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Infrastructure, Governance, and Poverty Alleviation in Forest Conservation Zones

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Abstract

This article examines the intersection of infrastructure, governance, and poverty alleviation in ecologically protected areas, focusing on Kampar Kiri Hulu in the Wildlife Reserve of Bukit Rimbang Bukit Baling (WR-BRBB), Riau Province, Indonesia. Despite national poverty reduction agendas, forest-edge communities face persistent multidimensional poverty driven by spatial isolation, legal constraints, and institutional fragmentation. Using policy ethnography, spatial mapping, and interviews, the study reveals that infrastructural exclusion is not merely a technical issue but rooted in rigid regulatory frameworks that prioritize conservation over basic services. It highlights the tension between environmental protection and development, documenting community adaptations such as gotong royong, adat-based governance, and small-scale eco-tourism or micro-hydro projects. The findings expose a governance paradox: conservation laws preserve ecosystems while simultaneously marginalizing residents and constraining local government action. The study proposes integrated policy responses, including collaborative governance (penta-helix), adaptive social protection, legal recognition of customary land, and investment in ecologically sensitive infrastructure. These recommendations aim to realign conservation with inclusive development. By grounding its analysis in the Kampar case, the article offers critical insights for addressing poverty in conservation zones across the Global South through socially embedded and territorially nuanced governance innovations.

Keywords: *Poverty Alleviation, Forest Conservation Zones, Infrastructure, Governance, Policy Innovation.*

Introduction

Poverty remains a persistent and multidimensional challenge in many developing countries, including Indonesia. Despite numerous social protection programs and economic interventions, certain regions continue to experience entrenched and extreme poverty due to geographical isolation, limited infrastructure, and institutional constraints. Among the most vulnerable are populations residing in forest conservation zones, where conventional models of development often clash with ecological preservation mandates. In this context, Kampar Regency in Riau Province, Indonesia, offers a unique empirical site to examine the intersections of infrastructure, governance, and poverty alleviation, particularly in the conservation zone of Wildlife Reserve in Bukit Rimbang Bukit Baling (WR-BRBB).

Indonesia's commitment to eradicating extreme poverty is reflected in its national development

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agenda. However, the complexity of poverty—especially in forest-adjacent regions—extends beyond income metrics. It encompasses a lack of access to education, healthcare, sanitation, and market connectivity (Santika et al. 2019; Chambers 1995). In Kampar Regency, where many rural settlements are situated within or near conservation areas, these deprivations are compounded by strict land-use regulations, geographical remoteness, and bureaucratic fragmentation. According to data from the Coordinating Ministry for Human Development and Cultural Affairs year 2022, Kampar hosts the highest number of extreme poor in Riau Province, with 14,153 individuals categorized as extremely poor. Kampar Kiri Hulu Subdistrict, which lies within the WR-BRBB, is emblematic of this challenge. It is characterized by low population density (9 people/km^2), geographical isolation, limited access to electricity and telecommunications, and reliance on river transportation. The 24 villages within this subdistrict, nine of which can only be accessed via the Subayang River, represent a landscape where conservation imperatives meet developmental urgencies. Many of these communities are classified as extremely underdeveloped villages and suffer from a lack of essential services and infrastructure. This physical inaccessibility has historically hindered the implementation of development programs and distorted the distribution of public goods (ADB 2012).

Infrastructural exclusion in these areas is not merely a technical failure but a governance issue. Development in conservation zones is strictly regulated under Indonesia's Ministry of Environment and Forestry (KLHK), which prohibits infrastructural interventions that may compromise ecological integrity. As such, even basic road construction or electrification initiatives require complex negotiations with Balai Besar Konservasi Sumber Daya Alam (BBKSDA), the provincial conservation authority. The resultant legal and procedural bottlenecks have constrained the ability of local governments to extend services to marginalized populations.

To navigate this tension, a cooperative governance model has emerged in Kampar, exemplified by the 2019 memorandum of understanding between Kampar District Government and BBKSDA Riau. This agreement permits the development of limited eco-tourism infrastructure, such as "interpretation roads" and micro-hydro energy systems, within the conservation area. However, these initiatives are largely symbolic and limited in scope, insufficient to transform the economic and social conditions of residents. The core challenge remains: how can infrastructure development and poverty alleviation be pursued in ways that respect environmental mandates while also enhancing access, equity, and local agency?

Existing literature on poverty reduction in conservation zones is sparse. Most frameworks remain dominated by dualistic narratives that pit development against conservation (Brockington, Igoe, and Schmidt-Soltau 2006). However, recent scholarship suggests the potential for integrative approaches that leverage indigenous knowledge, adaptive infrastructure, and collaborative governance (Agrawal and Redford 2006). In this light, the Kampar case offers valuable insights into designing spatially sensitive, institutionally coherent, and socially embedded development strategies. The study findings illuminate how local residents navigate the constraints of conservation regulations, how informal infrastructures—such as river transportation and communal labor—compensate for formal infrastructural gaps, and how institutional rigidity can be mitigated through policy innovation and stakeholder collaboration.

Conceptually, this article is grounded in three key frameworks. First is the theory of sustainable development, which emphasizes the reconciliation of environmental protection, economic growth, and social equity (WCED 1987). Second is theories of collaborative governance, which

underscore the importance of cross-sectoral and multi-level coordination in complex policy environments (Ansell and Gash 2008). Third is spatial justice theory, which interrogates how infrastructural inequality is both a symptom and a cause of structural poverty (Soja 2010). Together, these frameworks allow for a nuanced understanding of the infrastructural, institutional, and socio-cultural configurations that shape development outcomes in protected areas.

The empirical and theoretical contributions of this article are threefold. First, it provides a grounded analysis of poverty and infrastructure governance in a conservation zone—an area typically underrepresented in development discourse. Second, it identifies key enabling and constraining factors that influence policy effectiveness in special needs areas. Third, it proposes an alternative development model that integrates ecological sensitivity, local participation, and institutional adaptability. By articulating these dynamics in the context of Kampar Kiri Hulu, Indonesia, this study aims to contribute to ongoing debates in infrastructure policy, rural development, and environmental governance. The implications are not limited to Indonesia but extend to other parts of the Global South where conservation and development imperatives intersect.

Methodology

This study adopts a qualitative-interpretive research design grounded in the tradition of policy ethnography and supported by spatial analysis. Policy ethnography is a qualitative strategy that seeks to understand how policies are enacted, interpreted, and resisted at the local level (Shore, Wright, and Però 2011). This approach is particularly apt for studying complex governance environments like conservation zones, where multiple institutional logics converge and local actors must navigate overlapping systems of regulation, development policy, and customary norms.

The *case study* design centers on the Kampar Kiri Hulu Subdistrict of Kampar Regency, Riau Province—an administratively designated special-needs area that overlaps with the Wildlife Reserve of Bukit Rimbang Bukit Baling (WR-BRBB). This area was selected as a critical case due to its high concentration of extreme poverty, geographic isolation, infrastructural deprivation, and regulatory complexity related to forest conservation. Kampar Kiri Hulu contains 149 households classified as living in extreme poverty, many of which reside within forest boundaries regulated by the Ministry of Environment and Forestry.

The study draws upon both primary and secondary data. Primary Data collected through in-depth interviews, Focus Group Discussions (FGDs), and field observation. The in-depth interview has collected data from village heads (*kepala desa*), representatives from the Kampar District Government (Regional Planning Agency, Social Service Agency, and Public Works and Spatial Planning), field staff of Province's Natur Conservation Agency, leaders of *adat* (customary) institutions, and community members residing in WR-BRBB-adjacent villages. The research has also collected secondary Data from the various development planning documents i.e., RPJMD, RTRW Kampar, Regional Action Plan, and spatial maps (conservation boundaries, road networks)

The analysis followed a deductive-inductive logic, in which theoretical constructs (e.g., multidimensional poverty, collaborative governance, spatial exclusion) guided initial coding while allowing new categories to emerge from the data. Transcribed interviews and field notes were analyzed using thematic coding, supported by qualitative data software (*NVivo*), to identify

recurrent patterns and narratives. In parallel, spatial analysis using GIS tools was conducted to map settlement patterns and accessibility to services, road infrastructure and riverine connectivity, and conservation boundaries relative to village locations. This geospatial component was essential for visualizing the material dimensions of exclusion and corroborating qualitative claims with spatial data.

Multidimensional Poverty in the Conservation Zone: An Empirical Context

Kampar Kiri Hulu is one of the most geographically isolated and infrastructurally underserved subdistricts in Kampar Regency, Riau Province, Indonesia. The area borders the WR-BRBB, a protected forest covering over 141,000 hectares. Within this administrative boundary, the subdistrict consists of 24 villages—many of which are classified as *desa sangat tertinggal* (extremely underdeveloped villages) under Indonesia's Ministry of Villages classification system. Kampar Kiri Hulu is characterized by rugged topography, dense forest cover, and extensive river networks. Its accessibility is severely constrained. Only a few villages are connected by dirt or gravel roads, while the rest rely on the Subayang River as the main transportation artery. During the rainy season, this river becomes dangerous or impassable, further isolating the population from markets, services, and administrative support.

Administratively, the area is under the dual jurisdiction of local (Kampar Regency) and national (Ministry of Environment and Forestry) authorities. The legal classification of wildlife reserve restricts infrastructure development, land use change, and settlement expansion. This has direct implications on the feasibility of constructing basic public infrastructure, such as roads, electricity grids, schools, and health posts. According to the Coordinating Ministry of Human Development and Cultural Affairs, Kampar Kiri Hulu has among the highest concentrations of extreme poverty in Riau Province. The total population of the subdistrict is approximately 16,345 people, and 149 households are formally categorized as living in extreme poverty, with income below Rp11,633 (lest than US$ 1) per capita per day. Key indicators of deprivation in Kampar Kiri Hulu include 8 out of 24 villages are completely off-grid electricity, others rely on diesel generators or micro-hydro units. Less than 40% of villages are reachable by motorized vehicle throughout the year. Only one junior secondary school is available within the subdistrict. Students often travel 3–5 hours by boat to access senior high school. Only one auxiliary health post (*puskesmas pembantu*) operates in the interior villages. Emergency services are practically non-existent during flood seasons. Cellular signal is either weak or absent in most interior areas. Internet access is negligible. These structural deficits are compounded by a low Human Development Index (HDI) at the village level, as reflected in low school participation rates, high maternal mortality, and seasonal malnutrition during harvest failure periods.

The WR-BRBB is managed under the authority of the *Balai Besar Konservasi Sumber Daya Alam* (BBKSDA) Riau, which applies strict legal frameworks that prohibit settlement expansion and infrastructure construction within the protected forest. Any public infrastructure project—roads, bridges, even electricity poles—requires an Environmental Impact Assessment (*AMDAL*) and approval from multiple layers of the Ministry of Environment and Forestry. In practice, these regulations lead to long delays and bureaucratic impasses. An MoU signed in 2019 between the Kampar Regency Government and BBKSDA Riau created some limited exceptions. It allowed the development of low-impact eco-tourism paths and the installation of micro-hydro energy systems, provided they comply with conservation principles. However, the scale and implementation of these initiatives remain marginal and do not significantly alter the infrastructure landscape for the majority of residents. Furthermore, customary (*adat*) land claims

are not formally recognized within the conservation zone. This legal ambiguity undermines tenure security and discourages community investment in land improvement or settlement development. It also leads to occasional conflict between conservation officers and local residents accused of illegal farming or logging activities.

Despite these constraints, local communities have developed informal adaptive mechanisms to navigate the institutional rigidity of conservation policies. The *adat* institutions play a vital role in regulating land use, mediating disputes, and organizing communal labor (*gotong royong*) to maintain basic infrastructure such as footpaths, hanging bridges, and river docks. Village cooperatives and farmer groups (Kelompok Tani Hutan) also serve as intermediaries between state and community. In some villages, these groups have initiated community-led mapping and documentation of traditional land claims, often supported by NGOs or academic researchers. These efforts aim to create legitimacy for local land use practices and advocate for more inclusive conservation policies. One notable success is the pilot program in Tanjung Belit, where a multi-stakeholder tourism cooperative manages eco-tourism activities with permission from BBKSDA. Although still limited in economic scale, the program demonstrates the potential of co-management models to generate income while maintaining conservation standards.

The empirical context reveals a critical governance gap. On one hand, local government actors such as Kampar's Regional Development Planning Agency and the Social Service Agency express commitment to infrastructure development and poverty alleviation. On the other hand, they lack both the legal authority and budgetary control to implement projects within the WR-BRBB zone. Meanwhile, national conservation agencies operate with limited accountability to local development agendas. This governance misalignment results in a policy deadlock. Development proposals are either rejected on ecological grounds or rendered ineffective due to delays and underfunding. Consequently, communities are caught in an institutional vacuum—simultaneously regulated and neglected. Efforts to bridge this divide through collaborative platforms have so far yielded only modest gains. Coordination forums between conservation authorities and district agencies are often ad hoc, underfunded, and lack follow-through mechanisms. The absence of a permanent multi-stakeholder coordination body hampers strategic planning and implementation.

Poverty alleviation in forest conservation areas like Kampar Kiri Hulu faces a unique configuration of challenges that are not merely economic, but fundamentally legal, institutional, and spatial. This section outlines the key barriers that hinder development interventions in the region—each of which reinforces the others and creates a layered architecture of exclusion. The foremost legal barrier to infrastructure and service delivery in Kampar Kiri Hulu stems from the status as a conservation zone under national forestry law. Governed by the Ministry of Environment and Forestry (KLHK) through its local implementation body, *Balai Besar Konservasi Sumber Daya Alam* (BBKSDA) Riau, the area is subject to strict land-use limitations designed to protect biodiversity and ecological integrity. Regulation of KSDAE No. P.6/KSDAE/SET/KSA.0/6/2018 stipulates that all forms of infrastructure development—such as road construction, electrification, or public facilities—must obtain special permits and undergo Environmental Impact Assessments (AMDAL). The regulation categorizes these activities as "high-risk interventions" that are only permissible under exceptional circumstances. As a result, even basic developmental projects must pass through a labyrinthine approval process at the central government level, often taking years to finalize. This legal rigidity effectively suspends local autonomy. Although district governments are responsible for poverty alleviation under national decentralization law No. 23/2014, they are simultaneously stripped of authority

to act within conservation zones. This contradiction creates a jurisdictional conflict, namely Kampar Regency is held accountable for developmental outcomes but denied the legal instruments to realize them.

Another is institutional barriers related to the fragmentation and weak inter-governmental coordination. Beyond legal constraints, the institutional configuration of governance in Kampar Kiri Hulu is marked by fragmentation and coordination failure. The actors involved—ranging from Regional Planning Agency, Social Service Agency, Public Works and Spatial Planning, Natur Conservation Agency, Ministry of Environment and Forestry, and local *adat* (customary) councils—often operate in silos. Each agency follows its own mandates, planning frameworks, and accountability chains, resulting in duplication, delays, and policy deadlock. For example, Regional Planning Agency routinely includes road and energy infrastructure proposals for Kampar Kiri Hulu in its Regional Medium-Term Development Plan. However, these projects are frequently removed from funding consideration after being rejected by BBKSDA due to regulatory non-compliance. No permanent inter-agency forum exists to mediate these disagreements or facilitate joint planning. Even when memoranda of understanding (MoUs) are signed—such as the 2019 MoU between BBKSDA and the Kampar Regency Government—implementation tends to be project-specific and non-binding. The absence of institutionalized coordination mechanisms undermines strategic continuity and leaves development actors reacting to crises rather than planning proactively. Furthermore, fiscal fragmentation exacerbates the problem. BBKSDA receives its budget from national allocations focused narrowly on conservation, while Kampar's district budget (APBD) cannot legally fund projects that interfere with forest regulations. This dual budgeting system results in chronic underfunding of integrated programs that could simultaneously support conservation and local welfare.

Moreover, the physical geography of Kampar Kiri Hulu presents formidable obstacles to connectivity and access. The subdistrict consists of mountainous terrain, dense forests, and dispersed riverine settlements. Most villages lack all-season roads, and 13 of them can only be accessed by boat along the Subayang River. During the rainy season, floods and strong currents make these routes dangerous or impassable, isolating communities for weeks at a time. This isolation has direct consequences for public service delivery. Health workers are unable to reach remote areas regularly. Students must travel hours to attend junior secondary school. Goods, especially perishable items, are difficult to transport, inflating local prices and suppressing market participation. Without digital infrastructure, these communities are further excluded from administrative services, online education, and social protection programs that now require electronic identification or mobile connectivity.

Spatial exclusion is not merely a logistical problem—it becomes a political invisibility. Because development indicators in Kampar Kiri Hulu remain stagnant, the area receives less attention in regional prioritization processes. Planners tend to focus on zones with higher cost-efficiency ratios, marginalizing regions where unit costs for infrastructure are deemed too high. In this context, infrastructure deprivation reinforces the poverty trap that low institutional visibility leads to poor investment, which in turn perpetuates low social development outcomes and continued exclusion (Chambers 1995).

The interaction between legal, institutional, and spatial barriers creates negative feedback loops that obstruct both short-term interventions and long-term structural change. These loops are reinforced by epistemological asymmetries. State agencies prioritize "scientific" conservation paradigms over local experiential knowledge, often dismissing customary practices

as informal or illegitimate. This exclusion further marginalizes communities whose customary institutions might otherwise serve as allies in sustainable land stewardship.

Thus, poverty alleviation in forest conservation zones like Kampar Kiri Hulu is shaped by a convergence of legal, institutional, and spatial constraints. The designation of the WR-BRBB as a protected area imposes strict land-use regulations governed by national forestry law, effectively suspending local government authority. Development initiatives such as roads, electrification, and public facilities require lengthy and complex approvals, including environmental impact assessments. This legal rigidity leads to policy deadlock: while the Kampar Regency is mandated to reduce poverty under decentralization law, it lacks jurisdictional power in conservation areas. Institutional fragmentation further exacerbates the problem. Agencies operate in silos with minimal coordination, resulting in overlapping mandates and implementation paralysis. The absence of a permanent inter-agency mechanism weakens strategic planning and responsiveness, while dual budgeting systems prevent integrated funding for both conservation and development needs. Spatial isolation adds another layer of exclusion. Most villages are accessible only via rivers, and seasonal flooding cuts off essential services. This physical and political inaccessibility reduces institutional visibility, thereby reinforcing exclusion from development prioritization.

Despite these layered barriers, communities have not remained passive. Local adaptation emerges through *gotong royong* (mutual aid labor), informal infrastructure maintenance, and the revival of customary institutions. These mechanisms mediate land use, resolve disputes, and support resource stewardship. Villagers strategically combine local ecological knowledge with selective engagement in formal governance structures, exemplified by eco-tourism cooperatives and micro-hydro projects negotiated with BBKSDA. However, these practices remain limited by broader structural forces. Without legal recognition of customary rights, formal infrastructure, or capacity-building support, local innovations risk exhaustion rather than systemic transformation. Thus, while community resilience is vital, it must be complemented by enabling policy environments that recognize and institutionalize these grassroots capacities.

Integrative Approach for Poverty Reduction in the Forest Conservation Zone

This study is grounded in the interrelation of key conceptual domains—**multidimensional poverty, infrastructure and spatial exclusion,** and **collaborative governance**—as applied to Kampar Kiri Hulu, a subdistrict within the legally protected WR-BRBB, Riau, Indonesia. Each of these analytical lenses reveals how poverty is not only sustained but institutionally and spatially reproduced in areas subjected to overlapping ecological and developmental mandates. Sen (2000) reframes poverty as a deprivation of capabilities—the substantive freedoms to live a life one has reason to value—rather than merely a deficit of income. This framework is acutely relevant in Kampar Kiri Hulu, where forest-dependent populations suffer not only from economic marginality but also from systematic denial of essential services, educational opportunities, and political representation. Poverty here is structural, multidimensional, and enduring. Meanwhile, Chambers (1995) complements Sen's analysis by emphasizing the reinforcing cycles of poverty. In Kampar, this is evident in the way geographical remoteness leads to poor education and health outcomes, which then limit livelihood options, further entrenching marginalization. These factors do not occur in isolation but intersect in ways that reinforce each other. For example, limited access to education perpetuates low digital literacy, which then excludes residents from accessing national social protection schemes increasingly administered online. Likewise, the absence of permanent healthcare facilities contributes to high

maternal and infant mortality, which is compounded during the rainy season when floods sever riverine transportation routes, isolating whole communities for weeks.

The concept of *spatial injustice* (Soja 2010) helps capture how exclusion is structured through the spatial organization of power, law, and infrastructure. In Kampar Kiri Hulu, spatial injustice is evident in how the conservation status of WR-BRBB effectively creates an "infrastructure vacuum." This is not a result of technical incapacity, but rather legal design. National forestry law prohibits road building, electrification, or construction of public facilities within conservation areas without complex environmental clearance and multi-agency approval. As a result, the district government—though responsible for local development—is legally disempowered to act. This infrastructural exclusion is not only a symptom of poverty but a cause. The concept of *infrastructure heterogeneity* (Lawhon et al. 2023; Pilo' 2023) describes how investment in physical infrastructure is unevenly distributed based on political visibility and institutional influence. In Kampar, infrastructure proposals often fail to move beyond the planning stage due to resistance from BBKSDA, the authority overseeing conservation enforcement. This misalignment creates a *developmental void*: the district government remains accountable for poverty indicators, yet lacks legal instruments and authority to intervene in conservation zones. Fieldwork revealed that villages such as Aur Kuning, Batu Sanggan, and Tanjung Belit face drastically lower access to motorized roads, electricity, and schools compared to non-conservation villages in Kampar. For instance, students in some villages travel four to six hours by boat just to access junior high school, while healthcare is limited to a single auxiliary post serving over 10 villages. This spatialized inequality has political consequences. Areas that remain disconnected from road networks and mobile communication become *statistically invisible* in policy planning because their exclusion reduces the cost-efficiency of interventions. Infrastructure deprivation leads to weak administrative data, which then further deprioritizes the region in development planning—a feedback loop of neglect.

In light of these barriers, the idea of *collaborative governance* (Ansell and Gash 2008) offers a pathway for negotiated solutions that transcend institutional silos. Kampar Kiri Hulu is a textbook case of a multi-jurisdictional environment where local governments, conservation authorities, customary institutions, and community cooperatives operate in parallel with overlapping and often conflicting mandates. The 2019 MoU between the Kampar Regency Government and BBKSDA Riau was a significant step toward collaborative governance. It allowed for the limited development of "interpretation roads" and small-scale infrastructure such as micro-hydro systems. These projects, while symbolically important, remain insufficient in scale and impact. The MoU lacks strong implementation mechanisms, fiscal integration, and consistent monitoring. This fragmented governance landscape undermines the potential of collaborative approaches. While conservation authorities remain loyal to national preservation mandates, local governments prioritize human development targets. The result is a legal and institutional impasse: infrastructure proposals stall or get abandoned, and budget allocations for conservation zones often go unspent due to regulatory non-compliance. Ostrom's (2010) concept of *polycentric governance* becomes particularly useful here. It suggests that solutions can emerge from a network of overlapping decision-making centers that coordinate rather than compete. In Kampar, this would mean empowering village councils, customary leaders, and community-based organizations to co-manage development initiatives in collaboration with formal agencies. However, such models remain aspirational unless supported by legal recognition and budgetary autonomy.

Despite legal and spatial barriers, communities in Kampar Kiri Hulu display remarkable adaptive

capacity. This is manifested in the practice of *gotong royong* (collective labor), where communities maintain bamboo bridges, river docks, and footpaths using shared labor without state support. These informal infrastructures ensure year-round access to markets and schools, albeit with limited safety and durability. *Adat* institutions, such as Kerapatan Adat Nagari, also function as informal governance systems. They regulate land access, mediate disputes, and enforce environmental norms such as bans on logging sacred groves or fishing during breeding seasons. These practices represent *vernacular governance*—where traditional norms and informal institutions fill the vacuum left by formal state structures. One notable case is the eco-tourism initiative in Tanjung Belit. Managed by a village cooperative, it employs local youth as guides, provides homestays, and maintains forest trails in compliance with conservation principles. While still modest in scale, the initiative shows how *hybrid governance*—where formal regulations are negotiated through local institutions—can enable conservation-compatible development. Similarly, the micro-hydro power system in Aur Kuning was made possible through collaboration among villagers, conservation officers, and academic institutions. The community provided labor and land; the university offered technical support; BBKSDA gave conditional clearance. Such arrangements reflect the potential of *penta-helix* models that involve government, academia, civil society, private sector, and community actors in co-producing development solutions.

Yet, the resilience of local communities should not be romanticized. Community-led solutions are often underfunded, labor-intensive, and fragile in the face of environmental shocks. Floods regularly destroy footbridges and crops; limited access to capital prevents scaling up of eco-tourism; and lack of legal recognition for *adat* land discourages long-term investment in agriculture or infrastructure. Moreover, the digital divide remains a serious barrier. Many residents lack digital literacy, national ID cards, or access to internet networks, excluding them from basic services such as health insurance, social protection, and education. The state's increasing reliance on digital governance has left these populations behind. Without a formal mechanism to integrate *adat* knowledge and participatory planning into national development programs, these communities risk continued marginalization. A critical challenge is to create governance arrangements that are not only inclusive but also legally binding and fiscally supported.

Synthesizing the above, the empirical context of Kampar Kiri Hulu underscores the need for an integrative approach to development in conservation zones—one that addresses the spatial, legal, and institutional production of poverty while recognizing and reinforcing local resilience. This study proposes a development model that take into account four aspects. First is to **recognizes multidimensional poverty** as not only a policy problem but a governance failure. Second is to **redefine infrastructure** that include ecologically sensitive and community-led innovations. Next is to **institutionalize collaborative governance** through polycentric and penta-helix models. Also, it is necessary to **formalize adat institutions** as co-governors rather than informal actors. Finally, b**ridging digital exclusion** by deploying mobile registration units and offline-compatible social protection programs. Such a model would recalibrate the relationship between conservation and development—not as oppositional goals but as co-dependent imperatives. In doing so, Kampar Kiri Hulu could serve as a blueprint for other forest-dependent regions across the Global South facing similar structural constraints.

Governance Innovation for Poverty Reduction in Forest Conservation Zone

Kampar Kiri Hulu represents a vivid illustration of the governance paradox that characterizes

many forest conservation zones in the Global South: areas prioritized for ecological preservation are often systematically marginalized in development planning. The coexistence of biodiversity protection and extreme poverty illustrates the failure of siloed institutional logics—where conservation and development are treated as mutually exclusive goals (Brockington, Igoe, and Schmidt-Soltau 2006). This section proposes five interlocking governance innovations designed to reconcile these tensions, namely (1) ecologically-sensitive infrastructure, (2) collaborative governance platforms, (3) adaptive social protection, (4) legal pluralism and recognition of adat institutions, and (5) participatory data systems.

Ecologically sensitive infrastructure is necessary since conservation areas in Indonesia are regulated under the 1999 Forestry Law and related Ministry of Environment and Forestry decrees, which prohibit most forms of physical development in wildlife reserves. This legal rigidity reflects an outdated model of "fortress conservation" that isolates nature from human life (Adams and Hutton 2007). As such, the exclusion of infrastructure in Kampar Kiri Hulu—such as roads, bridges, electricity, and public facilities—has entrenched spatial injustice (Soja 2010) and deepened multidimensional poverty (Sen 2000). Innovative, low-impact infrastructure can offer a pathway forward. Pilot projects in Tanjung Belit and Aur Kuning have shown the feasibility of **micro-hydro power units, solar hybrid grids,** and **interpretive eco-paths** that provide essential services without violating conservation principles. The concept of *green infrastructure*—defined as infrastructure that delivers environmental, social, and economic benefits—has gained traction in international development (Anguelovski and Carmin 2011), and should be systematically integrated into Indonesia's National Medium-Term Development Plan. Moreover, the **Environmental Impact Assessment** framework must be revised to distinguish between extractive industrial projects and small-scale, community-based infrastructure. Current practice often equates a micro-hydro unit with a palm oil plantation in terms of procedural burden, undermining equity and common sense. Regulatory reforms should be evidence-based and risk-proportionate (World Bank 2017).

It is also necessary to adopt c**ollaborative governance platforms to break institutional silos.** Kampar's governance landscape is fragmented between national conservation authorities (e.g., BBKSDA Riau), district development agencies, and customary institutions. These actors operate within distinct mandates, funding structures, and legal frameworks, resulting in misalignment and developmental stagnation. Ansell and Gash (2008) describe **collaborative governance** as a model where public agencies engage non-state stakeholders in deliberative, consensus-oriented decision-making. The **penta-helix model**—widely promoted in Indonesian public administration—adds private sector and academia to this collaboration (Tadung 2023; Vani et al. 2024). To work in practice, however, this model must be institutionalized through concrete mechanisms. First, **multi-Stakeholder Forums** must be formalized through district regulations, with clear roles for BBKSDA, Regional Planning Agency, NGOs, cooperatives, and universities. Second, **joint planning platforms** should synchronize forest management plans with the RPJMD, enabling shared spatial datasets, participatory village development plans, and conflict resolution protocols. Finally, **sustainable financing mechanisms**—such as CSR funds, green bonds, and impact investment—should be channeled into eco-tourism, forest-based enterprises, and digital inclusion projects. The theory of **polycentric governance** (Ostrom 2010) is useful here. Rather than relying on hierarchical control, effective governance in complex systems emerges from overlapping, semi-autonomous institutions working in coordination. Kampar's fragmented governance could be reconfigured as a polycentric network, enhancing responsiveness and flexibility.

Next is a**daptive social protection to ensure inclusion in the last mile.** Conventional social protection frameworks often fail in regions like Kampar Kiri Hulu, not because of lack of funding, but due to logistical and institutional inaccessibility. Many residents lack ID cards, bank accounts, or digital literacy—preconditions for accessing national programs such as **PKH, BPNT, or JKN**. This reflects a broader pattern in which the "last mile" of welfare delivery is the most difficult to reach (Barrientos 2013; 2004). Adaptive social protection, as advocated by Sabates-Wheeler and Devereux (2008), emphasizes the need to tailor social safety nets to ecological and socio-cultural contexts. In Kampar, this means necessity to m**obile registration teams** using biometric and satellite tools to reach riverine communities, c**ommunity-based targeting** via customary councils to identify eligible households, and **conditional transfers linked to conservation** e.g., cash-for-conservation or food-for-forest-monitoring. These innovations not only improve program coverage but create **positive synergies between social welfare and environmental outcomes**, a principle increasingly recognized in integrated development policy (UNDP 2022). Furthermore, these programs should be designed to uphold *situated justice* (Fraser 2009)—the idea that fairness must account for specific geographies, identities, and capabilities.

Moreover, legal pluralism and recognition of adat institutions are also important. A core obstacle to equitable development in Kampar Kiri Hulu is the **legal invisibility of customary land tenure systems**. While communities continue to manage land based on customary norms—through communal rotation, sacred groves, and ritual prohibition zones—these systems lack formal recognition under national law. This legal limbo inhibits investment, causes tenure insecurity, and leads to conflict with conservation authorities (Nicholas 2020). Indonesia's **Constitutional Court Decision No. 35/PUU-X/2012** was a landmark ruling, affirming that customary forests are not state forests. Yet implementation remains weak. To realize this mandate, local governments must (1) conduct **participatory mapping** of customary territories with community input and validation; (2) issue **district regulations** that recognize customary law communities; (3) integrate customary principles into conservation planning, including rules on sacred zones, fallow cycles (*ladang berpindah*), and harvesting calendars. Legal pluralism—the coexistence of multiple normative systems—is not a threat to state sovereignty but a feature of democratic governance in plural societies (Merry 1988). Recognizing customary institutions as legitimate co-governors enhances the legitimacy, efficacy, and sustainability of conservation outcomes.

Finally, p**articipatory and localized data systems are essential in making marginality legible.** National poverty databases such as **DTKS** and **P3KE** often exclude remote populations due to outdated surveys, technological limitations, or administrative blind spots. This invisibility distorts policy targeting and reinforces exclusion. Scott's (1998) concept of *legibility* is relevant here: states govern more effectively when populations are made visible through simplified metrics. However, over-reliance on technocratic data risks erasing local realities. A hybrid approach is needed—combining **remote sensing** (for mapping infrastructure and forest cover) with **community-driven data** (on service access, local deprivation, and conservation contributions).

Kampar Kiri Hulu's governance landscape reveals the structural contradictions of forest conservation in Indonesia. Despite the rhetorical commitment to poverty reduction and inclusive development, current legal and institutional frameworks continue to marginalize forest-dwelling communities. This section has argued that meaningful poverty alleviation in conservation zones requires a new governance paradigm—one that centers local agency, ecological sensitivity, and

institutional coordination. Governance innovation is not merely about technical reform but political transformation. By embracing collaborative governance, adaptive welfare systems, legal pluralism, and participatory data, policy actors can reconfigure conservation zones from spaces of exclusion into laboratories of just and sustainable development. The lessons of Kampar are not confined to Indonesia—they speak to broader global struggles to harmonize environmental and social justice in an era of overlapping crises.

Conclusion

Kampar Kiri Hulu exemplifies the governance paradox of forest conservation zones: communities face multidimensional poverty while development is constrained by ecological protection mandates. This study has shown that infrastructural exclusion in such contexts is not merely a result of geographic remoteness but is deeply embedded in legal rigidity, institutional fragmentation, and spatial injustice. Through policy ethnography and spatial analysis, the article reveals how communities mobilize adaptive strategies—ranging from gotong royong and adat governance to eco-tourism and micro-hydro initiatives—within a highly restricted policy environment.

However, while community resilience is notable, it cannot substitute for systemic change. The persistence of extreme poverty in conservation areas demands a rethinking of development models—moving from exclusionary frameworks toward integrative, context-sensitive governance. Policy recommendations from this study include adopting ecologically sensitive infrastructure strategies, formalizing adat land rights, implementing adaptive social protection, and institutionalizing collaborative, multi-stakeholder governance platforms. The case of Kampar Kiri Hulu offers broader insights for regions across the Global South where conservation and development imperatives intersect. Addressing poverty in such zones requires more than balancing trade-offs; it entails designing governance systems that are inclusive, territorially grounded, and responsive to local socio-ecological realities. Only through such realignment can conservation efforts be sustained alongside just and equitable development outcomes.

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