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Human Capital and Sustainable Transportation Strategic Alignment in Public Sector Enterprises

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ABSTRACK

Public sector enterprises play a vital role in achieving national sustainability goals, particularly in the transportation domain. However, a persistent problem is the inadequate alignment between human capital development and the strategic implementation of sustainable transport policies. This misalignment often results in ineffective program delivery, limited innovation, and inefficient resource allocation. The purpose of this study is to explore how human capital is managed and strategically aligned with sustainable transportation objectives within public sector enterprises in Indonesia. Using a qualitative multiple-case study method, data were collected from 15 key informants across three levels of government—national, provincial, and municipal—through semi-structured interviews and document analysis. The findings indicate that institutions investing in targeted staff training, sustainability-focused leadership, and inter-agency collaboration tend to show stronger performance in implementing environmentally responsible transportation systems. Nonetheless, the study also identifies key barriers such as fragmented policy execution, lack of integrated performance evaluation, and limited institutional capacity. These insights underscore the importance of embedding environmental competencies and systems thinking within human capital strategies in the public sector. The study contributes theoretically by linking human capital theory to sustainable transportation and public sector innovation. Practically, it offers policy recommendations to improve workforce planning and capacity building aligned with long-term sustainability targets.

Keywords: *human capital; sustainable transportation; public sector; workforce development; institutional capacity*

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1. INTRODUCTION

The imperative for sustainable transportation systems is intensifying globally as nations grapple with urban congestion, climate change, and the need for inclusive infrastructure. In response, the strategic alignment between human capital management and sustainable transport development has emerged as a critical success factor, particularly within public sector enterprises. Human capital, defined as the collective skills, competencies, and knowledge of a workforce, plays a transformative role in shaping innovative, efficient, and environmentally responsive transportation systems (Kucharčíková & Mičiak, 2018; Zhao, Xiao, & Dai, 2021). Sustainable development in transportation, therefore, requires not only technological innovations but also the strategic mobilization of human capabilities across organizational and institutional levels (Strelnikova, 2022).

Public transport enterprises, especially in developing economies, are confronted with dual challenges: modernizing infrastructure while cultivating a workforce equipped to manage digital transformation, green mobility, and stakeholder accountability (Ahangeri et al., 2016; Wang & Zhang, 2020). The role of human capital in this context becomes more pronounced when linked to organizational learning, policy innovation, and inter-institutional coordination (Zaplitna & Kukushka, 2023; Hanh, 2024a). In Slovakia, for instance, studies have shown that transport enterprises investing in strategic human

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capital practices experience higher levels of operational resilience and long-term adaptability (Kucharčíková & Mičiak, 2017; Belás, Kmecová, & Čepel, 2020). Similarly, in China, human capital has been linked to increased R&D investment in transportation infrastructure and the acceleration of innovation capacity (Wei, Geng, & Zhang, 2024).

Moreover, the reciprocal relationship between human capital and institutional economics is drawing attention as a vital area of inquiry in transport sustainability research. Hanh (2024b) highlights that institutional change, when paired with skilled human capital, generates the adaptive governance required for sustainable transportation systems in urbanizing economies. This supports broader findings that cities with high human capital concentrations are more effective in implementing eco-friendly transit solutions (Zhang & Qi, 2021; Fleisher, Li, & Zhao, 2010). In contrast, limited investment in workforce competencies often correlates with lower transportation performance and unsustainable service delivery (Gillen, 2000; Mofokeng & Luke, 2014).

Despite growing acknowledgment of the importance of human capital, many public sector transport organizations remain entangled in outdated human resource practices, rigid bureaucratic norms, and limited innovation incentives (Zolnik & Sutter, 2010; Gould-Williams, 2003). These constraints inhibit the full integration of sustainability principles into transport planning and service provision. Additionally, the underutilization of public infrastructure and human potential undermines the goals of both economic growth and environmental responsibility (Saidi & Hammami, 2014; Kuhn, 1962).

This study addresses these concerns by examining how public sector transport enterprises strategically align human capital management with sustainability objectives. It investigates the mechanisms through which human resource policies, training systems, and institutional arrangements contribute to the planning, operation, and innovation of sustainable transportation. Drawing on cross-national evidence and theoretical perspectives, the study highlights the dynamic interplay between workforce development and sustainable mobility.

In doing so, this research fills a critical gap in the literature. While prior studies have extensively addressed transport infrastructure, environmental performance, and institutional governance (Mariani et al., 2018; Berman et al., 2021), fewer have explored the central role of human capital as a bridge between strategy and sustainability. Moreover, the context of public sector enterprises, particularly in transitional or emerging economies, remains underrepresented in empirical transportation scholarship (Storper & Scott, 2009; Chircu, 2006).

The objective of this study is to propose a conceptual and empirical framework that connects human capital strategies with sustainable transportation outcomes in public sector enterprises. By doing so, it aims to inform public policy, guide organizational reform, and support capacity-building efforts in the transport domain. The strategic importance of aligning workforce capabilities with environmental and mobility goals cannot be overstated, especially in an era defined by complexity, climate urgency, and urban transformation.

2. LITERATURE FRAMEWORK

2.1 Human Capital and Organizational Performance

Human capital has been extensively acknowledged as a core strategic resource that influences organizational adaptability, innovation, and long-term performance. Becker's foundational work on human capital theory emphasized education, skills, and health as determinants of labor productivity and economic development (Griliches, 1997). In transport-specific contexts, Kucharčíková and Mičiak (2018) affirmed that effective human capital management is vital for operational success in Slovak public transport enterprises. Similarly, Belás, Kmecová, and Čepel (2020) showed that the availability of human capital significantly influences public infrastructure development, especially for SMEs operating in heavily regulated sectors such as transportation.

2.2 Human Capital and Sustainable Transportation

The role of human capital in achieving sustainability in the transport sector is increasingly documented in the literature. Ahangari et al. (2016) demonstrated a positive correlation between high human capital indices and transport sustainability outcomes in developed countries. Their findings suggest that nations with strong health and education systems tend to develop more environmentally conscious and socially equitable transportation systems. Echoing this view, Zhao, Xiao, and Dai (2021) found that improvements in human capital contributed directly to enterprise performance and sustainable infrastructure development, especially in urban transit systems.

Hanh (2024a, 2024b) expanded this understanding by integrating institutional economics and human capital theory, arguing that sustainable transportation is best achieved when human resource capabilities are aligned with dynamic institutional reforms. This is particularly relevant in rapidly urbanizing countries, where human capital plays a mediating role between governance and infrastructure outcomes.

2.3 Human Capital and Innovation in the Transport Sector

Several scholars have underscored the importance of human capital in fostering innovation within transportation systems. Strelnikova (2022) focused on intellectual capital and emphasized the knowledge component of human capital as essential for transport innovation in Russia. Likewise, Wei, Geng, and Zhang (2024) linked transportation infrastructure development to increased research and development (R&D) investments by enterprises, suggesting that organizations with higher levels of skilled labor are more capable of leveraging infrastructure projects for technological innovation.

Zhang and Qi (2021) further demonstrated that urban economic development is significantly enhanced when transportation infrastructure is paired with a strong human capital base. Their findings indicate that cities functioning as hubs for human capital accumulation are more likely to benefit from the spillover effects of innovation and sustainable mobility.

2.4 Institutional Barriers and Public Sector Human Resource Challenges

Despite the growing literature advocating for stronger integration between human capital and transport policy, institutional barriers remain a significant impediment. Zolnik and Sutter (2010) highlighted how public sector innovation is often constrained by bureaucratic inertia and limited flexibility in workforce management. This observation is corroborated by Gould-Williams (2003), who found that trust in human resource practices within public organizations strongly correlates with performance outcomes.

In the Indonesian context and other emerging economies, the challenges are compounded by centralized decision-making, outdated civil service regulations, and poor incentives for upskilling (Farazmand, 2004). These factors create a misalignment between strategic goals of sustainable development and the actual capabilities of the public transport workforce (Berman et al., 2021; Kuhn, 1962).

2.5 Strategic Human Capital Planning in Public Enterprises

Strategic human capital management in transport enterprises necessitates a comprehensive understanding of workforce planning, institutional alignment, and infrastructure goals. Kucharčíková and Mičiak (2017) emphasized the necessity of investing in lifelong learning, technical training, and knowledge-sharing mechanisms. Complementing this, Saidi and Hammami (2014) demonstrated that transportation development has the potential to enhance human capital accumulation, creating a feedback loop that supports broader economic growth.

Poister (2010) argued for the inclusion of human resource alignment in strategic planning within the public sector, asserting that workforce capabilities are often overlooked in multimodal transportation strategies. Supporting this, Zaplitna and Kukushka (2023) claimed that human capital serves as a determinant in the formation of innovative transport models in post-Soviet economies, reinforcing the global relevance of workforce-centric policies.

2.6 Linking Human Capital, Infrastructure, and Economic Growth

A broader macroeconomic perspective ties human capital directly to infrastructure quality and urban competitiveness. Fleisher, Li, and Zhao (2010) highlighted how regional inequality in China is shaped by differences in human capital and infrastructure investment. In tandem, Storper and Scott (2009) emphasized the importance of creativity and talent concentration in urban transportation success, proposing that urban amenities and transit systems must co-evolve with human capital investments.

2.7 Synthesis and Theoretical Implications

Drawing from this body of work, it becomes evident that sustainable transportation development in public sector enterprises depends not only on financial and technological resources but critically on human capital. Theoretical integration between human capital theory, institutional economics, and strategic public management provides a comprehensive framework for understanding this relationship. However, gaps remain in empirical research, particularly in transitional economies where institutional volatility and policy inconsistency hinder sustainable outcomes.

3. METHODOLOGY

This study adopts a qualitative case study approach to explore how human capital strategies are aligned with sustainable transportation objectives in public sector enterprises. Given the complexity and context-specific nature of institutional settings in public organizations, especially in emerging economies, a qualitative design is most appropriate to uncover nuanced insights regarding managerial perceptions, policy implementation, and strategic alignment (Yin, 2018).

3.1 Research Design

The research design follows a multiple-case study structure involving three public transportation enterprises operating at different administrative levels: one national, one provincial, and one municipal. These enterprises were selected based on their explicit commitments to sustainable development goals (SDGs) and visibility in national transport strategies. The case study method allows for an in-depth

investigation of how human capital management is conceptualized, operationalized, and integrated into strategic transport planning (Poister, 2010; Kucharčíková & Mičiak, 2017).

3.2 Data Collection

Data were gathered using semi-structured interviews, document analysis, and policy reviews. A total of 15 key informants were interviewed, including HR managers, sustainability officers, transport planners, and government regulators. Interview questions were structured around four core themes: (1) human capital development practices, (2) strategic planning processes, (3) sustainability integration, and (4) institutional barriers and enablers. Each interview lasted between 60 to 90 minutes and was audio-recorded with participants' consent.

Additionally, strategic planning documents, HR policy guidelines, sustainability reports, and transport development plans were collected from each organization and reviewed thematically (Berman et al., 2021; Zolnik & Sutter, 2010).

3.3 Sampling and Site Selection

The sampling strategy employed was purposive, focusing on public enterprises that had demonstrated a commitment to both human capital investment and sustainable transport development. This aligns with the theoretical sampling method recommended by Creswell and Poth (2018), ensuring that selected cases are information-rich and reflective of the phenomenon under study. The study sites were located in Indonesia, providing a representative context of an emerging economy facing urbanization, decentralization, and institutional reform challenges (Farazmand, 2004; Hanh, 2024a).

3.4 Data Analysis

Data analysis followed a thematic coding process using manual categorization of interview transcripts and documents. The themes were pre-defined based on the literature review but open to modification as new patterns emerged. Coding was done iteratively to capture both convergences and divergences in participant responses. The data were triangulated across sources to enhance validity (Yin, 2018; Griliches, 1997).

- Five major themes were identified through the analysis:
- Human capital investment and training,
- Strategic planning and sustainability integration,
- Institutional support and resistance,
- Inter-agency collaboration,
- Measurable outcomes and challenges.

3.5 Validity and Reliability

To ensure credibility and trustworthiness, member checking was conducted where summaries of interview insights were sent back to participants for validation. Peer debriefing with fellow researchers and audit trails of coding decisions were maintained throughout the process. Following Lincoln and Guba’s (1985) criteria, transferability was enhanced through thick description of cases, while dependability and confirmability were supported through systematic documentation.

3.6 Ethical Considerations

The research protocol was approved by the university’s institutional ethics board. All participants were provided with informed consent forms outlining the purpose of the study, confidentiality assurances, and voluntary participation. Pseudonyms are used throughout the paper to protect organizational and individual identities.

4. RESULTS AND DISCUSSION

4.1 Strategic Role of Human Capital in Sustainable Transport

The data from case studies reveal that **human capital** plays a central role in defining, implementing, and sustaining transportation reforms in the public sector. Respondents emphasized that employees with competencies in sustainability, planning, and institutional governance are key drivers of successful green mobility strategies. This is consistent with the literature that positions human capital as a critical asset in organizational transformation, especially in infrastructure-heavy sectors such as transport (Kucharčíková & Mičiak, 2018; Fleisher et al., 2010).

In all three cases, strategic planning documents explicitly link talent development with the goals of sustainable development. One agency had incorporated sustainability competencies into its human resource planning system, focusing on environmental literacy, interagency collaboration, and system thinking. Such efforts are reflective of trends observed in other countries where the transport sector is undergoing modernization supported by knowledge-based workforce systems (Zhao et al., 2021; Werthner, 2003).

Moreover, the commitment to **continuous learning and upskilling** was a prominent theme. The interviewed HR managers reported partnerships with universities, technical institutions, and international agencies to train staff in green logistics, emissions monitoring, and smart transport technologies. These investments are aligned with the findings of Griliches (1997), who emphasized that human capital accumulation contributes significantly to technological adoption and diffusion within public service domains.

4.2 Alignment Challenges and Institutional Constraints

Despite a clear strategic intent, several **institutional and structural barriers** hinder full alignment between human capital development and transportation sustainability goals. The most significant among these is **fragmented governance**, where responsibilities for transport policy, infrastructure, and personnel lie across multiple departments, leading to conflicting priorities and inefficiencies (Zolnik & Sutter, 2010; Dixit, 2002).

Respondents also pointed out **budgetary limitations**, particularly in local government units, which restrict long-term investments in professional development. This problem echoes the challenges identified in the public sector literature, where human resource systems are often underfunded and operate within rigid bureaucratic structures (Gould-Williams, 2003; Farazmand, 2004).

Another constraint is the **lack of integrated performance metrics** that link employee outputs with environmental or sustainability outcomes. While most agencies evaluate staff based on technical and administrative indicators, they rarely incorporate indicators such as carbon savings, modal shift success, or stakeholder engagement. This mismatch results in limited incentive structures and weak organizational learning, as previously documented in studies of public enterprises in developing economies (Ahangeri et al., 2016; Belás et al., 2020).

4.3 Interdepartmental Collaboration and Leadership

One of the most positive findings across the three case studies is the **emergence of collaborative leadership models**, particularly in cities adopting urban mobility reforms. Several agencies established interdepartmental task forces comprising HR leaders, environmental experts, and transport engineers to jointly plan and implement sustainable initiatives. These platforms encouraged horizontal integration and policy coherence, which are widely recognized as enablers of public sector innovation (Poister, 2010; Berman et al., 2021).

Leadership commitment also emerged as a decisive factor in shaping a culture of innovation and sustainability. In two agencies, senior leaders had introduced **performance-based incentives and sustainability awards**, which significantly improved staff morale and organizational alignment. These observations support the arguments by Storper and Scott (2009) regarding the importance of vision-driven leadership in activating urban development through human capital strategies.

4.4 Role of Training and Knowledge Transfer

Across all sites, **capacity building** was the most heavily emphasized human capital strategy. The agencies relied on both in-house and external programs, focusing on energy-efficient fleet management, urban transport modeling, non-motorized transport promotion, and policy impact analysis. These themes closely mirror global training trends in public transport modernization (Zhao et al., 2021; Hanh, 2024a).

One municipality integrated sustainability modules into its civil servant training curriculum in collaboration with a local university. This practice resonates with the notion that **embedded learning** and **lifelong education** are essential to adapting to the fast-changing demands of smart transportation systems (Gillen, 2000; Hellman, 2016). Another agency emphasized **mentorship** and **peer-learning platforms**, where experienced planners mentor junior officers on regulatory reform, community engagement, and impact evaluation. This practice reinforces the view that tacit knowledge and workplace-based transfer mechanisms remain critical even in technologically advanced systems (Schmittem, 2021; Grasso, 2017).

4.5 Sustainable Transport Outcomes

Although human capital strategies varied in maturity across agencies, tangible outcomes were reported. One agency cited a 15% increase in public transit usage after implementing a driver training program focused on customer service and eco-driving. Another recorded improved stakeholder satisfaction due to well-trained engagement teams that conducted community consultations for bike lane development. These outcomes align with prior research which showed how targeted HR practices directly impact transportation sustainability metrics (Mukherjee et al., 2013; Mariani et al., 2018). Notably,

agencies that **invested in cross-sectoral competencies** (e.g., combining urban planning with environmental science) demonstrated higher adaptability and project success. This finding supports Stylos and Zwiegelaar's (2019) conclusion that multidimensional knowledge and data-driven intelligence are key to enabling sustainability transitions in transport and hospitality.

4.6 International Comparison and Relevance

The findings from Indonesia echo trends in European and Asian public sector enterprises, particularly in terms of the push toward **smart, green, and inclusive transport**. Studies in Slovakia (Kucharčíková & Mičiak, 2018), Lithuania (Čižiūnienė et al., 2016), and China (Wei et al., 2024) all point to the growing relevance of human capital as both a **driver and outcome** of sustainable transport policies. However, contextual differences remain. In Indonesia, decentralized governance complicates implementation, while European models often benefit from stronger intergovernmental coordination and EU funding. Therefore, human capital strategies in Indonesia must be tailored to account for **asymmetric capacities** across regions and the presence of **informal institutional norms** (Hanh, 2024b; Visuwasam & Raj, 2020).

4.7 Implications for Theory and Practice

From a theoretical standpoint, this study contributes to the **integration of human capital theory** and **institutional change frameworks** in the context of public sector sustainability. It affirms that workforce development is not merely an administrative task, but a **strategic lever for transformative change** in transport systems (Ahangari et al., 2016; Heggie, 1995).

Practically, the study provides a framework for **HR-policy alignment**, advocating for:

- Dedicated sustainability units within HR departments,
- Integration of environmental KPIs into performance appraisal,
- Development of cross-disciplinary curricula for transport professionals.

These recommendations offer actionable steps for public managers and policymakers who aim to transition toward greener and more resilient mobility systems.

5. CONCLUSION

This study highlights the pivotal role of human capital in advancing sustainable transportation within public sector enterprises in Indonesia. Through a qualitative exploration of public transport agencies and governmental bodies, the research reveals that strategic alignment between human resource development and environmental transport goals is both necessary and increasingly recognized. Competency development, continuous learning, and institutional leadership emerged as crucial enablers in shaping transportation systems that are not only efficient but also environmentally responsible.

The findings confirm that agencies which actively integrate sustainability into their human capital strategies—by developing cross-functional skills, fostering interdepartmental collaboration, and embracing innovation—achieve greater progress in implementing green mobility reforms. Training programs focusing on energy efficiency, public engagement, and systems thinking have shown practical benefits, such as improved commuter satisfaction and increased public transport use. These outcomes underscore the direct impact of skilled human resources on sustainable urban development.

From a theoretical perspective, the study contributes to the growing literature that links human capital theory with institutional transformation in the public sector. It expands the discussion by applying these frameworks to the context of transportation governance in a decentralized developing country. The research also illustrates how organizational structures and leadership practices can facilitate or hinder the operationalization of sustainability principles in public service delivery.

Practically, the research offers guidance for policymakers and practitioners. It calls for embedding sustainability competencies in civil servant education, integrating environmental indicators into performance systems, and building stronger linkages between HRM and transport planning. As cities face the twin pressures of climate change and urban growth, equipping the public workforce with relevant skills and vision becomes indispensable.

However, this study is not without limitations. Its reliance on qualitative methods and purposive sampling may limit the generalizability of findings. Additionally, the absence of quantitative data or analytical modeling restricts the depth of outcome measurement. Future research should therefore adopt mixed-methods approaches, incorporating surveys, statistical analysis, and performance audits across diverse regions to validate and extend the findings. Longitudinal studies could also explore how changes in human capital investments affect sustainability indicators over time.

In sum, human capital is no longer a peripheral concern but a strategic resource for achieving sustainable transportation in the public sector. Aligning human resource management with environmental policy objectives is not only desirable but necessary in shaping the future of inclusive, resilient, and low-carbon urban mobility.

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