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Evaluating Physical Infrastructure Policy for Poverty Reduction in Nias Regency

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ABSTRACT

Infrastructure development is a strategic fiscal instrument for poverty reduction in frontier (3T) regions, yet massive capital injections often fail to yield proportionate socio-economic benefits. This study evaluates the structural efficacy and implementation dynamics of physical infrastructure policy in Nias Regency, a disadvantaged archipelagic territory. Employing a qualitative descriptive design, data was gathered through semi-structured interviews, participant observations, and document analysis, and subsequently analyzed using William N. Dunn's evaluation criteria alongside George C. Edward III's implementation model. The findings reveal a distinct administrative paradox. While road network expansion effectively reduced spatial isolation decreasing isolated villages from 24 to 18 and achieving 233.89 km of reliable roads its capacity to eradicate systemic poverty remains structurally constrained. Policy performance is diluted by extreme geomorphological cost premiums (reflected in an escalating Construction Cost Index) and an inequitable capital allocation centralized around the district capital, Gido. Operationally, execution is hindered by extreme fiscal dependency, top-down communication that overrides grassroots planning forums (Musrenbang), and the systematic exclusion of local laborers by private contractors, triggering community alienation. To foster sustainable community welfare, local administrations must explicitly synchronize connectivity projects with economic empowerment. This study strongly recommends shifting fiscal priorities toward equitable rural network distribution, legally mandating local workforce quotas in private construction contracts, and adopting adaptive engineering designs to mitigate local environmental hazards.

Keywords: Public Policy Evaluation, Policy Implementation, Infrastructure Development, Poverty Alleviation, Frontier Regions.

I. Introduction

Infrastructure development serves as a fundamental pillar of public policy, driving social dynamics, economic growth, and the overall quality of public life. Physical facilities such as roads, bridges, electricity, sanitation, education, and healthcare facilities provide the essential foundation for spatial mobility and market integration. Consequently, these assets open pathways for poor communities to capture better socioeconomic opportunities. Extensive cross-country and localised literature demonstrates that targeted infrastructure investment significantly drives poverty reduction by expanding market access and reducing various economic barriers (Calderón & Servén, 2004). According to Kurniawan & Ihsan (2021), high-quality infrastructure cuts transportation costs, makes local products more competitive, expands market reach to previously isolated areas, and minimizes operational risks to attract domestic and foreign investments.



Beyond its direct economic contributions, robust infrastructure functions as a critical multi-dimensional catalyst for human capital development. Efficient transport networks and reliable facilities directly lower physical barriers to crucial basic social infrastructure. This improved access increases school attendance among rural pupils and ensures timely access to emergency maternal and public healthcare services. Furthermore, infrastructure expansion triggers a dual multiplier effect in employment because it generates immediate jobs during the labour-intensive construction phase and creates long-term operational and maintenance opportunities after the project is completed. Therefore, physical infrastructure acts as both a trigger for economic growth and a means to enhance the community's capacity to meet basic needs. Globally, investment in infrastructure correlates heavily with national development targets, where approximately 72 percent of the main indicators for the Sustainable Development Goals (SDGs) are directly influenced by the availability of infrastructure (Thacker et al., 2019).

Understanding the interplay between physical infrastructure and poverty reduction requires acknowledging the multidimensional nature of poverty itself. Poverty is no longer defined strictly by income metrics; it encompasses a profound deprivation of human capabilities, including severe limitations in accessing healthcare, education, and labor markets. Spatial inequality drastically exacerbates this multidimensional deprivation. When rural or frontier communities are geographically severed from urban centers, the absence of reliable infrastructure acts as a structural cage that locks marginalized populations out of the modern economy. Consequently, infrastructure development is not merely a technical engineering endeavor but a critical instrument of social justice. By physically bridging the gap between isolated communities and economic hubs, equitable infrastructure dismantles the spatial barriers that sustain generational poverty, transforming dormant rural potential into active economic participation. However, translating this theoretical potential into reality within archipelagic nations presents a highly complex administrative challenge. In mainland territories with contiguous landmasses, infrastructure investments frequently generate rapid and predictable market integration. In stark contrast, archipelagic states face severe geographical fragmentation that creates a 'double burden' of extreme logistical isolation and a high dependency on fragile maritime supply chains. In these highly specific environments, standard mainland policy formulas often prove inadequate. The unique intersection of dispersed geographies, volatile weather patterns, and localized socio-cultural dynamics demands a highly adaptive administrative approach to ensure that physical development genuinely translates into measurable poverty alleviation.

In the context of developing nations like Indonesia, infrastructure expansion forms a strategic national agenda deployed specifically to mitigate regional disparities and eradicate poverty within frontier, outermost, and disadvantaged regions, known as the 3T areas. North Sumatra Province, marked by its highly fragmented geographical landscape, exemplifies these implementation challenges. Within this province, the Nias Archipelago emerges as a critically vulnerable pocket of poverty. Specifically, Nias Regency continues to struggle with entrenched economic hardships and a challenging hilly topography that severely isolates its rural communities. Recent statistical data highlights the severity of this issue, showing a poverty rate of 14.89 percent in 2024, which represents one of the highest levels across the province. Paradoxically, this sluggish reduction in poverty, which only experienced a minor 0.21 percent decline from 15.1 percent in 2023, occurs alongside an aggressive fiscal push by the regional government. Based on the local budgetary data, Nias Regency allocates a massive 46.45 percent of its total General Transfer Funds toward physical capital spending. This sharp disconnect between escalating fiscal inputs and a slow decline in poverty points to a highly complex administrative phenomenon. It indicates that the execution of infrastructure policy does not yield automatic socioeconomic benefits. Rather, its structural efficacy is tightly bound to how projects are planned, how resources are managed, how equitably benefits are distributed, and how effectively the policy addresses the root causes of vulnerability.

To fully grasp the magnitude of this administrative paradox, it is essential to examine the specific financial and geographical realities of Nias Regency. Based on the 2024 Regional Revenue and Expenditure Budget (APBD), the total regional expenditure reached approximately IDR 1.06 trillion, with physical capital expenditures absorbing IDR 245 billion. While this substantial allocation fulfills the mandatory infrastructure

spending required by national regulations, transforming these financial inputs into durable physical assets is exceptionally challenging. The regency is heavily dominated by fragmented topographies, including steep hills, deep valleys, and undulating plains that are highly susceptible to erosion and landslides during the rainy season. These geomorphological risks significantly inflate construction and logistical costs. Consequently, local policymakers and technical implementers are forced to constantly navigate between ambitious poverty reduction targets, extreme environmental barriers, and the complexities of distributing resources equitably among isolated rural communities.

The specific relevance of evaluating Nias Regency lies in its position as a critical microcosm for the broader developmental challenges faced by archipelagic frontier regions. When massive capital injections intersect with severe geographical vulnerabilities and administrative constraints, the resulting policy outcomes frequently deviate from theoretical expectations. In such challenging environments, physical infrastructure ceases to be merely an engineering output. Rather, it becomes a highly sensitive socio-economic catalyst. If executed with institutional precision, it can successfully dismantle spatial inequality and empower marginalized populations. However, if structurally mismanaged, it risks exacerbating fiscal dependency, wasting limited resources, and alienating the very communities it intends to serve. Therefore, analyzing the intricate implementation dynamics within Nias Regency offers vital theoretical and practical insights. It directly illuminates why standard, centralized poverty alleviation formulas often stall in 3T territories, thereby underscoring the urgent necessity for a more adaptive, collaborative, and context-responsive administrative approach.

Recent empirical studies focusing on the Nias region have consistently highlighted that infrastructure interventions hit operational bottlenecks. Scholars identify systematic impediments such as weak cross-sectoral coordination, low community participation, institutional capacity deficits within local bureaucracies, and political interference in capital allocations. However, a significant State of the Art (SoTA) gap persists in the current literature. Prior inquiries remain heavily descriptive or segregated, focusing strictly on isolated project innovation or localised village performance (Ansell & Gash, 2008; Gea, 2023; Halawa et al., 2025; Harita, 2022). These studies largely fail to structurally evaluate infrastructure as a broader fiscal policy instrument tied directly to systemic poverty outcomes. Furthermore, there is a distinct conceptual gap in public administration literature regarding an integrative framework that simultaneously evaluates policy criteria and implementation dynamics within a 3T island territory.

To address this empirical and theoretical gap, this study establishes its novelty by integrating William N. Dunn's multi-criteria policy evaluation framework with George C. Edward III's policy implementation model. By utilising this combined lens, the research objective is to comprehensively evaluate the efficacy of Nias Regency's physical infrastructure policy across six analytical evaluation dimensions consisting of effectiveness, efficiency, adequacy, equity, responsiveness, and appropriateness. Concurrently, this study maps the operational variables of communication, resources, disposition, and bureaucratic structure that dictate field execution. Through a deeply contextualised qualitative approach focusing on Nias Regency with Desa Sogaeadu as an empirical site, this study goes beyond mere physical output tallies to unearth the underlying institutional arrangements and structural limitations that shape how infrastructure projects translate into meaningful poverty reduction and long-term community welfare.

II. Literature Review and Hypothesis Development

2.1. Macro and Meso Theoretical Foundations of Public Administration

To rigorously evaluate physical infrastructure policy within a disadvantaged region, the analysis must first be anchored in the macro and meso theoretical traditions of public administration. At the macro level, classic bureaucratic theory, pioneered by Weber (1947), emphasizes the absolute necessity of formal organizational structures, strict hierarchical rules, and clear divisions of labor. In the context of government-led physical development, a highly rationalized bureaucracy is theoretically expected to ensure that large-

scale infrastructure projects are executed systematically, on schedule, and with minimal abuse of authority. However, Simon's (1944) concept of "bounded rationality" provides a critical counter-perspective. Simon argues that administrative decision-making is rarely perfectly rational; instead, it is severely restricted by limited information, time constraints, and the cognitive boundaries of policymakers. This behavioral theory is profoundly relevant in explaining the persistent implementation challenges faced by the Nias Regency administration, where local officials must constantly adapt to unpredictable geographical, fiscal, and social uncertainties.

Furthermore, the evolution of public administration into New Public Management (NPM) marks a significant paradigmatic shift. Osborne's (1992) NPM principles advocate for the adoption of private-sector management techniques within the public sector to enhance efficiency, decentralization, and responsiveness to dynamic community needs. In the realm of poverty reduction, NPM dictates that public infrastructure investments must be profoundly result-oriented, delivering tangible socio-economic impacts on the ground rather than merely fulfilling administrative budget absorption targets. Additionally, collaborative public administration theory underscores the vital importance of multi-actor cooperation. According to Agranoff & McGuire (2001), effective infrastructure delivery cannot be monopolized by the state; it requires seamless collaboration among government agencies, private sector contractors, non-governmental organizations, and the marginalized beneficiary communities themselves to generate inclusive economic impacts. At the meso level, public policy analysis approaches namely rational, incremental, and communitarian theories provide specific lenses for evaluating policy formulation. Rational theory assumes that policymakers optimize decisions based on comprehensive objective data to achieve poverty reduction through perfect infrastructure design. Conversely, Lindblom (1959) incremental theory posits that policy evolves through pragmatic, successive, and small-scale adaptations due to severe resource constraints. This accurately explains why infrastructure policies in developing archipelagos frequently struggle to produce massive short-term impacts, relying instead on gradual physical improvements.

2.2. The Five Stages of Policy Analysis

According to Dunn (2018), evaluating a policy's ultimate impact requires an understanding of the entire policy analysis cycle, which consists of five interrelated stages. The first stage is Problem Formulation, wherein policymakers identify pressing social conditions such as spatial isolation and multidimensional poverty and define the boundaries of the problem within a broader socio-economic context. The second stage is Forecasting, which predicts the potential consequences of various policy alternatives, such as calculating the potential reduction in logistical costs if a specific road network is paved. The third stage is Policy Recommendation, where analysts compare the cost-benefit ratio of the alternatives and recommend the most optimal intervention based on public goals and fiscal feasibility. The fourth stage, Policy Monitoring, involves the continuous oversight of the implemented policy to ensure compliance with the original design and to rapidly identify operational bottlenecks, such as construction delays caused by extreme weather. The final stage is Policy Evaluation, which assesses whether the completed policy successfully achieved its intended objectives such as lowering poverty rates and determines whether the policy should be maintained, revised, or terminated. In this study, the evaluation phase is the primary focus, utilizing Dunn's six specific criteria to determine if the physical infrastructure in Nias Regency genuinely resolved the socio-economic vulnerabilities identified during the problem formulation stage.

2.3. Public Policy Evaluation and Implementation Framework

Policy evaluation constitutes a critical phase in the public policy cycle, serving as a systematic mechanism to assess the performance, outcomes, and impacts of governmental interventions. Rather than merely listing conceptual definitions, this study applies Dunn's (2018) six criteria: effectiveness, efficiency, adequacy, equity, responsiveness, and appropriateness as an integrated analytical lens. In the context of

infrastructure, these criteria transcend the mere measurement of physical engineering outputs. They evaluate whether a policy equitably distributes socioeconomic benefits, aligns with community needs, and adequately addresses the systemic roots of poverty.

However, the outcomes of policy evaluation are intrinsically bound to the dynamics of field execution. To capture this operational layer, this study incorporates Edward III's (1980) posits that policy implementation model which posits that policy implementation is fundamentally conditioned by four critical variables: communication, resources, disposition, and bureaucratic structure. For instance, resources encompass both tangible assets (budgetary allocations) and intangible assets (human capacity), which serve as the primary determinants of implementation effectiveness (Subarsono, 2015). Furthermore, an excessively rigid bureaucratic chain or distorted communication can significantly impede rapid responsiveness to local dynamics (Mazmanian & Sabatier, 1983; Purwanto & Sulistyastuti, 2012). Within public administration, integrating Dunn's evaluation criteria with Edward III's implementation variables provides a robust analytical tool to diagnose the specific institutional bottlenecks that prevent physical projects from generating sustainable socioeconomic outcomes.

2.4. Physical Infrastructure, Social Networks, and Sustainable Poverty Reduction

The theoretical linkage between physical infrastructure investment and poverty eradication is deeply rooted in sustainable development theory and development economics. Infrastructure forms the foundational physical capital required to stimulate economic activities and upgrade human capabilities (Thacker et al., 2019). The provision of basic physical infrastructure encompassing roads, bridges, clean water, electrification, and basic public facilities functions as a powerful structural catalyst to dismantle the spatial isolation (Atapattu, 2020). This also often traps poor communities in underdeveloped regions (Chotia & Rao, 2017; Van De Walle & Bank, 2017). From a sustainable development perspective, robust transportation infrastructure directly lowers logistical costs, enhances supply chain reliability, and integrates peripheral rural markets with urban economic growth centers. This spatial integration reinforces poverty reduction pathways when infrastructure policies explicitly account for regional and social disparities (Medeiros et al., 2021).

Beyond its direct economic growth functions, infrastructure directly fosters social equity and human development. Access to reliable roads and energy systems facilitates the equitable delivery of essential public services, such as health and education, which directly improves the living standards of vulnerable populations (Wardani & Gultom, 2022). Investments focusing on basic utilities significantly enhance the broader quality of life across multiple social dimensions (Parikh et al., 2015). Furthermore, contemporary literature emphasizes the critical role of social network theory in maximizing these infrastructure benefits. Infrastructure development does not operate in a vacuum; it is deeply embedded within local social structures. When physical development aligns with strong community networks and collaborative governance, it fosters local ownership and ensures better maintenance of public assets (Ansell & Gash, 2008). Engaging local social networks during the planning and execution phases translates physical assets into actual economic empowerment, making local products more competitive and expanding market reach (Kurniawan & Ihsan, 2021).

Conversely, infrastructure deficits perpetuate multidimensional poverty by restricting access to clean sanitation, increasing clean water acquisition costs, and hindering emergency healthcare access. This severe infrastructure gap, particularly within rural areas, serves as a major contributor to persistent high poverty rates (Atapattu, 2020). Therefore, in peripheral and disadvantaged territories, the evaluation of infrastructure policy must transcend mere technical or engineering tallies. It must encompass a holistic institutional assessment of how equitably these public goods interact with local social conditions to yield sustainable economic outcomes. To achieve significant poverty alleviation, fiscal allocations must prioritize connectivity projects that directly empower isolated communities and strengthen their social networks (Schachtebeck & Mbuya, 2016).

III. Research Method

3.1. Research Design and Theoretical Justification

This study employs a qualitative descriptive research design to achieve a nuanced, contextually grounded understanding of how physical infrastructure policy is formulated, implemented, and evaluated regarding its impacts on poverty reduction in Nias Regency. The theoretical justification for selecting a strictly qualitative approach stems from the research objectives: rather than measuring the statistical correlation between infrastructure spending and poverty rates, this study seeks to understand the "how" and "why" behind the administrative bottlenecks. By structurally mapping the policy processes, this qualitative design perfectly aligns with the objectives of evaluating policy performance (using Dunn's criteria) and diagnosing operational constraints (using Edward III's variables). The empirical investigation was conducted in Nias Regency, North Sumatra Province, Indonesia, with intensive village-level fieldwork localized in Desa Sogaeadu, Sogaeadu District. Nias Regency was purposively selected due to its unique socioeconomic position as a frontier region (3T area) experiencing entrenched poverty alongside substantial mandatory budgetary allocations for physical infrastructure development. Desa Sogaeadu serves as a representative empirical site to capture the micro-level implementation bottlenecks and trace the concrete distribution of infrastructure benefits at the community level.

3.2. Sampling Strategy and Informant Justification

Primary data was gathered through purposive sampling to recruit key informants who possess specialized institutional knowledge or are directly impacted by the policy output. The sample size consists of 5 (five) primary key informants. While numerically small, this sample size is theoretically justified for this qualitative inquiry because it achieves data saturation across the entire policy cycle. The selection criteria mandated that informants represent distinct, hierarchical tiers of policy execution: macro-level planning, fiscal management, technical engineering, village-level administration, and the grassroots beneficiary level. The key informants encompass diverse policy stakeholders across the entire administrative spectrum, including:

Table 1. Profile and Institutional Roles of Research Key Informants

No	Institution / Target Group	Functional Position / Informant Category	Strategic Role in Policy Cycle
1	Regional Financial and Asset Management Agency (BPKPD)	Head of the Budget Planning Division	Assessing local fiscal capacity, mandatory spending frameworks, and regional budgetary allocation constraints.
2	Regional Development Planning, Research, and Development Agency (Bappedalitbang)	Head of the Planning, Control, and Evaluation Division	Clarifying strategic policy alignment, top-down and bottom-up planning integration, and development priorities.
3	Public Works and Spatial Planning Office (Dinas PUTR)	Head of the Roads and Bridges Section	Evaluating technical execution variables, engineering field challenges, material procurement logistics, and contractor compliance.
4	Local Government of Desa Sogaeadu	Village Head (Kepala Desa)	Providing an institutional bridge between district-level planning and local community needs, and managing village-level execution.
5	Beneficiary Community	Vulnerable Community Members (Masyarakat Miskin)	Evaluating the perceived quality, direct socioeconomic impacts, structural equity, and long-term utility of the completed physical facilities.

3.3. Data Collection Procedures and Instrumentation

The primary data collected in this study is strictly qualitative. Data collection was executed through three primary procedures namely semi-structured in-depth interviews, participant observations, and document analysis. To ensure replication and accuracy, specific tools and materials were utilized. Interviews were guided by a thematic interview protocol directly derived from Dunn's and Edward III's frameworks. For example, sample interview questions for the fiscal agency probed the specific impacts of mandatory spending cuts (measuring 'Resources'), while questions for the village head assessed grassroots labor inclusion (measuring 'Disposition' and 'Equity'). Responses were recorded using digital audio recorders and transcribed verbatim to ensure data fidelity. Simultaneously, direct participant observations were conducted using field observation checklists to document the physical state of the infrastructure (e.g., road durability, bridge safety) and its socioeconomic utilization by the community. Secondary qualitative and statistical data was gathered via comprehensive document analysis of official local government texts, including the Regional Medium-Term Development Plan (RPJMD), the Regional Government Work Plan (RKPD), budgetary reports (APBD), and official poverty statistics compiled by the Statistics Indonesia (BPS).

3.4. Data Analysis and Methodological Originality, and Rigor

The methodological originality of this study lies in its integrative analytical approach. While qualitative policy evaluations are common in public administration literature, this study methodologically synthesizes William N. Dunn's multi-criteria evaluation framework with George C. Edward III's policy implementation variables into a single, cohesive coding matrix. To manage this theoretical synthesis, the study utilized Computer-Assisted Qualitative Data Analysis Software, specifically NVivo 12 Pro. This software-driven approach allowed researchers to cross-tabulate policy outcomes directly against operational bottlenecks, thereby generating a highly structured and objective diagnostic tool for qualitative assessment.

The accumulated qualitative data gathered from the field was systematically processed using the interactive qualitative analysis model proposed by Miles, Huberman, and Saldaña (2014). This established framework requires continuous, iterative analytical cycles throughout the entirety of the research process. The first continuous phase is Data Reduction. During this initial phase, verbatim interview transcripts, field observation checklists, and regional planning documents were imported into the NVivo 12 Pro environment. The raw data was then rigorously selected, focused, and abstracted into distinct thematic nodes. The coding process was strictly guided by the aforementioned theoretical frameworks, categorizing raw narratives into specific nodes such as "geomorphological constraints," "top-down prioritization," "local labor exclusion," and "agricultural market access."

The second phase of the interactive model is Data Display. To prevent cognitive overload and allow for systematic pattern recognition across a vast array of qualitative inputs, the coded nodes were meticulously organized into cross-case thematic matrices and narrative summaries. This visual display facilitated a direct and nuanced comparison of stakeholder perspectives; for instance, it enabled the researchers to contrast the Public Works Agency's technical justifications for high construction costs against the Village Head's perception of private contractor inefficiency. The final phase encompasses Conclusion Drawing and Verification. Initial conclusions regarding policy effectiveness and implementation constraints were continuously verified by revisiting the raw audio transcripts and field notes to ensure that the final analytical claims were consistently grounded in valid empirical evidence. To further ensure empirical rigor and guarantee data accuracy, trustworthiness was firmly established through a dual strategy. This included source triangulation cross-verifying accounts across different administrative levels and methodological triangulation cross-checking interview testimonies against direct field observations and official local planning documents.

3.5. Triangulation Strategy

To guarantee absolute empirical rigorousness and data accuracy, this study executed an exhaustive two-fold triangulation strategy: source triangulation and methodological triangulation. Source triangulation was systematically performed by continuously cross-verifying information extracted from distinct hierarchical perspectives. For instance, claims regarding the enhancement of spatial mobility were cross-examined between the macro-planners (Bappedalitbang), fiscal managers (BPKPD), technical executors (Dinas PUTR), and finally verified against the lived realities of the Village Head and marginalized community members. Furthermore, methodological triangulation was applied by contrasting subjective qualitative interview testimonies against objective field observations and macro-statistical documents. During direct field observations in Desa Sogaeadu, researchers physically validated the claims made by the community regarding improved vehicular access to public health centers. Crucially, the qualitative narratives regarding the reduction of isolated areas were cross-checked against the official statistical parameters embedded within the Regional Medium-Term Development Plan (RPJMD) 2025–2029 and the Regional Government Work Plan (RKPD) 2026. By methodologically interlacing subjective perceptions with objective infrastructural data matrices, this study guarantees a high degree of internal validity.

IV. Result and Discussion

4.1. Thematic Findings and Qualitative Field Evidence

Before evaluating the policy through the standardized theoretical matrices, it is critical to present the raw thematic realities extracted directly from the key informants. The in-depth qualitative interviews unearthed several dominant themes regarding policy direction, execution bottlenecks, social friction, and community socio-economic impacts. Policy Direction and Prioritization: The regional administration explicitly recognizes physical infrastructure as the primary catalyst for economic liberation in Nias. An informant from Bappedalitbang articulated this macro-level strategic focus: "The regional head's target to reduce poverty is through infrastructure development. Because the economic potential of the village can only be channeled if they can access economic centers in the sub-district". The BPKPD informant corroborated this direct economic correlation, stating: "It is very significant, because the existence of infrastructure such as roads will increase the community's economy. Easier access is opened for the community to sell their agricultural products".

Implementation Hurdles and Technical Constraints: Field execution testimonies revealed severe geomorphological and fiscal frictions that derail planning. An engineering official from Dinas PUTR described the extreme environmental barriers: "The problem is the terrain and work location. For example, our soil characteristics are not uniform, so when treated, the soil experiences landslides, which adds to the budget requirements. Furthermore, the challenge of material prices is prominent because we are in an archipelago; core materials like asphalt must be imported from across the sea, causing additional costs". This technical constraint is severely exacerbated by regional fiscal deficits. The BPKPD informant noted: "Actually, there is mandatory spending for infrastructure budgets, but in 2025 there were many budget cuts from the center, so the budget allocation for infrastructure could not reach the 40 percent threshold". Village Empowerment versus District Execution: At the grassroots level, testimonies exposed a deep structural fracture regarding labor inclusion and project quality. The Village Head of Sogaeadu highlighted a distinct difference in construction quality and community involvement between centrally funded district projects and locally funded village projects: "If the village builds it, it feels more robust because we maximize the budget using materials suited to village characteristics... One of the main differences is that the District Public Works projects rarely use local labor, whereas if the village builds it, local labor and village communities are heavily involved as workers".

Social Disposition and Infrastructure Vandalism: The exclusion of local labor by external private contractors has bred significant social resentment, negatively impacting the disposition of both the

community and the bureaucrats. The Dinas PUTR informant revealed severe post-project maintenance issues triggered by social conflict: "Post-project, vandalism usually occurs. They carry out destruction; for example, the water pipes were stolen, so the water stopped flowing. This makes the government pessimistic about building certain infrastructure again because the community's response is not to maintain the facilities that have been built". Tangible Socio-Economic Impacts: Despite these administrative and social frictions, the tangible benefits for the poor are undeniable once projects are completed. A community beneficiary explicitly confirmed the improved socio-economic access: "It is true. Farmers can distribute to the market easily now, such as rubber, bananas, and coconuts... Furthermore, it is easier now; the hospital is close, the community health center is by the side of the road, and the roads are already good".

4.2. Public Policy Evaluation via William N. Dunn's Criteria

The evaluation of the physical infrastructure policy in Nias Regency, aimed at poverty reduction, reveals multi-dimensional institutional outcomes across the six evaluative criteria established by Dunn (2018). To systematically structure this analysis, Table 2 synthesizes the core empirical findings derived from triangulated interview transcripts, field observations, and official planning documents. The subsequent sections will unpack these findings by providing specific data to support the evaluative claims.

Table 2. Synthesis of Policy Evaluation Based on William N. Dunn's Criteria

Evaluative Criterion	Empirical Findings and Field Evidence	Policy Conclusion
Effectiveness	Roads and bridges development successfully reduced the number of isolated villages from 24 down to 18 by 2024. Completed transport networks significantly enhanced spatial mobility and physical connectivity from rural areas to sub-district economic hubs.	Moderately Effective
Efficiency	Project execution suffered from exceptionally high construction and logistical costs. This inefficiency was heavily driven by Nias's challenging hilly topography, unstable soil structures, high precipitation, and the logistical necessity of importing core materials like asphalt from outside the island territory. Additionally, technical adjustments and contractual terminations hindered optimal resource utilization.	Not Optimally Efficient
Adequacy	While infrastructure expansion mitigated spatial isolation and smoothed daily mobility, it remains structurally inadequate to fully eradicate systemic poverty. Informants emphasized that long-term poverty alleviation cannot rely on a single physical variable but remains tightly dependent on structural variables such as sustainable job creation, stable agricultural commodity prices, and broader economic empowerment.	Inadequate
Equity	The distribution of physical infrastructure across Nias Regency remains spatially imbalanced. Capital allocations and development initiatives were heavily concentrated around the penning of the new district capital in Gido, leaving peripheral villages with deferred access to critical basic infrastructure upgrades.	Unequally Distributed

Responsiveness	Institutional mechanisms like <i>Musrenbang</i> and the <i>SIPD</i> application successfully captured community aspirations from the grassroots level. However, the actual translation of these inputs into projects was heavily constrained by centralized top-down prioritizing and severe local fiscal limitations, leaving minor localized needs unaddressed.	Moderately Responsive with Limitations
Appropriateness	Given that the macroeconomic structure of Nias Regency relies almost entirely on agrarian activities, the prioritization of roads and bridges is structurally appropriate. Enhanced connectivity serves as an absolute prerequisites to link isolated smallholder farmers with central market structures, validating the strategic value of the policy.	Strategically Appropriate

4.3. Analytical Interpretation of the Evaluation Criteria

The empirical findings presented in Table 2 underscore a deep-seated administrative paradox in Nias Regency's development framework. From an effectiveness standpoint, the reduction of isolated pockets directly supports regional development plans. This claim is not merely anecdotal; it is strongly validated by quantitative secondary data from the Nias Regency RPJMD (2025–2029). The data shows that the length of roads in "good" condition increased significantly from 154.09 km in 2020 to 233.89 km in 2024, raising the percentage of reliable road networks from 29.74 to 42.35 percent. This physical expansion directly corroborates the Bappedalitbang informant's statement that vehicle access successfully penetrated previously isolated terrain, reducing the number of isolated villages from 24 to 18. However, this physical effectiveness is compromised by a severe lack of efficiency. The local Indeks Kemahalan Konstruksi (IKK) -the official Construction Cost Index used to measure regional price disparities-escalated significantly from 106.76 in 2020 to 110.03 in 2024. This reflects the severe logistical premiums of an isolated island environment. This fiscal strain was further compounded by volatile soil behavior and geomorphological hazards, which frequently required post-allocation budgetary injections to mitigate landslides.

Furthermore, the criteria of adequacy and equity illuminate why the aggressive fiscal target of devoting 46.45% of General Transfer Funds to infrastructure has failed to trigger a rapid drop in poverty. Poverty in Nias is fundamentally multidimensional. While a newly paved road lowers the physical friction of distance, it cannot insulate smallholder farmers from fluctuating rubber or banana prices, nor can it substitute for a lack of formal labor opportunities. This limitation is worsened by political centralization. By concentrating capital expenditures on transforming Gido into an urban center, the regional government prioritized institutional visibility over rural equity. Consequently, peripheral communities continue to haul agricultural produce manually across unsafe networks, proving that until infrastructure spending shifts from centralized prestige to equitable rural distribution, its capacity to serve as a sufficient poverty antidote will remain fundamentally stalled.

While physical access has expanded, evaluating the policy through Dunn's criterion of Adequacy reveals glaring shortfalls. The empirical data shows that infrastructure alone is insufficient to resolve the root causes of systemic poverty in Nias. The BPKPD informant emphasized this limitation: "Poverty reduction cannot be seen from one variable alone. Infrastructure can indeed reduce poverty, but the most important thing is whether the community has decent jobs or not". This is echoed by the Bappedalitbang official, who noted that dilapidated school conditions in peripheral areas remain a stark portrait of unresolved poverty despite new roads being built.

Assessing the criterion of Equity uncovers deep spatial imbalances. Capital allocations were heavily skewed toward the aesthetic and urban transformation of the district capital in Gido. The Bappedalitbang informant admitted: "The condition is that the regional head focuses on ensuring the face of the District

Capital in Gido must be arranged first". Consequently, the Village Head of Sogaeadu reported that critical peripheral segments are abandoned: "It is still lacking, because there are still about 5 kilometers of unbuilt roads and highly vulnerable bridges". This confirms that the distribution of policy benefits is heavily determined by elite political clustering rather than equitable rural needs.

Regarding Responsiveness, the government has established formal channels to absorb community aspirations, primarily through the tiered Musrenbang (development planning forums) and the digital SIPD application. However, the actual responsiveness is heavily filtered. Because the regional fiscal capacity is extremely limited, the district government unilaterally selects projects deemed to have the "widest macro impact," frequently ignoring localized, highly specific community requests. Finally, evaluating Appropriateness confirms that focusing on physical infrastructure is the correct strategic choice for Nias Regency. Because the regional economy is almost entirely agrarian, establishing physical connectivity is the absolute prerequisite for any subsequent economic intervention. As the Bappedalitbang informant concisely summarized: "In our region, infrastructure still dominates because our base is in agriculture... so in our opinion, the most appropriate policy right now is infrastructure development". Therefore, the policy's theoretical design is highly appropriate; the failure to rapidly reduce poverty stems exclusively from execution inefficiencies, resource deficits, and inequitable political distribution.

4.4. Policy Implementation Dynamics via George C. Edward III's Model

While Dunn's criteria assess the outcomes, Edward III (1980) variables explain the operational bottlenecks that hindered those outcomes. Table 3 synthesizes these execution dynamics, which are subsequently analyzed to understand the structural failures in the field.

Table 3. Synthesis of Policy Implementation Based on George C. Edward III's Variables

Implementation Variable	Empirical Findings and Field Evidence	Operational Conclusion
Communication	Administrative transmission channels are active through formal planning frameworks like <i>Musrenbang</i> and the integrated <i>SIPD</i> system. However, the actual communication process remains deeply top-down. Decisions are dominated by the district executive based on perceived macro-impacts, which often leaves local stakeholders and rural communities detached from substantive decision-making, occasionally triggering grassroots resistance or project friction.	Formalized but Heavily Top-Down
Resources	Severe fiscal limitations serve as the primary bottleneck to infrastructure policy delivery. Nias Regency exhibits a critically low Local Generated Revenue (PAD), leaving the municipality highly dependent on central government transfer funds. Budgetary implementation is further strained by recent central transfer cuts. Operationally, these financial constraints are worsened by physical resource challenges, including the high price of importing core materials and severe geomorphological conditions	Severe Constraint; High Fiscal Dependence
Disposition	There is a positive institutional commitment among local and village officials to leverage infrastructure projects as immediate labor opportunities for poor residents. However, this disposition varies wildly among private contractors (<i>rekanan</i>) who frequently bypass local labor in favor of external crews. Furthermore, bureaucratic morale is tested by community behavior, where cases	Positive Intent with Fragmented Compliance

	of post-project vandalism and lack of local facility preservation discourage sustainable maintenance initiatives.	
Bureaucratic Structure	Institutional mandates and divisions of labor are clearly demarcated between technical agencies (<i>Bappedalitbang</i> for planning, <i>BPKPD</i> for financial management, and <i>Dinas PUTR</i> for engineering execution), alongside a clear formal division between district road networks and village networks. However, the administrative hierarchy is excessively centralized and highly vertical. This multi-layered structure delays operational adjustments and leaves technical planning vulnerable to elite political interventions.	Structurally Defined but Highly Centralized

4.5. Analytical Interpretation of Implementation Variable

The field dynamics mapped in Table 4 reveal that the structural breakdown of Nias Regency's infrastructure policy does not occur during conceptual planning, but rather during field execution due to critical resource starvation and institutional rigidity. Because the local tax base, the Pendapatan Asli Daerah (PAD) is exceptionally low, the public works budget is entirely exposed to volatility in central government transfers. This resource bottleneck is complicated by the vertical nature of communication channels. While digital platforms like SIPD (Regional Development Information System) create a veneer of modern management, they act as top-down compliance mechanisms. Grassroots data collected from Musrenbang the traditional village-level development planning forums are routinely filtered out during district-level aggregation. Because rural communities are marginalized during planning and localized construction tasks are routinely outsourced to rekanan (private commercial contractors) who refuse to employ local workers, a deep sense of alienation develops among the poor.

4.6. Comparative Discussion and Contextual Contradictions

The findings of this study provide crucial nuances to the existing body of literature. Traditional macro-economic theories, such as those proposed by Calderón & Servén (2004), often posit a consistently positive, almost automatic relationship between infrastructure expansion and poverty reduction. However, the empirical reality in Nias Regency contradicts this universal assumption. The evidence here demonstrates that infrastructure development does not automatically reduce poverty if it is systematically decoupled from local labor absorption and equitable spatial distribution. This study aligns closely with the findings of Medeiros et al. (2021) and Parikh et al. (2015), extending their arguments into the context of 3T archipelagic regions. Similar to their findings, this research confirms that infrastructure only acts as an economic catalyst when it addresses spatial disparities equitably. The unique contextual contribution of this study is its identification of "geomorphological inflation" (reflected in the rising IKK) and "centralized political clustering" (focused on the capital, Gido) as specific contextual factors that actively erode the poverty-reducing potential of infrastructure budgets. Therefore, in extreme geographical contexts, the relationship between physical capital and poverty alleviation is highly conditional upon bureaucratic execution and collaborative community inclusion.

V. Conclusion

This study provides a comprehensive institutional evaluation of Nias Regency's physical infrastructure policy. The empirical findings reveal a distinct administrative paradox: while the aggressive expansion of road networks has been moderately effective in dismantling physical isolation (validated by the increase in good-condition roads to 233.89 km), the policy remains fundamentally constrained in its capacity to eradicate systemic poverty. Evaluated through Dunn's framework, the policy's efficacy is diluted by low operational

efficiency due to Nias's challenging terrain, high construction cost premiums (IKK), and a severe lack of equity driven by capital expenditures being centralized around the district capital. Analyzed through Edward III's lens, the primary execution bottlenecks are extreme fiscal dependence on central transfers, top-down Musrenbang communication filtering, and the exclusion of local laborers by private contractors, which triggers community alienation and poor asset preservation. To resolve these structural deficits, this study articulates three concrete policy recommendations. First, local planning agencies (Bappedalitbang) must structurally shift fiscal priorities away from centralized urban penning toward equitable rural distribution, specifically targeting the remaining unpaved rural road gaps and unsafe bridges to ensure market connectivity for farmers. Second, to foster economic empowerment, the regional government must legally mandate private contractors to employ a specific quota of local village workforces during the construction phase. Third, the Public Works Agency (Dinas PUTR) must reform technical procurement by adopting adaptive engineering designs and localized material sourcing that match the region's unstable soil, thereby reducing reliance on expensive external materials.

Despite these insights, this study acknowledges certain methodological limitations. Because it employs a qualitative descriptive design, it cannot statistically measure the exact marginal increase in household income generated by specific road segments. Therefore, future research must address these limitations by employing mixed-methods or quantitative time-series analyses. Specific emerging research questions for future studies include: "What is the quantitative impact of the 233.89 km road expansion on the local agricultural commodity price index in Nias?" and "How does the engagement of local labor in infrastructure projects statistically correlate with household poverty transitions over a 5-year period?" Addressing these questions will further solidify the evidence base for infrastructure-driven poverty alleviation in frontier regions.

References

- Agranoff, R., & McGuire, M. (2001). Big Questions in Public Network Management Research. *Journal of Public Administration Research and Theory*, 11(3), 295–326. <https://doi.org/10.1093/oxfordjournals.jpart.a003504>
- Ansell, C., & Gash, A. (2008). Collaborative Governance in Theory and Practice. *Public Administration Review*, 68(3), 543–560.
- Atapattu, P. J. (2020). Poverty Reduction Effect of Infrastructure: A Cross Country Study of Developing Countries in Asia. *Journal of Business and Technology*, 4(1–2), 20–41. <https://doi.org/10.4038/jbt.v4i1-2.38>
- Calderón, C., & Servén, L. (2004). The Effects of Infrastructure Development on Growth and Income Distribution (Working Papers Central Bank of Chile 270).
- Chotia, V., & Rao, N. V. M. (2017). An empirical investigation of the link between infrastructure development and poverty reduction. *International Journal of Social Economics*, 44(12), 1906–1918. <https://doi.org/10.1108/IJSE-06-2016-0154>
- Dunn, W. N. (2018). *Public Policy Analysis: An Introduction* (6th ed.). Routledge.
- Edward III, G. C. (1980). *Implementing Public Policy*. Congressional Quarterly Press.
- Gea, R. I. (2023). Persepsi Masyarakat Tentang Kinerja Kepala Desa Dalam Pembangunan Infrastruktur Di Desa Silimabanua Kecamatan Tuhemberua Kabupaten Nias Utara. Universitas Medan Area.
- Halawa, A. G., Pasaribu, J., & Tobing, A. L. (2025). Inovasi Kebijakan Pemerintah Daerah Dalam Menurunkan Angka Kemiskinan Di Kabupaten Nias Barat. *KALBISOCIO Jurnal Bisnis Dan Komunikasi (Edisi Khusus: Kebijakan Publik)*, 12(2).
- Harita, S. K. S. (2022). Implementasi Kebijakan Percepatan Pembangunan Daerah Tertinggal: Suatu Studi Pada Kabupaten Nias Selatan Provinsi Sumatera Utara. Institut Pemerintahan Dalam Negeri.
- Kurniawan, A., & Ihsan, M. (2021). Infrastruktur, Investasi dan Implikasinya Terhadap Pertumbuhan Ekonomi. *Jurnal Riset Ilmu Ekonomi*, 1(2), 78–88. <https://doi.org/10.23969/jrie.v1i2.15>

- Lindblom, C. E. (1959). The Science of "Muddling Through". *Public Administration Review*, 19(2), 79–88.
- Mazmanian, D. A., & Sabatier, P. A. (1983). *Implementation and Public Policy with a New Postscript*. University Press of America.
- Medeiros, V., Ribeiro, R. S. M., & Amaral, P. V. M. do. (2021). Infrastructure and household poverty in Brazil: A regional approach using multilevel models. *World Development*, 137, 105118. <https://doi.org/10.1016/j.worlddev.2020.105118>
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). SAGE Publications.
- Osborne, D. , & G. T. (1992). *Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector*. Addison-Wesley.
- Parikh, P., Fu, K., Parikh, H., McRobie, A., & George, G. (2015). Infrastructure Provision, Gender, and Poverty in Indian Slums. *World Development*, 66, 468–486. <https://doi.org/10.1016/j.worlddev.2014.09.014>
- Purwanto, E. A., & Sulistyastuti, D. R. (2012). *Implementasi Kebijakan Publik: Konsep dan Aplikasinya* (edisi Indonesia). Gava Media.
- Schachtebeck, C., & Mbuya, J. (2016). Assessing the potential benefits of road infrastructure development for poverty alleviation: Lessons learnt from developing economies. *Journal of Economics and Political Economy*, 2(1), 197–212.
- Simon, H. A. (1944). *Decision-Making and Administrative Organization*. *Public Administration Review*, 4(1), 16. <https://doi.org/10.2307/972435>
- Subarsono, A. G. (2015). *Analisis Kebijakan Publik: Konsep, Teori, dan Aplikasi*. Pustaka Pelajar.
- Thacker, S., Adshead, D., Fay, M., Hallegatte, S., Harvey, M., Meller, H., O'Regan, N., Rozenberg, J., Watkins, G., & Hall, J. W. (2019). Infrastructure for sustainable development. *Nature Sustainability*, 2(4), 324–331. <https://doi.org/10.1038/s41893-019-0256-8>
- Van De Walle, D., & Bank, W. (2017). Infrastructure and Poverty in Vietnam. <https://www.researchgate.net/publication/5077928>
- Wardani, L., & Gultom, Y. M. L. (2022). Health Care Infrastructure Limits the Ability of the Poor to Utilize National Health Insurance: The Case of Indonesia. *Asia Pacific Journal of Public Health*, 34(1), 137–139. <https://doi.org/10.1177/10105395211046503>
- Weber, M. (1947). *The Theory of Social and Economic Organization*. Free Press.