



Empowering Low-Carbon Behavior through Sustainable Leadership and Green Intellectual Capital in Indonesia's Public Administration

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Abstract

Governments worldwide face increasing pressure to reduce carbon emissions and align with global climate commitments. Civil servants in Indonesia play a crucial role in implementing policies that advance low-carbon development. While sustainable leadership (SL) is considered essential in shaping pro-environmental behavior, the pathways through which leadership influences employee low-carbon behavior (LCB) remain underexplored. This study examines the mediating role of green intellectual capital (GIC) in the relationship between SL and LCB. A quantitative survey was conducted with 348 civil servants (ASN) across ministries, local governments, and public agencies in Indonesia. Data were analyzed using partial least squares structural equation modeling (PLS-SEM) with SmartPLS 4. Robustness checks were performed to address common method bias, non-response bias, and endogeneity. The results reveal that SL does not directly influence LCB; instead, its effect is fully mediated by GIC. This indicates that leadership contributes to carbon-reducing behaviors primarily by building organizational knowledge, skills, and systems that support sustainability. The study extends the resource-based view by showing how SL enhances organizational resources, which in turn drive employee behavior. Practically, the findings highlight the importance of leadership development and green knowledge management as policy levers for achieving Indonesia's net-zero goals.

Keywords: *Sustainable Leadership, Green Intellectual Capital, Low-Carbon Behavior, Public Sector, Indonesia*

INTRODUCTION

Countries are under mounting pressure to cut carbon emissions and align national actions with the Paris Agreement (Sampene *et al.*, 2021; Wiredu *et al.*, 2023). Because climate outcomes hinge on everyday choices, effective policies must target human behavior (Steg *et al.*, 2017). Evidence likewise shows that addressing environmental problems requires shifts in both cognition and behavior across sectors (Wang *et al.*, 2021). In Indonesia, one of the world's major greenhouse gas emitters with a pledge to reach net-zero by 2060, understanding low-carbon behavior (LCB) and its drivers is therefore essential (World Bank, 2019; Ministry of Environment and Forestry, 2021).

Within this agenda, civil servants (Aparatur Sipil Negara/ASN) are pivotal to advancing *Asta Cita Pembangunan Indonesia*, the eight strategic goals spanning economic, social, and environmental dimensions (Ministry of National Development Planning/ Bappenas, 2022). As frontline implementers, they ensure service delivery, oversee state administration, and help stabilize socio-economic-environmental systems that underpin national development (BPS - Statistics Indonesia, 2024). Ongoing bureaucratic reform emphasizes efficiency, optimizing personnel spending and adopting output-based performance systems, to raise productivity while containing fiscal burdens (World Bank, 2019; OECD, 2021). Properly targeted, these reforms foster inclusive, sustainable growth and strengthen Indonesia's global competitiveness (OECD, 2021). Administrative efficiency also creates fertile ground for LCB, for example, through digitalization

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that reduces paper use, official travel, and energy-intensive routines. Such changes streamline resource-heavy procedures, curb emissions, and reinforce low-carbon development principles central to the *Asta Cita* agenda while bolstering public trust ([Transparency International, 2022](#)). Professional capacity building further enables practical actions, adopting public transport, deploying renewables in government buildings, and institutionalizing green workplace practices ([Kementerian PAN-RB, 2023](#)). Given Indonesia's continued reliance on non-renewables ([International Energy Agency \(IEA\), 2021](#)), cultivating LCB among ASN is a direct pathway to reducing environmental impacts across government operations.

A growing body of work highlights green intellectual capital (GIC), the knowledge, skills, systems, and relationships oriented toward environmental stewardship, as a core enabler of sustainability performance ([Chen, 2008](#); [Brusca et al., 2020](#); [Weqar & Haque, 2020](#)). Strong GIC helps organizations optimize resources, cut waste and emissions, and align missions with societal expectations, thereby enhancing legitimacy and trust ([Buhaya & Metwally, 2024](#)). In the public sector, investments in green human capital (training, awareness), green structural capital (processes, technologies), and green relational capital (stakeholder collaboration) can translate sustainability aspirations into routine low-carbon practices.

Concurrently, research on sustainable leadership (SL) shows that leaders who integrate environmental, social, and ethical considerations can mobilize pro-environmental behaviors and long-term sustainability outcomes ([Avery & Bergsteiner, 2011](#); [Pless & Maak, 2012](#); [Yu et al., 2024](#)). In bureaucratic settings, SL can signal priorities, provide resources, establish supportive systems, and build partnerships, conditions under which employees are more likely to adopt LCB.

Guided by the resource-based view (RBV) ([Barney, 1991](#)). We conceptualize SL as a strategic, sustainability-oriented leadership resource that cultivates GIC, which in turn equips employees to enact LCB ([Yusliza et al., 2020](#)). RBV suggests leadership does not automatically yield behavioral outcomes; rather, its effects are realized through valuable, hard-to-imitate organizational resources. We therefore position GIC as the central mechanism linking SL to employees' low-carbon actions in Indonesia's public sector.

LITERATURE REVIEW

Resource-Based View (RBV)

The resource-based view (RBV) argues that organizations gain a sustainable advantage by cultivating resources that are valuable, rare, inimitable, and non-substitutable ([Barney, 1991](#)). In this study, sustainable leadership (SL) and green intellectual capital (GIC) are conceptualized as such resources.

SL embodies a leader's ability to integrate environmental and ethical considerations into organizational vision, decision-making, and resource allocation. Through role modeling and resource support, leaders embed sustainability values across the institution.

GIC, encompassing green human capital (employees' environmental knowledge and skills), green structural capital (eco-oriented processes, systems, and technologies), and green relational capital (collaborations with external stakeholders), provides the knowledge base and infrastructure that enable employees to consistently adopt low-carbon behavior (LCB) ([Dumay et al., 2015](#)).

From the RBV perspective, SL enhances GIC, and GIC, in turn, equips employees with the competencies, routines, and relationships needed to reduce emissions in their daily work.

Sustainable Leadership and Low-Carbon Behavior

Leadership plays a central role in shaping employee attitudes and behaviors. Prior research shows that transformational, responsible, and ethical leadership styles promote pro-environmental practices ([Mi et al., 2019](#); [Zhang et al., 2023](#)). Sustainable leadership (SL) integrates these

approaches with a long-term sustainability orientation ([Avery & Bergsteiner, 2011](#)).

In government institutions, SL is expected to inspire LCB by fostering shared values, creating a supportive environment, and ensuring accountability for sustainability outcomes. Thus, we hypothesize:

H1. Sustainable leadership positively influences low-carbon behavior.

Green Intellectual Capital as a Mediator

Although leadership can shape employee behavior, RBV suggests that the link is indirect, operating through organizational resources. GIC represents the bundle of knowledge, structures, and relationships that translate leadership intentions into tangible practices. For example, leaders may encourage sustainability, but employees are more likely to practice LCB when training, eco-friendly systems, and external collaborations are in place ([López-Gamero et al., 2011](#); [Shahzad et al., 2025](#)).

Thus, SL enhances GIC, and GIC in turn promotes LCB by providing the tools, routines, and institutional support for environmental action. We propose:

H2. Green intellectual capital mediates the relationship between sustainable leadership and low-carbon behavior.

RESEARCH METHOD

Research Design and Sample

This study employed a quantitative survey design targeting civil servants (Aparatur Sipil Negara/ASN) across ministries, local governments, and public agencies in Indonesia. ASN are relevant because they play a direct role in implementing sustainability-related reforms and low-carbon initiatives.

A stratified random sampling approach was used to ensure representation by institution type, position, and geographic region. In total, 348 valid responses were collected. The sample was balanced in terms of gender (57% female, 43% male), covered a wide age range (18–55+ years), and included staff, supervisors, and senior officials, thus reflecting the diversity of Indonesia's public sector.

Measures

All constructs were measured using established scales on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree).

- Sustainable Leadership (SL): Adapted from ([Mccann & Holt, 2010](#)), capturing leaders' social, ethical, and environmental responsibility.
- Green Intellectual Capital (GIC): Based on [Chen \(2008\)](#), with three dimensions—green human, structural, and relational capital.
- Low-Carbon Behavior (LCB): Items adapted from [Ali et al. \(2023\)](#), [Saeed et al. \(2019\)](#), and [Lange \(2023\)](#), measuring practices such as energy saving, recycling, and supporting eco-initiatives.

All items were translated, pretested with civil servants, and refined for clarity and cultural appropriateness.

FINDINGS AND DISCUSSION

The demographic profile of the 348 respondents reflects balanced representation across gender, age, education, and institutions. Most respondents were under 35 years of age and employed at the staff level, indicating that the findings capture perspectives from frontline

implementers of government policies.

The measurement model demonstrated reliability and validity, with Cronbach's alpha and composite reliability above 0.70 and AVE values above 0.50 (Hair *et al.*, 2022). Discriminant validity was satisfied through the Fornell–Larcker criterion and the HTMT ratio (Henseler *et al.*, 2016), confirming that sustainable leadership (SL), green intellectual capital (GIC), and low-carbon behavior (LCB) were distinct constructs.

Descriptive results showed moderately high levels of SL, GIC, and LCB. Structural equation modeling clarified the relationships among these constructs. The direct effect of SL on LCB was insignificant, indicating that leadership alone does not directly drive pro-environmental behavior among civil servants. However, SL had a strong effect on GIC, which in turn significantly predicted LCB. Mediation analysis confirmed a significant indirect effect of SL on LCB through GIC, indicating full mediation.

These findings contribute both theoretically and practically. From a theoretical perspective, the results extend the resource-based view (Barney, 1991) by showing that SL operates indirectly through organizational resources. Specifically, GIC emerges as the key mechanism that converts leadership's sustainability vision into actionable behavior. This aligns with prior studies emphasizing the role of intellectual capital in enhancing sustainability outcomes (Chen, 2008; Paoloni *et al.*, 2023). By confirming that SL strengthens GIC and that GIC facilitates LCB, this study supports arguments that organizational knowledge, systems, and relationships are essential for embedding pro-environmental practices in daily routines (Weqar & Haque, 2020).

In terms of leadership research, the absence of a direct SL → LCB link challenges assumptions that leader behavior automatically translates into employee action. Instead, the findings suggest that leadership must be institutionalized through organizational mechanisms to influence outcomes, echoing evidence that sustainable and responsible leadership is most effective when coupled with enabling structures and resources (Robertson & Barling, 2013; Zhang *et al.*, 2023). This complements studies highlighting the importance of green HRM and structural supports in fostering employee pro-environmental behavior (López-Gamero *et al.*, 2011; Shahzad *et al.*, 2025).

Practically, the results highlight the importance of investing in GIC within the public sector. Leadership training should be paired with initiatives that build green human capital through environmental education and awareness programs, enhance green structural capital via eco-friendly systems and digital processes, and strengthen green relational capital by engaging stakeholders such as NGOs and local communities (Ghlichlee *et al.*, 2024). In doing so, civil servants will be equipped with the necessary resources to integrate LCB into their daily work.

Finally, the findings have policy relevance. Strengthening GIC directly supports Indonesia's *Asta Cita* development goals and the national net-zero 2060 commitment. By embedding sustainability into knowledge, systems, and partnerships, government institutions can ensure that sustainable leadership translates into the everyday low-carbon practices required to address climate change.

CONCLUSIONS

This study examined how sustainable leadership (SL) fosters low-carbon behavior (LCB) among Indonesian civil servants, with green intellectual capital (GIC) as the mediating mechanism. The findings demonstrate that SL does not directly influence employees' low-carbon practices but instead operates indirectly by strengthening GIC. In line with the resource-based view (Barney, 1991) GIC, comprising green human, structural, and relational capital-emerges as the organizational resource that translates leadership vision into behavioral outcomes.

The results contribute theoretically by clarifying the pathway from leadership to pro-environmental behavior in the public sector, supporting earlier evidence that intellectual capital is central to sustainability performance (Dumay *et al.*, 2015; Paoloni *et al.*, 2023). Practically, the study highlights that leadership development initiatives should be complemented by systematic investments in training, green systems, and stakeholder engagement to build the intellectual capital necessary for embedding low-carbon practices. For policymakers, these insights emphasize that bureaucratic reform and climate strategies must align leadership development with organizational capacity building to meet Indonesia's net-zero 2060 target.

In conclusion, sustainable leadership in the public sector matters not because it directly changes employee behavior, but because it cultivates the intellectual capital that enables civil servants to adopt and sustain low-carbon practices. By strengthening GIC, governments can transform leadership vision into tangible organizational and societal contributions to climate change mitigation.

LIMITATIONS & FURTHER RESEARCH

Despite its contributions, this study is not without limitations. The cross-sectional design restricts causal inference, and future research could adopt longitudinal or experimental designs to trace how leadership and GIC evolve. The study's focus on Indonesia also limits generalizability; comparative studies across different countries or between public and private sectors would enrich understanding. Finally, while this study centered on GIC as a mediator, other organizational factors, such as green HRM practices, sustainability culture, or digital transformation, could provide additional explanatory power (Shahzad *et al.*, 2025).

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