2019). By examining a concrete case in an Indonesian private university, this study has the potential to formulate an initial model of how green innovation principles can be adapted to the higher education context and how they interact with existing performance management systems and intellectual capital.

From a practical standpoint, the findings of this study are expected to be useful for policymakers and higher education practitioners. For government bodies and quality assurance agencies, the results can inform the integration of green innovation and sustainability dimensions into performance-based funding policies, accreditation instruments, and capacity-building programs for universities. For university leaders and managers, this case study can serve as a practical reference for designing a contextualized GIS roadmap, including how to align leadership, organizational learning, strategic flexibility, and the use of information technology to drive a green transformation that positively affects service performance, research, and institutional reputation (Indriati et al., 2023; Tjahjadi et al., 2019; Yang et al., 2023).

Ultimately, this research is expected to inspire more green innovation initiatives within Indonesian higher education so that institutional performance is assessed not only in terms of academic and economic achievements but also by its contributions to environmental sustainability and the broader well-being of society (Le, 2022; Qin et al., 2025).

II. Method

A. Research Approach

In this study, a qualitative case study approach (Busetto et al., 2020; Charli et al., 2022; Manek et al., 2016) was employed to describe how GIS is used to improve the green performance of a private higher education institution in Indonesia. The qualitative approach was chosen because it is well-suited to reporting the results of an in-depth investigation within a specific contextual phenomenon and allows the reported findings to be interpreted and applied to broader, similar contexts.

B. Research Question

In line with the aims and approach of the study, the research question was formulated as an investigative and elaborative question (Creswell & Creswell, 2018; Merriam & Tisdell, 2016), namely: how are the stages of utilizing GIS to enhance the green performance of private higher education institutions in Indonesia.

C. Research Location

This study was conducted at a private higher education institution, which, at the request of the participants, will hereafter be referred to as "Higher Education X." It is a medium-sized private university located in Purwakarta Regency, West Java, with approximately 247 lecturers and 5,003 students distributed across various faculties and study programs. Amid intense competition among private universities and regulatory pressures from national accreditation, the university leadership considers that institutional performance can no longer be deemed adequate if assessed solely by graduation rates or academic reputation. Still, it must also be evaluated in terms of strategic leadership capacity, organizational capabilities, and long-term sustainability for its stakeholders (Yang et al., 2023). In recent years, Higher Education X has positioned itself as a campus committed to integrating a green innovation strategy (GIS) into all teaching, research, and community engagement activities, so that the implementation of the three pillars of higher education does not proceed in isolation but rather mutually reinforces them. This shift in orientation aligns with the view that higher education institutions in developing countries play a key role in driving green innovation and social transformation amid increasingly complex environmental and socio-economic pressures (Yang et al., 2023). The tendencies identified by the author at Higher Education X make this institution an ideal research site, as they are closely aligned with the aims of the study.

D. Data Compilation.

The data in this study consist of perceptible events, documents that trace the stages of GIS utilization within the scope of the university's internal management, and information provided by policy makers and policy implementers at the institution. Given this variety of data, a triangulation approach was adopted as the data collection technique (Dahal, 2025). Three instruments were developed to guide data collection. First, every event directly observed by the researcher was recorded on an observation sheet. Second, a document identification sheet instrument was used to categorize relevant documents. Third, an in-depth, semi-structured interview instrument (Bingham, 2023; Bingham & Witkowsky, 2021) was used to guide interviews with purposively selected research participants (Merriam & Tisdell, 2016).

The instruments were derived from the GIS indicators described by Le (2022) and subsequently refined through a focus group discussion (FGD) with an actively involved

research expert in education. In turn, the final version of the interview instrument was jointly agreed upon and used as the initial guide for the conversations. Considering the roles of internal management actors relevant to the research theme, nine research participants were purposively selected from the study site. The study was conducted at a private higher education institution in Indonesia over 91 days, from 1 July to 29 September 2025. Sixty-one of these days were used for an integrated process of data compilation and analysis, while the remaining 30 days were devoted to preparing the research report.

E. Data Analysis

From the data compilation process, three types of data were obtained: interview transcripts, observation notes, and document annotations that demonstrate the implementation of GIS in university management to improve institutional performance. Owing to its suitability for examining factual conditions within specific contexts (Braun & Clarke, 2023; Charli et al., 2022), thematic analysis was employed to process these data. This thematic analysis procedure was carried out in six stages, as described by Ahmed et al. (2025), using NVivo version 12, which is considered reliable for facilitating data analysis in qualitative research (Pongsakorn, 2023).

In the first stage (familiarization with the data), the researchers engaged deeply with the raw information, which comprised interview transcripts, technical guidance documents governing school locations, and observational records of newly implemented school arrangements. They repeatedly read through these materials, compiling preliminary notes and composing reflective memos to build early understandings of the data. In the second stage (Generating Initial Codes), the researcher conducted a systematic process to identify codes or central ideas across the entire dataset, with each code representing a brief synthesis of a particular data segment. At this point, NVivo software was employed to assist with the analysis. In the third stage (Searching for Themes), the researcher organized the codes into broader themes as higher-level data groupings and explored both explicit and implicit linkages between these themes and the research questions through interpretive analysis.

The procedure advances to the fourth stage (Reviewing Themes). At this stage, themes were scrutinized to ensure internal consistency and alignment among the themes, the research questions, and other themes. To capture the similarities and differences across themes, the researchers revisited the original data, checking whether each theme accurately reflected the evidence. Based on this review, some themes could be combined, divided into more specific themes, or removed if no longer relevant. Next, in the fifth stage (Defining and Naming Themes), after completing the previous step, the researcher sharpened the core meaning of each theme and articulated how each theme addressed the research question, thereby delineating the study's focus. Once finalized, each theme was labelled with concise words or phrases and supported by detailed explanations to improve transparency. Finally, in the sixth stage (Writing the Report), the researcher conveyed the analytical results in a logically structured descriptive narrative. The written report provided rich descriptions of the themes, illustrative data extracts, and interpretive commentary, thereby addressing the research questions and linking the empirical findings to the existing literature. To support the data display, mind maps were generated in NVivo and will be integrated with Canva.

F. Ethical Clearance

Compliance with applicable scientific ethical standards was strictly enforced throughout the research process (Pietilä et al., 2020). The selected participants were chosen not only because their roles were directly related to GIS practices at their university, but also because their informed consent had been obtained. Accordingly, all of them took part in the data collection process voluntarily (Lavee & Itzchakov, 2023). Interviews were conducted only based on scheduled appointments mutually agreed upon by the researcher and the participating informants. To ensure anonymity, the real names of all participants were concealed and replaced (Bredal et al., 2024) with subject codes: “P1” for participant 1, “P2” for participant 2, and so on (Bredal et al., 2024). Finally, the ethical standards observed in this study also included maintaining the confidentiality of the private university’s real name as the research site. Therefore, at the request of the internal policy makers, the institution is referred to as “Higher Education X.

III. Results and Discussion

A. First Theme: Green Innovation Strategy Formulation

At Higher Education X, the idea of a green innovation strategy (GIS) emerged from the concerns of the Foundation's board and the rectorate in responding to accreditation pressures, competition among private universities, and the ecological vulnerability of Purwakarta, which is surrounded by industrial zones. They realized that university performance could no longer be adequately measured solely by student intake figures or accreditation rankings, but also by the ability to lead change, develop organizational capabilities, and safeguard the institution's long-term sustainability, as emphasized in studies of leadership and performance in Indonesian private higher education institutions (Yang et al., 2023).

In response to this awareness, the university leadership organized a series of strategic workshops bringing together the rector, deans, heads of study programs, faculty representatives, and members of the Foundation. In these forums, GIS was not discussed as an add-on project, but as a new lens through which to view the entire Tridharma: how a green vision should infuse the curriculum, research directions, and community service programs. This

approach is consistent with the argument that organizations oriented toward learning and endowed with strategic flexibility are better positioned to leverage green innovation to improve long-term performance (Yang et al., 2023).

One dean described this shift in perspective succinctly: "In the past, strategic meetings were all about the numbers. Like how many new students, how many indexed journals. Now the rector invites us to think about what kind of footprint this campus wants to leave for this city and for the planet" (Interview P1, July 3, 2025). For P1, the discursive move from "numerical targets" to a "sustainability footprint" made GIS feel more human and more relevant to the everyday lives of the academic community.

At the Foundation level, the commitment to GIS was translated into a multi-year strategic plan and budgeting documents that explicitly identified the strengthening of green programs as a funding priority. A member of the Foundation referred to this step as an effort to "secure the future of the campus as well as the future of the environment in which we live" (Interview P3, July 5, 2025). This structural support from the institutional owner aligns with findings that a robust green strategy requires a combination of top management commitment and the integration of sustainability values into the organization's core policies (Le, 2022).

For lecturers and administrative staff, the process of formulating GIS was experienced as an invitation to reframe their professional roles. A young lecturer explained, "Once the university started to speak seriously about green innovation, I began to think: the courses I teach, the research topics I choose, even the community service projects I supervise, should be helping residents reduce the environmental burdens they face every day" (Interview P2, July 11, 2025). This way of thinking is consistent with literature that stresses the importance of linking green innovation to tangible social and environmental benefits, rather than merely complying symbolically with sustainability trends (Le, 2022).

Through this series of processes, Higher Education X articulated several core GIS principles: the campus as a "living laboratory" for sustainability practices; the Tridharma as an integrated ecosystem for green innovation; and partnerships with local communities and businesses as shared arenas for testing sustainable solutions. These principles then served as the basis for defining performance indicators, such as the number of courses integrating environmental issues, the proportion of research focusing on green innovation, and the scale of impact of community engagement programs. This represents a concrete form of translating green, performance, and strategy concepts in the context of a private university in Indonesia (Le, 2022; Yang et al., 2023).

B. Second Theme: Green Innovation Strategy Implementation

After the vision and principles of the green innovation strategy (GIS) were agreed upon, Higher Education X entered the implementation phase across faculties, study programs, the library, and supporting units. This implementation not only involved installing green facilities but also changes in everyday behaviors and academic practices, in line with the trend of many universities developing green campus programs to foster more comprehensive sustainability awareness (Urquiza Gómez et al., 2015). At the university level, the rectorate set several annual performance targets related to GIS, such as the number of courses integrating environmental issues, the volume of green-themed research activities, and sustainability-oriented community service programs, which were then cascaded into the work plans of each unit, referring to performance indicators for modern higher education institutions (Yang et al., 2023).

At the faculty and study program levels, GIS implementation was clearly visible in curriculum revisions and teaching practices. Some programs introduced new sustainability courses, while others embedded green innovation modules into existing courses, such as operations management, entrepreneurship, or community education. A head of the study program described this change as follows: "We agreed that every graduate should have completed at least one project with a positive environmental impact, whether it is a product design, a social campaign, or a simple technological solution" (Interview P3, July 21, 2025). This project-based approach reflects the principle that practical green innovation requires integrating technical knowledge with social and environmental sensitivity (Le, 2022).

The library and learning resource units became another locus of GIS implementation through digitization of collections, reduced paper use, and energy-efficient management of learning spaces. Library staff recounted how the “paper-lite” policy drove a shift from physical forms to a digital lending system, while electricity consumption displays were installed in several reading rooms as visual reminders for users. “At first, many people complained about why everything is online? But over time, they felt proud when they learned that the campus’s carbon footprint could gradually decrease,” said one librarian (Interview P4, August 1, 2025). Such practices are consistent with findings that structured green campus programs can enhance sustainability awareness and practices among the academic community (Urquiza Gómez et al., 2015).

Administrative and support units, such as general affairs, logistics, and information technology. Implemented GIS primarily through procurement policies and facilities management. Procurement processes began to require environmental criteria, such as the energy efficiency of electronic equipment or certification of

recycled materials. At the same time, office waste management shifted toward sorting and collaboration with local recycling partners. One administrative staff member explained, "Previously, we purchased goods based only on price and functional needs. There is now an additional column in the form: environmental impact. So, we are forced to think about whether this item will contribute to the waste problem five years from now" (Interview P5, August 3, 2025). This approach aligns with the concept that integrating green strategy and social responsibility practices into day-to-day operations can strengthen an organization's sustainable performance (Le, 2022).

To ensure that GIS implementation remained on track, Higher Education X developed a monitoring mechanism that combined academic performance indicators with green indicators. Some indicators were drawn from higher education performance frameworks that emphasize leadership and organizational capabilities, such as faculty participation in green innovation projects and cross-unit collaboration (Yang et al., 2023). Other indicators mirrored standard green campus monitoring practices, such as energy consumption per square meter of building space, the area of green open space, and the volume of waste successfully recycled, to capture more tangible environmental impacts (Ahmad & Wu, 2022; Cao & Chen, 2019). A senior lecturer summed up this experience by noting, "Now evaluation meetings no longer talk only about student numbers and journals, but also about how green our ways of working are from day to day" (Interview P6, August 1, 2025).

C. Third Theme: Managerial Environmental Concern

Behind the implementation of GIS at the faculty and study program levels, Higher Education X built a relatively strong foundation of environment-based management through a combination of formal policies, organizational structures, and financial support from the governing Foundation. The Foundation's leader and the rectorate agreed that sustainability is not merely a project-based program, but a governance principle that must be reflected in the campus vision, strategic plans, and budgeting systems, in line with the view that an effective green campus requires the integration of on environmental policies into the core governance of the institution (Yang et al., 2023). One Foundation board member described this orientation as follows: "If the policies do not change, green programs will only become banners and posters. That is why we embedded environmental indicators directly into the campus work plans and annual budgets" (Interview P7, July 27, 2025).

This commitment was realized through the establishment of a small team under the Vice-Rector for Planning and Finance, tasked with mainstreaming environmental aspects across the management cycle, from planning and implementation to program evaluation. The team developed an environment-based management guideline that regulates, for example, building energy-efficiency standards, waste-management procedures, carbon-footprint reporting mechanisms, and procurement procedures for goods and services that prioritize environmentally friendly products. This approach is consistent with studies on green campus implementation that emphasize the importance of institutional structures and clear internal regulations to ensure that sustainability efforts do not remain confined to isolated initiatives by individual lecturers or students (Ahmad & Wu, 2022; Cao & Chen, 2019).

The Foundation also assumed the role of "guardian of consistency" through incentive policies and budgetary control. Programs and units that performed well on green indicators. For example, reduced energy consumption, increased green space, or successful campus waste bank management were given priority in access to funding and facility support. Conversely, proposals for new physical infrastructure were required to include an environmental impact analysis and an energy efficiency plan as prerequisites for funding approval. This practice aligns with findings from various studies showing that the success of green campus initiatives is strongly influenced by the strength of leadership policies and the availability of resources consistently allocated to environmental agendas (Abbass et al., 2022; Adenle et al., 2020).

However, the strengthening of environment-based management at Higher Education X has not been without challenges commonly found in many other universities, such as budget constraints, uneven levels of understanding across the academic community, and time-consuming environmental certification or audit processes (Statistik, 2015). A bureau head. Acknowledging, "In budget meetings, there is always a tug-of-war between routine operational needs and green investments. But the Foundation is quite firm: if two programs are equally important, the one with clearer environmental benefits goes first" (Interview P8, August 19, 2025). To address resistance and limited understanding, the university organized various internal outreach activities and training sessions on green campus concepts and green innovation, in line with research recommendations that stress the importance of continuous education for the academic community to reduce barriers to green campus implementation (Abbass et al., 2022; Adenle et al., 2020).

The human dimension of environment-based management is evident in the leadership's involvement of lecturers, administrative staff, and students in decision-making processes, through regular consultation forums. From senate meetings to open dialogues at the faculty level, these are used to discuss priorities for green programs and to listen to the experiences of everyday campus-space users. An environmental activist student described their experience as follows: "We were invited to sit together, not just asked to show up when there was a tree-planting event. Our voices about the canteen, campus transportation, and open spaces were genuinely heard"

(Interview P9, August 27, 2025). In this way, environment-based management at Higher Education X does not exist merely as documents and indicators. Still, it becomes a collective process that connects the Foundation's vision with the daily practices of the academic community, as advocated in the green campus. The literature emphasizes collaboration and participation of all stakeholders.

D. Synthesis of Results

The in-depth investigative findings of this study reveal three main themes that emerge in the implementation of the green innovation strategy (GIS), namely Green Innovation Strategy Formulation, Green Innovation Strategy Implementation, and Managerial Environmental Concern. Through the lens of these three themes, Higher Education X has succeeded in improving indicators across three domains of green higher education performance: Academic-Tridharma Indicators, Operational-Campus Environment Indicators, and Campus Governance and Participation Indicators. Look at Figure 1.

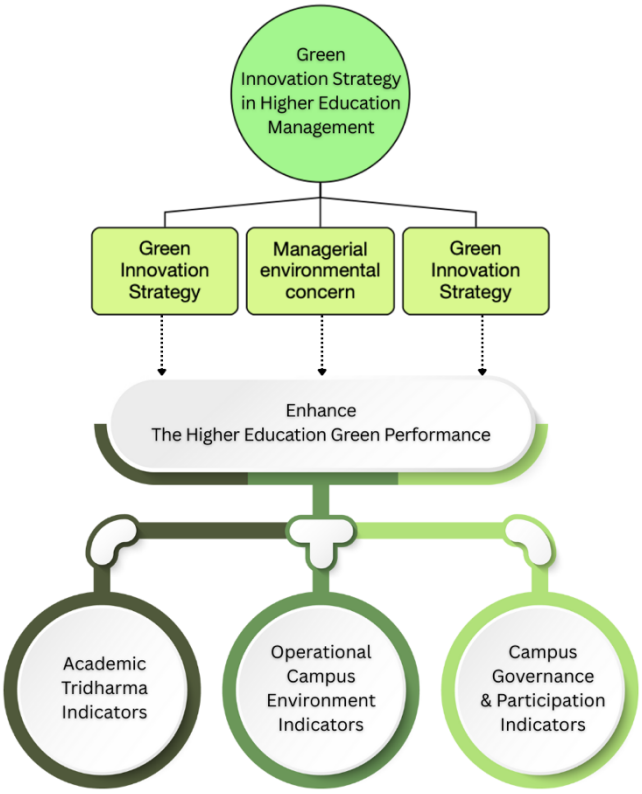

Fig. 1. Mind Map of Green Innovation Strategy to Enhance the Higher Education Green Performance. Source: Thematic Analysis with NVivo and Display by Canva

The Academic-Tridharma Indicators, Operational-Campus Environment Indicators, and Campus Governance and Participation Indicators illustrated in Figure 1 are all consistent with prevailing green campus performance assessment practices that emphasize curriculum, energy, waste, and green open space (UI Green Matric World University Rankings, 2024).

The Academic-Tridharma Indicators are reflected in the number of courses that explicitly integrate environmental issues and green innovation across study programs; the volume of research on green innovation and sustainability relative to total faculty research; the scale and depth of community service programs oriented toward environmental solutions for surrounding communities; and the quality of students' learning experiences, for example, the requirement that each graduate complete at least one project with a positive environmental impact (a product, social campaign, or simple technological solution).

The Operational-Campus Environment Indicators are evident in the reduction of paper consumption through digitization policies and "paper lite" practices in the library and administrative units; improvements in energy efficiency and reductions in the carbon footprint through energy saving management of learning spaces and monitoring of electricity use per room and per square meter of building area; the expansion and enhancement of green open spaces on campus; and the volume of waste that is successfully sorted and recycled, including the performance of the campus waste bank and collaborations with local recycling partners.

Meanwhile, the Campus Governance and Participation Indicators are clearly visible in the integration of environmental indicators into strategic plans and annual budgeting systems (with an increasing share of funds and priority programs allocated to green initiatives); faculty participation in green innovation projects and the extent of cross unit collaboration in implementing GIS programs; the consistency of policies issued by the Foundation and university leadership (such as providing incentives for units with strong green performance and requiring environmental impact analyses for new physical development); and the degree of involvement of faculty members, administrative staff, and students in decision making processes related to green programs, as reflected in regular consultation forums and responsiveness to feedback from campus users.

This qualitative report positions the implementation of GIS at Higher Education X as a holistic strategic process, beginning with Green Innovation Strategy Formulation, moving through Green Innovation Strategy Implementation, and extending to Managerial environmental concern. It then traces how these three elements interlink with the three domains of green higher education performance that parallel the emphases of UI Green Matric World University Rankings (2024), namely curriculum, energy, waste, and green space. These findings go beyond much of the previous literature, which tends to capture only a single dimension. For example, academics' attitudes toward Education for Sustainability (EfS) without directly connecting them to institutional performance change, or, conversely, a narrow focus on indicator measurement without exploring the

strategic processes and actor dynamics underlying those indicators (Christie et al., 2015; Urquiza Gómez et al., 2015).

E. Green Innovation Strategy Formulation and Academic Domain

Within the domain of Green Innovation Strategy Formulation, Higher Education X explicitly integrates environmental issues and green innovation into curricula across study programs, promotes faculty research on sustainability themes, and ensures that every graduate gains experience in projects with positive environmental impact. This configuration turns the Academic-Tridharma Indicators into more than a mere checklist of activities; they become the manifestation of a deliberately crafted green academic strategy. This both reinforces and extends the findings of Christie et al. (2015), who showed that academics generally support EfS but face obstacles when attempting to embed it into curricula. This study demonstrates how such barriers can be overcome through an explicit, cross-disciplinary GIS formulation that is tightly linked to graduate learning outcome targets.

Furthermore, the academic dimension in this study resonates with the Adaptable Model for Assessing Sustainability (AMAS) framework, which positions education, research, and community engagement as the main channels through which universities influence sustainable development, usually mapped through aggregate quantitative indicators (e.g. Urquiza Gómez et al., 2015). Rather than stopping at that level, this study adds a qualitative layer that reveals the "story behind the numbers": how curricular decisions, research incentives, and the design of community engagement programs are strategically interwoven into GIS. This enables stakeholders in developing countries to observe the mechanical process of change and its constituent stages, not merely the outcomes.

F. Green Innovation Strategy Implementation and Campus Environment

At the level of Green Innovation Strategy Implementation, Higher Education X operationalizes its green strategy through "paper-lite" policies, energy management and monitoring of electricity consumption per room and per square meter, institutionalized waste separation and recycling, and the expansion of green open spaces. All these practices are reflected in the strengthening of the Operational-Campus Environment Indicators. This approach is consistent with the campus sustainability assessment literature (Adenle et al., 2021; Ahmad & Wu, 2022), which emphasizes the importance of operational dimensions in managing energy, water, waste, and land use. However, unlike prior related studies, this research does not stop at the design of measurement tools; instead, it qualitatively traces how these policies and operational practices emerge from and, in turn, reinforce the previously formulated GIS (Lo-Iacono-Ferreira et al., 2018; Urquiza Gómez et al., 2015).

In the context of developing countries, this focus on concrete implementation is highly relevant to findings from Nigeria, where the selection and weighting of sustainable campus indicators highlight the importance of transportation, carbon footprint, and spatial data for thoughtful campus planning, yet many universities face constraints in infrastructure and data availability (Adenle et al., 2020, 2021; Harris et al., 2021). The findings in this section offer complementary lessons: even without sophisticated, innovative campus systems, universities can reduce their ecological footprint through a combination of low-cost operational policies and the strengthening of a green work culture anchored in GIS. This provides a realistic example for higher education institutions operating under similar resource limitations.

G. Managerial Environmental Concern and Participation Domain

The most distinctive contribution of this study lies in sharpening the dimension of Managerial environmental concern and its relationship with the Campus Governance and Participation Indicators, namely, how the ecological concern of senior leaders and the foundation is translated into the integration of green indicators within strategic plans, budgeting, incentive systems, and the design of participation forums for the academic community. The literature on environmental management systems in higher education does indeed emphasize the importance of top management commitment and policy as the foundation for formulating indicators and Key Performance Indicators (KPIs), but it tends to portray formal aspects (policies, targets, procedures) without capturing the dynamics of managerial concern in everyday decision-making (Adair & Jaeger, 2016; Alshubiri, 2021; Amjad et al., 2021; Lo-Iacono-Ferreira et al., 2018).

Against this backdrop, the present study fills the gap by showing that managerial environmental concern is not merely a normative precondition but a driving force that bridges GIS with tangible changes in budgeting, incentives, and deliberative processes on campus. This deepening of the relationship between managerial concern, indicators, and performance also enriches the discourse on sustainability KPI networks, which have recently been analyzed using social network analysis and MICMAC to identify "driver" indicators that exert the most significant influence on others, such as the purchase of green products and collaboration with environmentally responsible suppliers (H. Bashir et al., 2023; M. F. Bashir et al., 2024).

While those studies map the structural relationships among performance metrics, this research illustrates how such indicators are born and "sustained" through the value sensitivities and decisions of campus leaders within the local social, political, and cultural context of an Indonesian university, thereby generating a more humanistic narrative of how green KPIs acquire their vitality in day-to-day practice.

H. Novelty and Relevance for Developing Countries

Compared with the various campus sustainability assessment models generally developed in Europe, North America, or East Asia, this study presents a comprehensive portrait of GIS implementation at an Indonesian university by simultaneously linking three core processes: Green Innovation Strategy Formulation, Green Innovation Strategy Implementation, and Managerial environmental concern, with three main performance domains. Through this in-depth qualitative approach, the results differ from most research that focuses primarily on developing measurement tools or conducting multi-campus surveys. As such, the study offers a form of novelty that is particularly important for developing countries, namely a contextual understanding of *how* universities with limited resources can design, execute, and manage green innovation strategies in a gradual yet purposeful manner (Adenle et al., 2020, 2021; Christie et al., 2015; Urquiza Gómez et al., 2015).

By combining lenses of policy-strategy, curriculum and Tridharma, campus operations, and participatory governance, this study not only addresses the scarcity of qualitative GIS case studies in Indonesian higher education, but also provides practical insights that can be adapted by universities in other developing countries facing similar pressures: demands from global green rankings, funding constraints, and the need to maintain social relevance within surrounding communities. Its rich and human-centred implementation narrative, from "paper-lite" policies and student projects with positive environmental impacts to incentive mechanisms and green consultation forums, helps bridge the gap between the technical language of sustainability indicators and the everyday realities of the academic community. This makes the research not only scientifically original but also inspiring for sustainable campus practice in a wide range of global contexts.

IV. Conclusion

Through an in-depth case analysis, Higher Education X demonstrates that a green innovation strategy (GIS) implemented through (1) the formulation of a green innovation strategy aligned with the university's vision and characteristics, (2) the implementation of the green innovation strategy, and (3) a strong focus on environment-based management, collectively and integratively improves three green higher education performance indicators: Academic - Tridharma Indicators, Operational-Campus Environment Indicators, and Campus Governance and Participation Indicators. These results are valuable not only because they capture the successful enhancement of Higher Education Green Performance amid a broader landscape in which many universities struggle to improve, but also because they are directly relevant to the pursuit of sustainable campus development in developing-country contexts. This makes the study potentially adaptable for other higher education institutions across developing countries worldwide. At a time when GIS applications in the literature are predominantly reported in the business and manufacturing sectors, this study offers a comprehensive picture of how GIS is adopted and functions to improve Higher Education Green Performance. It illustrates an intersectoral theoretical practice that transfers insights from the business and manufacturing sectors into higher education. Moreover, compared with several other relevant studies on sustainable campuses that primarily focus on partial measurements of sustainability aspects, these findings show how green innovation strategy operates across all lines of campus life, thereby accelerating improvements in higher education's green performance. This constitutes a strong form of novelty and signals a pioneering contribution within this field. The practical implication of the research is the use of GIS in university management to enhance institutional performance and sustainability. Finally, follow-up studies using a quasi-experimental approach are recommended.

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