

# Institutional Capacity Development for Public Street Lighting Services at the West Java Provincial Transportation Agency

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Rapid population growth in West Java Province has directly contributed to increased mobility and higher traffic volumes on public roads. To support road safety, security, and the smooth flow of traffic at night, the provision of adequate public street lighting has become a critical public service requirement. However, in practice, the management of public street lighting along provincial roads continues to face several challenges, including the uneven distribution of street lighting installations, recurring failures of electrical components, and slow emergency response times due to the extensive geographical coverage and the absence of a real-time monitoring system. This study aims to analyze the institutional capacity development of public street lighting services at the West Java Provincial Department of Transportation, with a particular focus on the Regional Technical Implementation Unit (UPTD) for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III. These institutional challenges are attributed to shortages of qualified technical personnel, inadequate operational facilities and infrastructure, suboptimal monitoring mechanisms, and limited budget allocations. The findings indicate that the current management of public street lighting has not yet achieved optimal performance. This is reflected in the low level of street lighting coverage along provincial roads within the operational area of the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III, which has reached only 31.16% of the total required coverage. Institutional constraints are further evidenced by vacant functional positions for traffic facilities personnel, a limited number of skylift vehicles, inconsistent maintenance budgets, and a weak integrated control system. The primary barriers to institutional capacity development include budget limitations, shortages of competent human resources, the extensive geographical area, and insufficient operational support facilities. Efforts to enhance institutional capacity include strengthening interagency coordination, improving the quality of human resources, optimizing planning processes, and developing adaptive technical strategies through the implementation of a simple, responsive, and digitally based public complaint reporting system. This study is expected to contribute theoretically to the literature on public sector organizational capacity development while providing practical recommendations for the West Java Provincial Department of Transportation to improve the quality of public street lighting services.

**Keywords:** institutional capacity development, public service, public street lighting, Department of Transportation, West Java.

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## 1. Introduction

Public service is one of the fundamental functions of government and serves as a manifestation of the state's responsibility to promote public welfare. In any governmental organization, citizens are the founders, owners, and holders of state sovereignty. Consequently, government institutions are expected to be responsive and adaptive in addressing the aspirations and needs of the community by providing quality public services that effectively meet public interests.

Law of the Republic of Indonesia Number 25 of 2009 on Public Services defines public service as "activities or a series of activities carried out to fulfill the needs of every citizen and resident for goods, services, and/or

administrative services in accordance with statutory regulations, provided by public service providers." Accordingly, public service constitutes the primary responsibility of government officials as public servants. This responsibility is also explicitly mandated in the Preamble to the 1945 Constitution of the Republic of Indonesia, particularly in the fourth paragraph, which outlines the state's obligation to protect all Indonesian citizens, promote public welfare, educate the nation, and contribute to world order based on freedom, lasting peace, and social justice.

To strengthen public services in the transportation sector, particularly public street lighting, the Ministry of Transportation has established a comprehensive regulatory framework. Initially, public street lighting was regulated through the Minister of Transportation Regulation Number 27 of 2018. However, in response to technological advancements, changing public needs, and legal developments, the regulation was replaced by the Minister of Transportation Regulation Number 47 of 2023 concerning Public Street Lighting Equipment. This regulation emphasizes the adoption of technological innovation to improve road safety, security, orderliness, and traffic flow. Furthermore, the Directorate General of Land Transportation issued Director General of Land Transportation Decree Number KP-DRJD 7198 of 2023 concerning the Technical Guidelines for Public Street Lighting Equipment. The decree stipulates that public street lighting facilities must comply with technical and safety requirements established by the Directorate General and provides standardized technical guidelines to ensure uniform implementation throughout Indonesia.

At the provincial level, the Government of West Java has demonstrated its commitment to improving road safety through Governor of West Java Decree Number 7181/HUB.02.03.06/Bid. LalinJalan concerning Technical Specifications for Traffic Facilities. The decree establishes standardized specifications for the procurement, installation, maintenance, and repair of road facilities, including traffic signs, road markings, public street lighting, guardrails, and other traffic infrastructure. These standards are intended to ensure consistency in design and implementation across provincial roads under varying geographical and operational conditions. Through these national and provincial regulations, both the Ministry of Transportation and the West Java Provincial Department of Transportation have committed to enhancing road safety, security, orderliness, and traffic efficiency by ensuring the availability of adequate supporting infrastructure.

The West Java Provincial Department of Transportation operates seven Regional Technical Implementation Units (UPTDs), namely the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Regions I, II, III, and IV, the UPTD for Ferry Transportation Infrastructure Management (LL ASDP), the UPTD for NUSA WIRU Transportation Infrastructure Management, and the UPTD for Crossing and Maritime Transportation Infrastructure Management. Among these units, responsibility for managing public street lighting falls under the UPTDs for the Management of Land Transportation Infrastructure and Traffic (LLAJ), each of which oversees four operational sectors. Consequently, each UPTD possesses different institutional capacities in terms of both human resources and operational capabilities.

This study focuses on the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III, which is responsible for supervising and controlling provincial roads in Garut Regency, Tasikmalaya Regency, Tasikmalaya City, Ciamis Regency, Banjar City, and Pangandaran Regency. One of its principal performance indicators is ensuring the availability, maintenance, supervision, and control of public street lighting facilities throughout its service area. Adequate public street lighting is essential for improving road safety, maintaining traffic order, and ensuring smooth traffic flow, thereby requiring effective and well-targeted implementation.

Despite its strategic role, the management of public street lighting continues to face significant institutional challenges. Budget allocations for new installations, maintenance, supervision, and operational control

remain insufficient relative to the extensive geographical coverage of the service area. Consistent financial support is essential to achieve the targeted level of public street lighting coverage across provincial roads.

In addition to budget constraints, the organization experiences shortages of qualified technical personnel. Supervising and maintaining public street lighting across an extensive road network requires competent and responsive technical staff. However, the organizational structure of the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III remains incomplete, particularly due to vacant functional positions responsible for traffic facilities management, thereby reducing institutional effectiveness and accountability.

Operational facilities and infrastructure also remain inadequate compared with the geographical responsibilities assigned to the UPTD. The service area encompasses geographically challenging locations, including disaster-prone roads, remote areas with limited electrical infrastructure, and mountainous regions where public street lighting remains insufficient to support road safety. These conditions further complicate maintenance activities and delay responses to infrastructure failures.

Based on these institutional issues, this study examines the institutional capacity development of public street lighting services at the West Java Provincial Department of Transportation, specifically within the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III. Preliminary observations indicate that the UPTD operates with limited institutional capacity in terms of human resources, infrastructure, and financial support, yet remains committed to becoming a model regional unit for other UPTDs within the province. Accordingly, this study aims to:

1. Analyze the institutional capacity development of public street lighting services at the West Java Provincial Department of Transportation.
2. Identify the factors that hinder institutional capacity development in public street lighting services at the West Java Provincial Department of Transportation.
3. Analyze strategic efforts to strengthen institutional capacity for improving public street lighting services at the West Java Provincial Department of Transportation.

## 2. Methods

This study employed a single instrumental case study design using a descriptive qualitative approach. A single instrumental case study focuses on one particular case to gain a deeper understanding of a broader phenomenon. This approach was selected because it enables the researcher to obtain an in-depth and comprehensive understanding of institutional capacity development in the provision of public street lighting services at the West Java Provincial Department of Transportation, particularly within the Regional Technical Implementation Unit (UPTD) for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III.

A qualitative approach was considered appropriate because the phenomenon under investigation cannot be adequately measured using quantitative methods. Instead, it requires an exploration of organizational processes, institutional practices, decision-making mechanisms, and interactions among stakeholders. This approach also facilitates the investigation of fundamental questions regarding what occurred, how the institutional processes were implemented, who was involved, and when and where the relevant activities took place.

The study utilized both primary and secondary data sources. Primary data were obtained directly from field observations and interviews with selected informants, while secondary data were collected from official documents, regulations, reports, organizational records, and other relevant publications related to public street lighting management and institutional capacity development.

Institutional Capacity Development for Public Street Lighting Services at the West Java Provincial Transportation Agency. Deni Yusufadila et.al

Research informants were purposively selected based on their knowledge, experience, and direct involvement in the management of public street lighting services. Informants were individuals who were willing to provide information, participate in discussions, and contribute insights relevant to the research objectives. The selection of informants was guided by theoretical considerations and practical assumptions regarding their depth of understanding rather than through random sampling.

Data were collected using multiple qualitative techniques, including in-depth interviews, direct observation, document analysis, and Focus Group Discussions (FGDs). To enhance the credibility and trustworthiness of the findings, data triangulation was employed by comparing information obtained from different sources and data collection methods.

The collected data were analyzed using the interactive qualitative data analysis model proposed by Miles and Huberman (as cited in Simangunsong, 2017). This analytical framework consists of three interrelated stages carried out continuously throughout the research process until data saturation is achieved: (1) data reduction, involving the selection, simplification, and organization of relevant information; (2) data display, involving the systematic presentation of data to facilitate interpretation; and (3) conclusion drawing and verification, whereby findings are interpreted and continuously validated to ensure their consistency and credibility.

### **3. Results and Discussion**

#### **Institutional Capacity of Public Street Lighting Services at the West Java Provincial Department of Transportation**

##### **Capacity to Perform Core Functions in Public Street Lighting Services**

Based on the interview findings, the installation of new public street lighting (PSL) facilities involves the participation of an external supervisory consultant. Nevertheless, the Regional Technical Implementation Unit (UPTD) for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III also conducts internal supervision as part of its risk mitigation and project control mechanisms. Internal supervisory teams are organized according to road sections, with each phase and work item inspected and documented in official inspection reports by the respective team leaders. Each internal supervisory team consists of four to five personnel, and their performance is evaluated monthly. This organizational arrangement demonstrates that the UPTD has implemented technical control functions throughout the installation process, although its effectiveness remains dependent on the availability of personnel and the allocation of field responsibilities.

In maintenance activities, technical control is implemented through routine monitoring. According to the informants, every provincial road section is inspected at least once per week to identify damaged street lighting units. Road segments with a higher risk of damage, particularly those located in areas with dense vegetation or other environmental disturbances, are monitored twice weekly. This indicates that technical control is not limited to corrective maintenance after failures occur but also includes preventive monitoring aimed at maintaining the operational condition of public street lighting infrastructure.

Despite these efforts, the organization's capacity to perform its core functions remains constrained by several institutional limitations. First, the provision of public street lighting remains inadequate, with only 31.16% of the required coverage currently available. Second, maintenance services are significantly affected by shortages of technical personnel, skylift vehicles, and replacement materials. Informants reported that the UPTD has only three public street lighting technicians, a single maintenance team, and one skylift vehicle to serve provincial roads across six regencies and municipalities. Third, response times

to infrastructure failures are influenced by travel distances, geographical conditions, and the availability of spare components. Fourth, information regarding the condition of damaged street lighting is not yet available in real time, requiring maintenance teams to conduct on-site inspections before determining the nature of the damage and the necessary replacement materials.

Overall, the West Java Provincial Department of Transportation, through the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III, has demonstrated the ability to perform its core public street lighting functions; however, this capacity has not yet reached an optimal level. The organization has established essential institutional components, including planning mechanisms, technical databases, installation priorities, maintenance procedures, and technical supervision systems. Nevertheless, the effectiveness of these core functions remains limited by the substantial gap between the required and existing public street lighting coverage, shortages of qualified technical personnel, insufficient operational vehicles, the absence of a real-time damage information system, and dependence on annual budget allocations. Therefore, strengthening institutional capacity in this dimension should focus on improving data-driven planning, integrating digital monitoring systems, expanding technical and operational resources, and reinforcing control mechanisms to ensure that public street lighting services are delivered more equitably, responsively, and sustainably.

### **Capacity to Adapt and Learn in Public Street Lighting Management**

The findings indicate that continuous organizational improvement continues to face significant challenges, particularly regarding the availability of real-time damage information. Informants explained that the most difficult information to obtain concerns the operational status of street lighting units and the severity of their damage, as these conditions can change rapidly and the exact type of failure is often identified only after direct field inspection. Information regarding the type of damage is crucial because it enables maintenance teams to prepare the appropriate equipment and replacement components before traveling to the affected location. Without such information, maintenance personnel may travel long distances only to discover that the required components are unavailable, preventing immediate repair. This finding suggests that although organizational learning has occurred, it is not yet fully supported by an integrated real-time information system.

From the perspective of organizational learning theory, the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III demonstrates characteristics of adaptive learning, reflected in its ability to adjust operational practices through route optimization, responses to public complaints, prioritization of maintenance locations, and the utilization of field data. However, this learning process has not yet evolved into generative learning, as conceptualized by Senge (1990), which emphasizes the organization's capacity to develop proactive systems that anticipate future challenges rather than merely responding to existing problems. This limitation is evident in the absence of an integrated real-time public street lighting database, the underutilization of digital information technology, and the continued shortages of maintenance equipment and technical personnel.

Overall, the adaptive and learning capacity of the West Java Provincial Department of Transportation, through the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III, can be considered to have progressed but not yet reached an optimal level. The organization has demonstrated its ability to respond to budget constraints by establishing maintenance priorities, address infrastructure failures through routine inspections and public complaint mechanisms, develop a public street lighting database, utilize solar-powered street lighting systems in areas lacking electrical infrastructure, and conduct weekly and monthly performance evaluations. However, these adaptive capabilities require further strengthening through the integration of organizational data, implementation of digital monitoring systems,

expansion of smart monitoring technologies, improvement of damage reporting accuracy, and increased investment in human and operational resources. Such measures would enable organizational learning to evolve from a reactive approach toward a more proactive and sustainable system of continuous institutional improvement.

### **Capacity to Build Relationships in the Delivery of Public Street Lighting Services**

Relationships with the community are closely associated with the accuracy and reliability of field information. Local residents are often the first to identify malfunctioning street lights, damaged electrical cables, or poorly illuminated road sections that pose safety risks. Consequently, community involvement can significantly accelerate the detection of public street lighting failures. From the perspective of public service logic, citizens should not be regarded merely as passive recipients of public services but also as co-producers who contribute to service delivery through information sharing, incident reporting, and participation in maintaining the service environment (Osborne, Radnor, & Nasi, 2013).

The findings indicate that the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III has demonstrated a considerable capacity to establish collaborative relationships with multiple stakeholders. Rather than operating independently, the UPTD has developed partnerships with municipal and regency transportation agencies, the national electricity company (PLN), private contractors, and local communities. Coordination with local transportation agencies is particularly valuable because these agencies possess closer relationships with local communities, better knowledge of local conditions, and the capacity to assist in monitoring activities and initial responses to infrastructure failures. Relationships with contractors are governed through formal contractual mechanisms, including pre-construction meetings (PCM), work performance evaluations, and maintenance obligations during the warranty period. Meanwhile, community members contribute by reporting damaged street lighting facilities and identifying areas requiring additional lighting.

Despite these strengths, several limitations remain within this relational dimension. First, much of the coordination continues to rely on informal communication and personal relationships among field personnel. Informants from local governments explained that maintenance coordination is frequently conducted through personal contacts, whereas formal coordination generally occurs only during provincial inter-agency meetings. Second, coordination with PLN has not yet been fully integrated, particularly concerning data sharing and the installation of new electricity meters. Informants reported that the UPTD does not receive comprehensive data from PLN, and discrepancies between PLN records and those maintained by local transportation agencies have, in certain cases, required mediation by law enforcement authorities. Third, public reporting mechanisms have not yet been integrated into an official digital platform, resulting in heavy reliance on personal communication with field officers.

Overall, the capacity to build relationships in public street lighting management within the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III can be considered functionally effective but not yet fully institutionalized. Functionally, collaboration with external stakeholders has enabled the organization to address challenges associated with extensive service areas, limited maintenance personnel, field information requirements, and technical coordination. However, these relationships require further institutional strengthening through more formal, well-documented, and system-based coordination mechanisms. Collaboration with municipal and regency transportation agencies should be supported by structured data-sharing arrangements, coordination with PLN should focus on integrating electricity meter and network information, community participation should be strengthened through official complaint reporting channels, and relationships with contractors should continue to be monitored through systematic performance evaluations and compliance with maintenance obligations.

Accordingly, relationship-building represents a critical component of institutional capacity development for public street lighting services within the West Java Provincial Department of Transportation. Given the extensive operational area and limited organizational resources of the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III, collaboration is not merely an alternative management approach but an operational necessity. To maximize its effectiveness, however, the existing collaboration model, which largely depends on informal communication, should evolve into a more structured, data-driven, and accountable coordination system.

### **Capacity to Mobilize Resources for Public Street Lighting Services**

Resource mobilization constitutes one of the most important dimensions of organizational capacity development in public sector institutions. According to Baser and Morgan (2008), organizational capacity is determined not only by institutional mandates and organizational structures but also by an organization's ability to mobilize available resources effectively to perform its functions and achieve its objectives. These resources include human resources, financial resources, information, and organizational assets. Within the context of public service delivery, the capacity to mobilize resources is particularly important because public organizations are often required to meet service targets despite operating under significant resource constraints. Consequently, organizational capacity can be assessed by examining how effectively available resources are utilized, how resources are allocated according to organizational priorities, and how operational strategies are adapted to existing limitations.

In the provision of public street lighting services by the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III, resource mobilization is reflected in four principal dimensions: human resource management, financial resource management, information management, and organizational asset management. These dimensions are closely interconnected. The availability of qualified technical personnel influences the speed and quality of maintenance activities; budget availability determines the organization's capacity to install new lighting facilities and undertake repairs; the quality of information affects the prioritization of maintenance and installation activities; while organizational assets—including operational vehicles, technical equipment, and replacement components—determine the ability of maintenance teams to perform effectively in the field.

#### **1. Human Resource Mobilization**

The findings indicate a clear imbalance between service demands and the availability of technical personnel. A single maintenance team is responsible for servicing provincial road sections across six regencies and municipalities, while public street lighting (PSL) failures may occur at any time and require rapid intervention. During the interviews, informants stated that, ideally, the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III should operate four maintenance teams, each assigned to a specific service area and equipped with its own skylift vehicle. This requirement arises from the extensive geographical coverage, which makes it impossible for a single maintenance team to provide timely and effective services.

The shortage of human resources directly affects maintenance operations. Informants explained that routine maintenance is conducted monthly by a team consisting of at least four personnel. The maintenance team typically operates three days per week, following routes determined by geographical proximity and road network continuity. In practice, however, certain road segments require considerably longer maintenance periods when damage is complex, resulting in delays to maintenance activities on other road sections.

From the perspective of organizational capacity, these findings demonstrate that the UPTD possesses the ability to mobilize its available human resources, although this capacity remains limited. Existing personnel

continue to perform maintenance activities despite resource constraints; however, their operational reach is insufficient relative to the size of the service area and the number of public street lighting facilities requiring regular monitoring. Therefore, strengthening human resource capacity should involve not only increasing the number of technical personnel but also establishing region-based maintenance teams, enhancing technical competencies, improving work allocation mechanisms, and providing adequate operational support.

## **2. Financial Resource Mobilization**

Budget realization data indicate that, in 2024, the allocation for public street lighting amounted to IDR 2,964,574,555, with an expenditure realization of IDR 2,964,130,000, leaving an unspent balance of only IDR 444,555. These figures demonstrate that almost the entire budget was utilized. Nevertheless, a high budget absorption rate does not necessarily indicate that service requirements have been fulfilled, as the availability of public street lighting throughout the operational area of the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III remains inadequate. Thus, the principal challenge lies not in budget utilization but rather in the insufficiency of the allocated budget relative to actual service needs.

Limited financial resources also affect maintenance operations by restricting personnel deployment and the availability of replacement materials. Informants noted that maintenance and repair budgets remain insufficient, limiting the frequency of field mobilization to damaged locations. Although routine monitoring continues, inspection intervals are often extended because of financial constraints. Furthermore, the availability of essential materials—including electrical cables, miniature circuit breakers (MCBs), contactors, photocells, and other technical components—is highly dependent on budget availability.

To address these financial limitations, the UPTD has adopted a priority-based resource allocation strategy. New installations are prioritized for road sections characterized by high traffic volumes, elevated accident rates, major public activity centers, strategic inter-regency transportation corridors, and locations proposed by relevant stakeholders. Maintenance activities similarly emphasize operational efficiency to maximize service outcomes despite financial constraints. These findings suggest that the organization demonstrates an adaptive capacity to manage financial resources; however, its financial management remains primarily reactive to budget limitations rather than fully capable of meeting overall public street lighting requirements.

## **3. Information Resource Mobilization**

The UPTD's information management capacity is reflected in its efforts to establish a centralized public street lighting database. Informants explained that all public street lighting data are managed by a single database administrator to prevent inconsistencies arising from multiple data versions. Data validation is conducted regularly based on field monitoring activities, while updates to the database are authorized by organizational leadership whenever changes occur in the field. This approach demonstrates organizational awareness of the importance of reliable data for planning and decision-making.

Despite these efforts, significant limitations remain in information management. Informants identified the operational condition of street lighting units and the severity of infrastructure damage as the most difficult information to obtain. Since the operational status of street lighting can change rapidly, the specific nature of equipment failures often cannot be determined without direct field inspection. However, such information is essential for enabling maintenance teams to prepare the appropriate equipment and replacement components before traveling to the site. Without accurate information, maintenance personnel may travel long distances only to discover that the necessary replacement components are unavailable, preventing immediate repairs.

Accordingly, information resource mobilization has been successfully implemented for planning purposes through the development of a comprehensive public street lighting database. However, it remains insufficient in terms of real-time operational monitoring. Existing and projected public street lighting data provide the basis for budget planning and infrastructure development, whereas information regarding equipment failures continues to rely heavily on manual inspections and public reports. Consequently, future improvements should prioritize the integration of public street lighting databases, the development of digital damage reporting systems, and the implementation of faster and more accurate monitoring technologies.

#### **4. Mobilization of Organizational Assets and Operational Facilities**

The findings indicate that the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III has made substantial efforts to mobilize available organizational resources despite operating under significant constraints. From a human resource perspective, maintenance activities continue to be conducted by a single technical team operating through routine inspections and responses to public complaints. From a financial perspective, the 2024 public street lighting budget was almost fully utilized, although its overall value remains insufficient to satisfy service requirements. From an information management perspective, the UPTD has developed a comprehensive public street lighting database that supports planning and budget preparation. Regarding organizational assets, available skylift vehicles, manual equipment, and technical components continue to be utilized to maintain the functionality of existing public street lighting infrastructure.

Nevertheless, the organization's resource mobilization capacity has not yet reached an optimal level because substantial disparities remain between service demands and available resources. Shortages of technical personnel, maintenance teams, skylift vehicles, replacement materials, and financial resources have compelled the organization to adopt a priority-based service delivery approach. Furthermore, the absence of a real-time damage information system means that maintenance activities continue to depend heavily on manual monitoring and reports submitted by members of the public.

Overall, the resource mobilization capacity of the West Java Provincial Department of Transportation, through the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III, can be considered functional but limited and largely adaptive in nature. The organization has demonstrated the ability to mobilize available resources to support the installation, maintenance, and repair of public street lighting infrastructure. However, persistent shortages of qualified personnel, financial resources, operational vehicles, technical materials, and integrated information systems continue to limit the effectiveness and equity of service delivery. Therefore, future capacity development initiatives should prioritize strengthening technical human resources, implementing needs-based budgeting, integrating public street lighting databases, expanding operational facilities, and establishing more proactive maintenance material management systems.

#### **Commitment to Shared Goals and Values in Public Street Lighting Services**

The findings indicate that the commitment to shared goals and values in the provision of public street lighting (PSL) services within the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III is relatively strong in terms of organizational orientation and day-to-day operational practices. However, this commitment requires further strengthening at the institutional system level. Organizational leadership has demonstrated a clear service orientation by establishing targets for expanding public street lighting coverage and maintaining existing lighting infrastructure. Organizational ethics are reflected in the responsiveness to public complaints and the continuous efforts to ensure that street lighting facilities remain functional. A shared organizational vision is also evident in the recognition that public street lighting

constitutes an essential public facility whose benefits are directly experienced by the community, particularly in enhancing road safety, public security, and nighttime socio-economic activities.

Nevertheless, this organizational commitment alone is insufficient unless it is supported by an effective institutional system. Persistent shortages of qualified human resources, limited financial resources, inadequate technical facilities, and the absence of real-time operational data continue to constrain the organization's ability to translate its commitment into equitable, efficient, and responsive public services. Therefore, capacity development within this dimension should focus on institutionalizing public service values through the establishment of measurable performance indicators, accessible public complaint mechanisms, a comprehensive public street lighting development roadmap, data-driven performance evaluation systems, and the reinforcement of an organizational culture that recognizes public street lighting as an integral component of public service delivery and road safety management.

Accordingly, commitment to shared organizational goals and values constitutes both the normative and practical foundation for strengthening the institutional capacity of the West Java Provincial Department of Transportation in managing public street lighting services. Without such commitment, public street lighting management could easily be perceived merely as a technical or infrastructure-related function. Conversely, a strong organizational commitment positions public street lighting as a strategic public service that requires effective leadership, ethical service delivery, a shared institutional vision, and organizational accountability to provide safe, well-illuminated, and secure road environments for the public.

## **Factors Hindering the Institutional Capacity Development of Public Street Lighting Services at the West Java Provincial Department of Transportation**

### **1. Regulatory Constraints and the Division of Authority**

The findings indicate that the existing institutional arrangement continues to require active involvement from municipal and regency transportation agencies in the provision of public street lighting (PSL) services along provincial roads. During the installation of new lighting facilities, local transportation agencies contribute information regarding priority locations, local conditions, and community needs. In maintenance activities, these agencies frequently serve as the first point of contact for public complaints, assist in field monitoring, and, in certain cases, provide initial responses when damaged facilities are located beyond the immediate operational reach of the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III. Consequently, the principal regulatory challenge does not arise from the absence of legal provisions but rather from the discrepancy between the formal distribution of authority, public perceptions, and actual service delivery practices. As a result, the UPTD is required not only to perform technical functions but also to manage intergovernmental coordination and public expectations.

Challenges related to institutional authority are also evident in the management of the electrical infrastructure supporting public street lighting. In several instances, electricity meters (kWh meters) installed along provincial roads are registered under the names of municipal or regency transportation agencies because these local governments are responsible for paying electricity bills. Consequently, responsibility for the physical management of public street lighting infrastructure and the administrative management of electricity services is divided among different institutions. When problems arise involving electricity meters, power supply, or distribution networks, the UPTD must coordinate simultaneously with both local transportation agencies and the national electricity company (PLN). This situation demonstrates that although institutional responsibilities are clearly defined administratively, effective service delivery still depends on strong cross-sector governance and interorganizational coordination.

Therefore, the division of institutional authority becomes a significant obstacle when it is not accompanied by adequate public communication, clearly defined complaint mechanisms, and well-established coordination procedures among government institutions. From the perspective of institutional capacity development, these governance challenges reduce the organization's ability to deliver services efficiently because each complaint or technical issue often requires prior clarification of organizational responsibilities. Accordingly, strengthening institutional capacity requires improvements in governance arrangements, simplification of complaint procedures, and broader public dissemination of reporting mechanisms based on road classification and administrative authority.

## **2. Governance and Inter-Agency Coordination Constraints**

Governance challenges are also evident in the public complaint management system. Community members are often the first to identify malfunctioning street lighting or poorly illuminated road sections; however, not all citizens are familiar with the official reporting channels. In many cases, complaints are submitted through personal communication with field officers or through local government offices. Although this informal approach may function effectively for individuals who have direct access to government personnel, it creates unequal access for members of the public who are unfamiliar with available reporting mechanisms. Consequently, governance challenges involve not only coordination among government institutions but also the relationship between public service providers and citizens, who function both as beneficiaries and as valuable sources of operational information.

Overall, governance constraints in institutional capacity development arise because coordination among stakeholders has not yet been fully integrated into formal, documented, and data-driven management systems. Informal relationships have undoubtedly facilitated short-term service delivery; however, long-term institutional capacity development requires more structured and institutionalized coordination mechanisms. Coordination with municipal and regency transportation agencies should be supported by regular data exchange, collaboration with PLN should be strengthened regarding electricity meters and distribution networks, contractor management should be reinforced through more responsive performance evaluation systems, and public complaints should be directed through official reporting platforms that are accessible, transparent, and capable of tracking follow-up actions.

## **3. Budgetary and Financial Constraints**

Financial data indicate that the 2024 public street lighting budget amounted to IDR 2,964,574,555, with actual expenditures totaling IDR 2,964,130,000, leaving an unspent balance of IDR 444,555. From an administrative perspective, this demonstrates an exceptionally high budget absorption rate. Nevertheless, efficient budget utilization does not necessarily imply that public street lighting needs have been adequately addressed. Indeed, the fact that only 31.16% of the required public street lighting coverage has been achieved indicates that the primary challenge lies not in budget implementation but rather in the insufficiency of budget allocations relative to actual service requirements. In other words, while the organization effectively utilizes available financial resources, the allocated budget remains inadequate to eliminate the existing gap in service provision.

Budget limitations also directly affect the availability of maintenance materials. Records of component usage during 2024 indicate the consumption of 7,110 meters of 2 × 10 mm twisted cable, 774 meters of 3 × 2.5 mm NYM cable, 185 wedge clamps, 53 connectors, 22 contactors, 18 units of 6 A photocells, and 17 units of 10 A photocells. The substantial consumption of these materials illustrates that effective maintenance requires an adequate inventory of replacement components. When maintenance budgets are insufficient, repair activities may be delayed even when qualified technical personnel are available.

Accordingly, financial constraints represent a structural barrier because they affect multiple dimensions of organizational capacity. Limited budgets restrict the installation of new street lighting facilities, reduce maintenance frequency, constrain the procurement of replacement components, limit the deployment of maintenance teams, and delay the acquisition of operational equipment. Therefore, strengthening institutional capacity requires financing mechanisms based on actual service requirements rather than solely on routine annual budget allocations. A medium-term financing roadmap should be developed to integrate the funding requirements for new installations, maintenance of existing infrastructure, information system development, and operational resource enhancement.

#### **4. Human Resource Constraints**

The shortage of human resources also significantly affects routine monitoring activities. Ideally, preventive maintenance should be conducted through regular inspections of public street lighting conditions along every road section. However, with only one maintenance team responsible for an extensive service area, inspections cannot always be performed promptly or comprehensively. In practice, road sections experiencing complex infrastructure failures often require extended maintenance periods, delaying scheduled inspections and maintenance activities in other locations. These findings demonstrate that human resource limitations affect not only the volume of work that can be completed but also the organization's capacity to detect infrastructure failures at an early stage and prevent recurring disruptions.

Beyond the limited number of technicians, human resource challenges also involve the availability of specialized technical expertise. Not all organizational personnel possess the qualifications necessary to perform public street lighting maintenance. While non-technical employees may assist with administrative tasks, field support, or site security, technical repairs require personnel with specialized knowledge of electrical systems, occupational safety procedures, and public street lighting equipment. Consequently, strengthening organizational capacity requires not only increasing the number of employees but also expanding the number of qualified technical personnel and reinforcing professional competencies relevant to traffic facility management.

Overall, human resource constraints constitute one of the primary barriers to institutional capacity development in public street lighting services. The limited number of technicians and maintenance teams restricts the organization's ability to respond promptly to infrastructure failures, particularly in remote and geographically dispersed areas. Future capacity development should therefore prioritize the recruitment of additional technical personnel, the establishment of region-based maintenance teams, specialized training in electrical engineering and occupational safety, and the strengthening of functional positions directly related to the management of road traffic facilities.

Here is the English translation in academic style suitable for an international journal.

#### **5. Constraints in Operational Facilities, Infrastructure, and Organizational Assets**

Constraints related to operational facilities and organizational assets are closely associated with the availability of maintenance materials. Records of component utilization indicate that public street lighting (PSL) maintenance requires substantial quantities of materials, particularly twisted cables, NYM cables, wedge clamps, connectors, miniature circuit breakers (MCBs), contactors, photocells, and street lighting brackets. The high consumption of network-related components demonstrates that PSL failures involve not only burned-out lamps but also electrical distribution networks and control equipment. When maintenance materials are insufficient, repair activities cannot be completed promptly. This finding indicates that operational assets encompass not only vehicles and maintenance equipment but also adequate inventories of replacement components that correspond to the various types of infrastructure failures.

Accordingly, constraints in facilities, infrastructure, and operational assets demonstrate that institutional capacity development cannot be achieved solely through improved planning or the expansion of human resources. The organization also requires operational equipment and assets that are proportional to the size of its service area. Additional skylift vehicles, material transportation vehicles, safe manual maintenance equipment, personal protective equipment, and an effective inventory management system for maintenance components are essential to enhance the technical capacity of the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III.

## **6. Constraints in Data, Information, and Monitoring Systems**

The findings also reveal challenges related to the synchronization of planning documents, technical databases, and operational field data. According to the initial planning documents, the operational area of the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III consists of 48 provincial road sections with a total length of 486,140 meters. However, operational information provided by informants refers to 49 provincial road sections with an approximate total length of 486,035 meters. Rather than indicating an error, these discrepancies reflect the dynamic nature of data updating processes and highlight the need for data synchronization to ensure that planning, budgeting, and performance evaluation are based on consistent information.

Data integration challenges are also evident in maintenance records. The organization maintains separate datasets for maintenance plans, monthly activity reports, work logs, component utilization, and public complaints. Although each dataset serves an important function, the absence of integration reduces the accuracy of performance evaluation. For example, maintenance planning records document 69 maintenance locations or work packages involving 1,242 lighting units, whereas monthly implementation reports record 51 maintenance activities involving 1,209 repaired lighting units. Such differences in reporting formats indicate the need for an integrated reporting system that links maintenance planning, implementation, material consumption, and public complaint data.

Public complaint management also represents an important aspect of information and monitoring constraints. Community complaints provide valuable information regarding damaged street lighting and poorly illuminated locations. However, when complaints continue to be submitted through informal communication channels or personal contacts with field personnel, the resulting information cannot be systematically consolidated. Consequently, the organization faces difficulties in mapping infrastructure failures, measuring response times, and evaluating complaint resolution performance. Therefore, data-related constraints involve not only the availability of technical databases but also the integration of public street lighting databases, damage reports, maintenance records, and public complaint management systems.

Overall, limitations in data and information systems constitute a major obstacle to institutional capacity development. Although the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III has established a planning database, it has not yet developed a comprehensive monitoring system that provides real-time, integrated information for rapid decision-making. Capacity development in this dimension should therefore prioritize the establishment of a public street lighting management dashboard, digital reporting platforms, integration of community complaint data, geospatial mapping of street lighting assets, and standardized procedures for updating infrastructure damage information in a timely manner.

## 7. Technical and Geographical Constraints

In addition to geographical challenges, technical constraints arise from the recurring nature of public street lighting failures. Infrastructure failures involve not only burned-out lamps but also damaged electrical cables, control panels, miniature circuit breakers (MCBs), contactors, photocells, electrical short circuits, interference from trees and bamboo vegetation, and damaged lighting poles. Records of component utilization demonstrate substantial demand for twisted cables, NYM cables, connectors, MCBs, contactors, and photocells. These findings indicate that many failures are associated with electrical distribution systems and control equipment rather than lighting units alone. Such failures require on-site diagnosis, appropriate replacement materials, and technical personnel with specialized expertise in public street lighting electrical systems.

Environmental conditions further increase maintenance complexity. Trees, bamboo vegetation, extreme weather conditions, and the theft of electrical components contribute to recurring infrastructure failures. Informants reported that field maintenance requires a continuous supply of network-related components, including electrical cables, MCBs, contactors, photocells, and other accessories. Theft of infrastructure components imposes additional maintenance burdens because stolen equipment must be replaced despite limited budgets and constrained inventories of replacement materials.

Accordingly, technical and geographical conditions represent significant constraints on the organization's capacity to deliver public street lighting services. The extensive service area, diverse road conditions, limited electricity access in certain locations, and recurring technical failures require a more adaptive management strategy. Institutional capacity development should therefore emphasize the establishment of geographically based service zones, classification of road sections according to maintenance complexity, deployment of public street lighting technologies appropriate to local environmental conditions, strengthening of maintenance material inventories, and enhancement of occupational safety standards for field maintenance personnel.

### **Strategies for Strengthening the Institutional Capacity of Public Street Lighting Services at the West Java Provincial Department of Transportation**

Efforts to strengthen the institutional capacity of the West Java Provincial Department of Transportation in managing public street lighting (PSL) should be understood as a comprehensive organizational development process rather than merely increasing the number of installed lighting units or completing technical field operations. Based on the research findings, the principal challenges encountered by the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III include regulatory and jurisdictional issues, governance and inter-agency coordination, budget limitations, shortages of human resources, inadequate operational facilities, weaknesses in data and information systems, and technical and geographical constraints. Consequently, institutional capacity development should be designed as an integrated strategy that enhances the organization's ability to plan, implement, coordinate, maintain, and evaluate public street lighting services in a sustainable manner.

Within the public sector context, Grindle (1997) argues that government capacity development encompasses the strengthening of human resources, organizational systems, and institutional arrangements that shape the behavior of public actors. Accordingly, efforts to enhance public street lighting services should address three interrelated levels simultaneously: the individual level, through the development of technical personnel and public officials; the organizational level, through improvements in work processes, information systems, organizational assets, and financial management; and the institutional level, through the strengthening of operational regulations, jurisdictional coordination, and collaborative governance. This approach is also consistent with the OECD's perspective on innovative public sector capacity, which

emphasizes that sustainable organizational capacity should be developed at the systemic level rather than relying solely on individual employees or organizational units.

### **1. Strengthening Governance and Operational Regulations for Public Street Lighting**

Strengthening governance arrangements is essential for addressing administrative issues related to the electrical infrastructure supporting public street lighting. In practice, electricity meters (kWh meters) installed along provincial roads may involve multiple stakeholders, including municipal and regency transportation agencies as well as the national electricity company (PLN). Therefore, formal operational cooperation agreements should be established to define the respective responsibilities of the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III, local transportation agencies, and PLN regarding the installation of new electricity meters, management of electricity meter failures, electricity payment responsibilities, and maintenance of electrical infrastructure located within their respective jurisdictions. Such agreements are necessary to ensure that the physical management of street lighting infrastructure and the administration of electricity services operate within a coordinated governance framework.

Accordingly, strengthening governance arrangements serves to bridge the gap between formal institutional regulations and practical operational requirements. From an organizational capacity perspective, this initiative reinforces the organization's core functional capacity by providing clearer operational procedures for service delivery. Simultaneously, it strengthens relational capacity by promoting more structured coordination among the provincial government, municipal and regency governments, PLN, and local communities.

### **2. Strengthening Collaborative Coordination and an Integrated Public Complaint System**

An integrated public complaint system should also be connected with municipal and regency transportation agencies. Since community members frequently submit complaints to local governments, reports concerning provincial roads should be rapidly forwarded to the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III. Conversely, complaints mistakenly submitted to the UPTD but relating to municipal or regency roads should be redirected promptly to the appropriate local authority. Such integration would reduce public confusion while improving response times and service efficiency.

Coordination with PLN should likewise be strengthened through the establishment of clearer technical communication mechanisms. At present, communication with PLN is often conducted indirectly through municipal transportation agencies or private contractors. While this arrangement may continue, it should be supported by standardized technical contact lists, clearly defined escalation procedures, and mutually agreed response-time standards for issues involving electricity meters, miniature circuit breakers (MCBs), kWh meters, and electrical distribution networks. Such measures would enable electrical failures affecting public street lighting to be addressed more efficiently and reduce reliance on informal personal communication.

Collaboration with contractors should also be strengthened through more effective performance management during both the implementation and maintenance periods of infrastructure projects. Every new installation project should be accompanied by comprehensive asset documentation, including geographical coordinates, technical specifications, photographic records, warranty periods, and contact information for the responsible maintenance personnel. Should equipment failures occur during the warranty period, the UPTD would be able to enforce contractors' maintenance obligations based on complete and verifiable documentation. Under this approach, contractors are regarded not merely as infrastructure providers but as integral partners within the broader public service delivery network responsible for maintaining the operational performance of public street lighting systems.

### **3. Strengthening Needs-Based Financing and Developing a Public Street Lighting Development Roadmap**

In addition to financing new installations, maintenance funding should be strengthened through a dedicated budgeting framework. Maintenance planning data for 2024 indicate 69 maintenance locations or electrical circuits involving 1,242 lighting units, whereas monthly implementation reports document 51 maintenance activities involving 1,209 repaired lighting units. These figures demonstrate that existing public street lighting infrastructure requires substantial and continuous maintenance expenditures. Consequently, public street lighting budgets should distinguish more clearly between funding for new installations, routine maintenance, component replacement, procurement of spare materials, maintenance team mobilization, and information system development.

Financing strategies should also incorporate a life-cycle asset management approach. Public street lighting systems incur costs not only during procurement and installation but also throughout their operational lifespan, including maintenance, component replacement, infrastructure renewal, and repairs resulting from adverse weather conditions, vegetation interference, or theft. Therefore, every new public street lighting project should include long-term maintenance cost projections covering the expected operational life of the infrastructure. Such an approach would enable the government to focus not merely on increasing the number of installed lighting units but also on ensuring their long-term functionality and sustainability.

### **4. Strengthening Technical Human Resources and Establishing Area-Based Service Zones**

From an operational perspective, the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III should establish maintenance teams organized according to geographical service zones. Considering that its operational area includes Garut Regency, Tasikmalaya Regency, Tasikmalaya City, Ciamis Regency, Banjar City, and Pangandaran Regency, dividing the service area into regional zones would significantly reduce response times. For example, separate maintenance zones could be established for Garut, Tasikmalaya, Ciamis–Banjar, and Pangandaran. Each service zone should ideally be equipped with dedicated technical personnel, operational vehicles, and essential maintenance components, thereby eliminating dependence on a single maintenance team operating from the central UPTD office.

In addition to geographical restructuring, human resource capacity should be strengthened through specialized technical training programs. Training should include public street lighting network maintenance, electrical control panel diagnostics, replacement of miniature circuit breakers (MCBs) and contactors, photocell maintenance, occupational safety procedures for working at height, skylift operation, maintenance of solar-powered street lighting systems, and digital documentation of maintenance activities. Such training is essential because infrastructure failures frequently involve electrical networks, control panels, sensors, and control equipment rather than burned-out lamps alone.

Human resource capacity can also be strengthened by involving personnel from municipal and regency transportation agencies through structured collaborative arrangements. Because these agencies operate closer to the affected locations, they can assist in monitoring activities and provide initial responses to infrastructure failures, provided that appropriate coordination mechanisms, standard operating procedures (SOPs), and logistical support are supplied by the UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III. However, this collaborative arrangement should be governed by clearly defined institutional responsibilities to avoid conflicts regarding jurisdiction, occupational safety, and asset accountability. Through such arrangements, inter-agency collaboration becomes an institutionalized component of service capacity rather than merely an informal operational practice.

Below is the English translation in formal academic style appropriate for an international journal.

## 4. Conclusion

Based on the findings and discussion, the study draws the following conclusions regarding the institutional capacity development of public street lighting (PSL) services at the West Java Provincial Department of Transportation.

### 1. Institutional Capacity Development of Public Street Lighting Services

The institutional capacity of public street lighting services was examined using the five dimensions of organizational capacity proposed by Baser and Morgan (2008), with the following findings:

#### a. Capacity to Perform Core Functions

The UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III has implemented planning and technical supervision functions; however, its performance in delivering public services remains suboptimal. This is evidenced by the fact that public street lighting coverage along provincial roads has reached only 31.16% of the total requirement, leaving 68.84% of the required road network without adequate lighting. Furthermore, the organizational structure remains incomplete due to the absence of functional traffic facilities officers who are responsible for leading technical supervision in the field.

#### b. Capacity to Adapt and Learn

The organization has established routine learning mechanisms through weekly evaluations and centralized data updating managed by a single administrator to maintain data validity. Nevertheless, its adaptive technological capacity remains largely reactive rather than predictive because it has not yet implemented a real-time monitoring system for street lighting conditions. Consequently, electrical failures are often detected only after field inspections, resulting in delays in emergency response and maintenance activities.

#### c. Capacity to Build Relationships

Functional collaboration has been established with municipal and regency transportation agencies, the national electricity company (PLN), and contractors to support operational activities. However, these collaborative relationships have not yet been fully institutionalized, as coordination continues to rely heavily on informal communication and personal relationships among field personnel. Moreover, the absence of an integrated electricity meter (kWh) database with PLN frequently leads to discrepancies in electricity consumption records.

#### d. Capacity to Mobilize Resources

The organization's ability to mobilize internal resources remains severely constrained. In terms of human resources, only three field technicians are responsible for maintaining 48 provincial road sections covering approximately 486.14 kilometers. Regarding operational assets, maintenance activities rely on only one skylift vehicle. These limitations are further exacerbated by inconsistent and fluctuating annual budget allocations for both new public street lighting installations and routine maintenance.

#### e. Commitment to Shared Goals and Values

Government personnel demonstrate a strong ethical commitment to ensuring road safety during nighttime travel. However, this commitment has not yet been institutionalized through measurable organizational performance indicators. Organizational culture remains focused primarily on administrative outputs, such as the number of lighting units repaired, rather than broader public service outcomes, including citizen satisfaction, service responsiveness, and public accountability.

### 2. Factors Hindering Institutional Capacity Development

The principal factors constraining the institutional capacity development of public street lighting services at the West Java Provincial Department of Transportation are as follows:

Institutional Capacity Development for Public Street Lighting Services at the West Java Provincial Transportation Agency. Deni Yusufadila et.al

- a. **Organizational Structure and Human Resource Constraints**  
The absence of functional traffic facilities specialists and the insufficient number of qualified technical personnel create a significant imbalance between service demands and organizational capacity.
  - b. **Budgetary and Financial Constraints**  
Limited and inconsistent annual budget allocations for new installations and routine maintenance restrict the sustainable procurement of replacement materials and maintenance components.
  - c. **Operational Facilities and Geographical Constraints**  
The limited availability of operational equipment, particularly skylift vehicles, combined with the extensive geographical coverage of six regencies and municipalities and restricted access to PLN electricity networks in mountainous areas, significantly hinders service delivery.
  - d. **Governance and Inter-Agency Coordination Constraints**  
Cross-sector collaboration has not yet been fully institutionalized through formal governance mechanisms. In addition, the absence of legally integrated electricity meter (kWh) data with PLN continues to impede effective supervision and administrative management of public street lighting systems.
3. **Strategies for Institutional Capacity Development**  
To address these institutional challenges, several strategic initiatives have been implemented or are currently being developed:
- a. **Improving Planning and Data Management**  
The UPTD for the Management of Land Transportation Infrastructure and Traffic (LLAJ) Region III is developing a more comprehensive and centralized public street lighting database organized according to provincial road sections to improve planning accuracy and estimate actual infrastructure requirements.
  - b. **Implementing Adaptive Technical Strategies**  
Alternative technologies, particularly solar-powered public street lighting systems, are being utilized to overcome the limitations of extending conventional electricity networks to mountainous and remote areas where PLN infrastructure is unavailable or difficult to install.
  - c. **Simplifying Public Service Information Systems**  
The UPTD is developing a low-cost, user-friendly, and responsive digital complaint management system that utilizes simple digital reporting mechanisms to facilitate preliminary diagnosis of infrastructure failures before technical personnel are dispatched to the field.
  - d. **Strengthening Inter-Agency Coordination**  
Functional coordination with municipal and regency transportation agencies is being enhanced to improve preliminary monitoring activities and facilitate emergency communication and response in areas located far from the UPTD headquarters.

Finally, this study is subject to several limitations. The qualitative research approach adopted in this study provides an in-depth understanding of institutional processes, constraints, and capacity development strategies but does not allow for the quantitative examination of relationships among organizational variables. Future studies are therefore encouraged to employ mixed-methods approaches by integrating in-depth interviews, field observations, community surveys, spatial data analysis, and quantitative service performance indicators. Such an approach would contribute to advancing organizational capacity theory within the context of public infrastructure services by moving beyond descriptive institutional analysis toward more robust, measurable, and empirically testable analytical models applicable across different regional contexts.

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