

# The Human Resource-Infrastructure Nexus: Driving Performance in Local Government Environmental Services

Yesus Armiro Korbaffo, University of Timor, Indonesia

Maria Gracela Efu, University of Timor, Indonesia

**Received:** 01/07/2025; **Accepted:** 03/07/2025; **Published:** 05/07/2025

**Abstract:** The effective performance of local government environmental services is crucial for achieving sustainable development goals, yet these agencies often face significant operational challenges, particularly in developing regions. This study addresses this issue by examining the interconnected roles of human resources and infrastructure—the 'human resource-infrastructure nexus'—as key drivers of employee performance. Employing a quantitative approach, this research collected primary data through a questionnaire administered to 66 employees of the Environmental Services Office in North Central Timor Regency, Indonesia, using a saturated sampling technique. The data were analyzed using multiple regression analysis. The results demonstrate that the quality of human resources and the adequacy of infrastructure are both strong, positive, and significant individual predictors of employee performance ( $p < 0.05$ ). Critically, the simultaneous analysis confirms a powerful synergistic effect, where both factors combined significantly drive overall performance ( $p < 0.05$ ). This study's findings underscore the necessity of an integrated strategic approach. To enhance performance, policymakers must move beyond siloed improvements and instead focus on concurrently developing human capital and upgrading physical infrastructure to achieve optimal service delivery.

**Keywords:** Employee Performance, Human Capital, Infrastructure, Public Sector.

## 1. Introduction

The performance of local government environmental agencies is a cornerstone of sustainable development and effective public service delivery. In an era of escalating environmental challenges, the ability of these institutions to successfully implement policies and achieve strategic objectives is of paramount importance. Performance in this context is not merely an administrative metric but a reflection of an organization's capacity to translate its mission into tangible outcomes for the community. However, many public agencies, particularly in developing regions, face significant hurdles in achieving maximal performance, often due to internal organizational factors.

Organizational theory suggests that performance is driven by a combination of key capabilities. Among the most critical are the quality and competence of its human resources (HR) and the adequacy of its supporting infrastructure (sarana prasarana). Human resources are the primary engine of any organization, the "motor penggerak" responsible for executing all functions and activities. The effectiveness of these individuals is, in turn, heavily reliant on the availability and quality of the tools and facilities provided, as adequate infrastructure is essential for employees to complete their work efficiently.

While extensive research has affirmed the individual importance of HR and infrastructure, these factors are often examined in isolation. Many studies have focused on the singular impact of HR on performance, while others have concentrated on the role of infrastructure. This siloed approach overlooks the critical synergistic relationship or nexus between the two. Highly skilled employees may be hindered by inadequate tools, just as advanced infrastructure offers little value without competent personnel to operate it. This study addresses this gap by investigating the combined, simultaneous impact of both human resources and infrastructure, treating them as an interconnected system that drives employee performance.

The challenges of this HR-infrastructure nexus are empirically evident at the Environmental Services Office (DLH) in North Central Timor Regency, Indonesia. An analysis of the agency's 2022 performance data reveals a significant gap between targets and actual achievements across several key indicators. For instance, targets for community-based waste management (89% realization), urban park maintenance (80% realization), and quality of planning (76% realization) all fell short of their intended goals. This performance deficit prompts an investigation into its underlying causes.

A closer look at the agency's internal context reveals potential weaknesses in both key areas. In terms of human resources, a large proportion of the staff holds a non-tertiary education level, with 28 employees having a high school diploma (SLTA) and 22 having a middle school education (SLTP). This educational profile suggests a potential challenge in terms of the human capital quality required for increasingly complex environmental

management tasks. Concurrently, the effectiveness of these employees is directly tied to the adequacy of the infrastructure they use. Therefore, this study is motivated by the following research questions:

- To what extent do human resources partially affect employee performance at the DLH?
- To what extent does infrastructure partially affect employee performance at the DLH?
- To what extent do human resources and infrastructure simultaneously affect employee performance at the DLH?

By answering these questions, this paper aims to provide empirical evidence on the critical importance of an integrated approach to managing human capital and physical infrastructure to enhance public sector performance.

## 2. Literature Review and Hypothesis Development

### 2.1. Employee Performance in the Public Sector

Employee performance is a cornerstone of organizational effectiveness, defined as the degree to which an individual achieves the tasks and responsibilities assigned to them, thereby contributing to the organization's strategic objectives. In the context of public sector agencies like the Environmental Services Office, performance is not merely about output but about the effective implementation of programs and policies that serve the public good. According to Moehariono (2012), performance can only be accurately assessed when there are pre-determined criteria and standards for success, which allow for a clear evaluation of an employee's contribution against set targets. The absence of such benchmarks makes it impossible to gauge organizational success. Performance is influenced by a multitude of factors, including individual capabilities, motivation, leadership, and the work environment itself. This study focuses on two critical components of that environment: the quality of human resources and the adequacy of supporting infrastructure.

### 2.2. The Role of Human Resources in Driving Performance

Human Resources (HR) are widely regarded as the most critical asset for any organization, serving as the primary driver for all operational activities. The effective management of HR, from recruitment to development, is essential for achieving organizational goals efficiently. The quality of human capital encompassing knowledge, skills, and capabilities directly correlates with the quality of work produced and the ability to innovate and solve problems.

A higher level of education is often considered an indicator of superior human capital, as it is expected to enhance an individual's analytical thinking and problem-solving skills, thereby positively impacting their performance. Conversely, a workforce with lower educational attainment may present challenges in meeting complex job demands, a situation observed at the Environmental Services Office in North Central Timor where a majority of employees have a high school education or less. Previous research has consistently demonstrated a significant and positive relationship between the quality of human resources and employee performance. For instance, a study by Fikri Ghody (2008) at an environmental agency found that HR was a significant predictor of employee performance. This established relationship leads to the first hypothesis: Hypothesis 1 ( $H_1$ ): Human resources have a significant positive effect on employee performance.

### 2.3. The Importance of Infrastructure for Performance

Infrastructure, locally termed *sarana prasarana*, refers to the set of facilities and tools that support the execution of work. It can be distinguished into *sarana* (movable items directly used in a task, such as computers, machines, or vehicles) and *prasarana* (immovable supporting facilities like buildings, roads, or office layouts). The availability of adequate and well-maintained infrastructure is not merely a convenience but a fundamental prerequisite for employee productivity. Without proper tools and a conducive physical environment, employees cannot complete their tasks quickly or easily, regardless of their skill level.

According to Bohari (2019), the quality of infrastructure directly influences employee performance; good facilities lead to better performance, while poor facilities will result in suboptimal outcomes. This suggests that infrastructure acts as an enabler, allowing employees to translate their skills into tangible results. Research by Syafaruddin (2013) and Didi Hartono (2014) confirms this, finding that infrastructure has a positive and

significant influence on employee performance. Based on this, the second hypothesis is proposed: Hypothesis 2 (H<sub>2</sub>): Infrastructure has a significant positive effect on employee performance.

#### 2.4. The Human Resource-Infrastructure Nexus and Simultaneous Effect

While the individual contributions of HR and infrastructure are well-documented, a more holistic understanding requires examining their combined, synergistic effect. The "Human Resource-Infrastructure Nexus" proposes that these two factors are interdependent and mutually reinforcing. The most skilled and motivated workforce will be fundamentally limited if they lack the necessary tools and facilities. Conversely, state-of-the-art infrastructure will fail to deliver its potential value if operated by personnel who lack the required competence.

Achieving maximal performance, therefore, requires an integrated approach where investments in human capital development are matched by corresponding upgrades to physical infrastructure. The problem statement of this study is rooted in this concept, where performance deficits at the Environmental Services Office are hypothesized to stem from concurrent challenges in both HR quality and infrastructure adequacy. Testing this simultaneous influence is crucial for providing a comprehensive model of performance drivers in the public sector. This leads to the final hypothesis: Hypothesis 3 (H<sub>3</sub>): Human resources and infrastructure simultaneously have a significant positive effect on employee performance.

#### 2.5. Conceptual Framework

The conceptual framework for this study is built upon the premise that employee performance within a public sector organization is a direct function of the interplay between human capabilities and the operational environment. Based on the literature review, this framework posits that two critical antecedent variables Human Resources and Infrastructure act as primary drivers of Employee Performance. The framework outlines two direct causal pathways: the first suggests that a higher quality of human resources leads to enhanced performance, while the second proposes that the adequacy of infrastructure independently facilitates better performance outcomes.

The central thesis of this framework, however, lies in the "Human Resource-Infrastructure Nexus." It moves beyond analyzing these factors in isolation to examine their simultaneous and combined effect. This nexus suggests that the true potential of a skilled workforce can only be realized when supported by adequate infrastructure, and conversely, advanced infrastructure yields maximal returns only when managed by competent personnel. The framework therefore models both the partial (individual) and simultaneous (combined) influence of these variables on the dependent variable, Employee Performance. The hypothesized relationships are visually depicted in Figure 1.

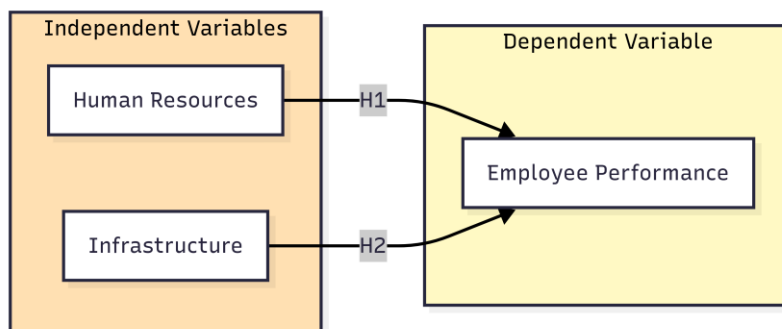


Figure 1: Conceptual Framework of the Research  
Source: Efu, 2022

### 3. Research Methods

#### 3.1. Research Design

This study employed a quantitative research design with an explanatory approach to test the hypothesized relationships between variables. A cross-sectional survey method was utilized, gathering data at a single point in time to analyze the influence of human resources and infrastructure on employee performance. The research was

conducted at the Environmental Services Office (DLH) of the North Central Timor Regency, Indonesia, a public sector organization responsible for local environmental management. The data collection period for this study spanned from July to August 2023.

### 3.2. Population and Sample

The target population for this research comprised all employees of the Environmental Services Office (DLH) of the North Central Timor Regency. A saturated sampling technique, also known as a census method, was adopted for this study. This technique was deemed most appropriate given the small and accessible population size, as it allows for the inclusion of all members, thereby eliminating sampling error and increasing the study's internal validity. Consequently, the final sample consisted of 66 respondents, representing the entire employee population of the agency at the time of the study.

### 3.3. Data Collection and Instrument

Primary data for this study were collected using a structured questionnaire (*angket*) as the main research instrument. The questionnaire was distributed to all 66 employees of the organization. While the research methodology also noted the use of observation and interviews, the quantitative data required for statistical analysis and hypothesis testing were derived exclusively from the responses provided in the questionnaire.

### 3.4. Operationalization of Variables

The variables in this study were operationalized as follows:

- Employee Performance (Y): This dependent variable reflects the quality and quantity of work achieved by an employee in fulfilling their assigned duties. It was measured using multiple questionnaire items assessing factors such as adherence to work standards, achievement of targets, timeliness in completing work, and cooperation with colleagues.
- Human Resources ( $X_1$ ): This independent variable refers to the quality, competence, and capabilities of the employees. It was measured through statements in the questionnaire regarding employees' ability to complete work effectively, optimism, skill level, and efficient use of organizational resources.
- Infrastructure ( $X_2$ ): This independent variable, locally termed *sarana prasarana*, encompasses the physical and technical facilities that support work activities. Measurement was based on questionnaire items concerning the availability, condition, and adequacy of office equipment (e.g., computers, printers), building layout, and transportation facilities provided by the organization.

All items were measured using a Likert-type scale, where respondents indicated their level of agreement with each statement.

### 3.5. Data Analysis Techniques

The collected data were processed and analyzed using the statistical software package SPSS Version 20. The data analysis procedure included two main stages:

#### 4.2.1. Descriptive Analysis

This was used to summarize the basic features of the data, providing simple summaries about the sample and the measures.

#### 4.2.2. Inferential Analysis

This was used to test the research hypotheses and make inferences about the population. The primary tools were simple and multiple linear regression analyses.

- Simple Linear Regression was conducted to determine the partial effect of each independent variable (Human Resources and Infrastructure) on the dependent variable (Employee Performance), thereby testing  $H_1$  and  $H_2$ .
- Multiple Linear Regression was employed to assess the simultaneous effect of both independent variables on Employee Performance, testing  $H_3$ . The model is represented by the equation:  $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \epsilon$ .

Hypotheses were tested at a significance level ( $\alpha$ ) of 0.05. Statistical decisions were made by comparing the calculated p-value against the alpha level, and by comparing the calculated t-statistic and F-statistic against their respective critical values from the statistical tables.

#### 4. Result and Discussion

This section presents the statistical results of the hypothesis tests, followed by a comprehensive discussion that interprets these findings within the context of existing literature and their practical implications.

##### 4.1. Results

The collected data were analyzed using simple and multiple linear regression to test the hypotheses. The significance level for all inferential tests was set at  $\alpha = 0.05$ . The primary findings from the statistical analysis are summarized in Table 3 and detailed below.

- Hypothesis 1 ( $H_1$ ): The first simple linear regression analysis was conducted to assess the partial effect of Human Resources on Employee Performance. The result confirmed a significant positive influence, with a significance value of 0.000, which is below the 0.05 threshold. Therefore, Hypothesis 1 is supported.
- Hypothesis 2 ( $H_2$ ): The second simple linear regression analysis examined the partial effect of Infrastructure on Employee Performance. This test also yielded a significant positive result, with a significance value of 0.000 ( $p < 0.05$ ). Thus, Hypothesis 2 is supported.
- Hypothesis 3 ( $H_3$ ): A multiple linear regression analysis was performed to evaluate the simultaneous effect of both Human Resources and Infrastructure on Employee Performance. The result showed a significant combined influence, with an F-statistic of 21.446 and a significance value of 0.000 ( $p < 0.05$ ). This confirms that both independent variables together are strong predictors of the dependent variable. Therefore, Hypothesis 3 is supported.

Table 3: Summary of Hypothesis Testing Results

<i>Hypothesis</i>	<i>Variables Tested</i>	<i>Statistical Result</i>	<i>Significance Value</i>	<i>Conclusion</i>
$H_1$	Human Resources ( $X_1$ ) → Employee Performance (Y)	Positive and Significant	0.000 < 0.05	Supported
$H_2$	Infrastructure ( $X_2$ ) → Employee Performance (Y)	Positive and Significant	0.000 < 0.05	Supported
$H_3$	( $X_1$ ) & ( $X_2$ ) → Employee Performance (Y)	Positive and Significant	0.000 < 0.05	Supported

Source: Efu, 2022

##### 4.2. Discussion

The statistical results robustly support all three hypotheses, providing clear evidence of the critical roles that human resources and infrastructure play in shaping employee performance at the studied agency. This discussion interprets these findings, links them to the study's central theme, and explores their broader implications.

###### 4.2.1. The Foundational Impact of Human Resources and Infrastructure

The confirmation of  $H_1$  and  $H_2$  aligns with established management principles and prior research. The significant positive influence of human resources underscores that employees are the primary engine of any organization. In the context of the Environmental Services Office, where a large portion of the staff has non-tertiary education, the quality of human capital becomes an even more salient predictor of success. This finding resonates with research by Fikri Ghody (2008), which also identified HR as a significant factor in the performance of environmental agency employees.

Similarly, the validation of H<sub>2</sub> confirms that infrastructure is a critical enabler of performance. As argued by Bohari (2019), adequate facilities are directly linked to employee output; good infrastructure facilitates good performance, while its absence hinders it. This finding highlights that even the most skilled employees can be limited by the quality of the tools and environment provided to them.

#### 4.2.2. *The Human Resource-Infrastructure Nexus: A Synergistic Driver*

The most significant contribution of this study is the validation of H<sub>3</sub>, which confirms the powerful simultaneous effect of both variables. This result provides strong empirical support for the Human Resource-Infrastructure Nexus concept. It suggests that performance in the public sector is not driven by isolated factors but by a synergistic interplay between human capabilities and physical resources. The strong F-statistic (21.446) indicates that the combined model has substantial explanatory power. This finding implies that managerial strategies focusing on only one of these two pillars either personnel training or infrastructure upgrades are likely to be inefficient. To achieve maximal performance, a holistic approach that integrates investment in both human capital and physical infrastructure is necessary. The performance gaps noted at the agency can thus be understood as a direct consequence of concurrent inadequacies in both domains.

#### 4.2.3. *Implications, Limitations, and Future Research*

The findings offer clear managerial implications for the Environmental Services Office and similar public sector organizations. There is a pressing need for an integrated strategy that includes targeted training and educational opportunities to enhance human capital, alongside systematic investment in upgrading and maintaining essential infrastructure. Fostering a more collaborative and disciplined work culture can further amplify the positive effects of these investments.

This study is not without limitations. Its cross-sectional design and focus on a single organization limit the generalizability of its findings. Future research should aim to test the HR-Infrastructure Nexus model in different public sector contexts and employ longitudinal designs to better understand causality. Further studies could also incorporate additional variables, such as leadership style or work motivation, to build a more comprehensive model of public sector performance.

## 5. Conclusion

This study empirically validated the critical roles of both human resources and infrastructure as significant individual predictors of employee performance within a local government environmental agency. The central finding, however, is the powerful simultaneous effect of these two factors, providing strong support for the Human Resource-Infrastructure Nexus model. The research concludes that performance in the public sector is not driven by isolated inputs but by the synergistic interplay between capable personnel and adequate operational facilities. Therefore, to overcome performance deficits, managerial strategies must abandon siloed approaches and instead adopt an integrated framework that concurrently develops human capital and enhances physical infrastructure.

## Acknowledgment

The author(s) would like to express sincere gratitude to all parties who have provided invaluable support during the completion of this research. Particular gratitude is extended to:

- The academic supervisors for their unwavering guidance, direction, and motivation.
- The Head and all staff of the Environmental Services Office of North Central Timor Regency for their permission, cooperation, and willingness to provide the necessary data for this research.
- The Management Study Program, Faculty of Economics and Business, University of Timor (FEB UNIMOR), for the academic support and facilities provided throughout the period of study and research.

## AI Acknowledgment

The authors declare that generative AI or AI-assisted technologies were not used in any way to prepare, write, or complete this manuscript. The authors confirm that they are the sole authors of this article and take full responsibility for the content therein, as outlined in COPE recommendations.

## Informed Consent

The authors have obtained informed consent from all participants.

## Conflict of Interest

The authors declare that there is no conflict of interest.

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### **ABOUT THE AUTHORS**

**Yesus Armiro Korbaffo:** Lecturer, Management Study Program, Faculty of Economics and Business, Universitas Timor, Kefamenanu, East Nusa Tenggara, Indonesia  
Email: [armirokorbaffo@gmail.com](mailto:armirokorbaffo@gmail.com)

**Maria Gracela Efu:** Student, Management Study Program, Faculty of Economics and Business, Universitas Timor, Kefamenanu, East Nusa Tenggara, Indonesia  
Corresponding Author's Email: [Mariagracela01@gmail.com](mailto:Mariagracela01@gmail.com)