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Evaluating land policies for suitable toll road development in Yogyakarta

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Abstract

This study aims to identify key factors influencing land policies for the Yogyakarta toll road and assess whether land acquisition supports green infrastructure development. Using qualitative methods, it combines primary data from questionnaires and in-depth interviews with 33 sub-district (Panewu) and village (Lurah) leaders, alongside secondary data from regulations and literature. Panewu is the leader of a sub-district area, while Lurah is the leader of a village area. The Analytic Hierarchy Process is applied to evaluate land policy based on appropriateness, responsiveness, equity, adequacy, efficiency, and effectiveness. The findings reveal that policy alignment is crucial for land acquisition. The process prioritizes community welfare through fair compensation, economic growth, and transparency, aligning with the Sultanate's leasing strategy. The national land policy is perceived as fairer, earning greater public trust. The study identifies that toll road construction impacts 35.48 hectares of agricultural land, mitigated through elevated designs and land substitution, supporting green infrastructure goals. The study concludes that integrating community welfare, transparency, and environmental safeguards into land policies ensures sustainable development. Practical implications include enhancing stakeholder engagement, equitable compensation, and reinvesting lease revenues into infrastructure. These measures align land acquisition practices with broader sustainability objectives, providing a model for similar regions.

Keywords: Green infrastructure, Land acquisition, Land policy, Sustainable development, Toal road.

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1. Introduction

Policies in Indonesia emphasize that toll road construction is carried out to facilitate the transportation of people, goods, and services, which is important for many people [1]. However, toll road construction can also face resistance from indigenous

communities and other stakeholders, requiring consultations and consideration of various opinions [2]. Government compensation policies in land acquisition processes are crucial to ensure fairness and minimize conflicts with affected individuals. Adiprasetyo et al. [3] highlight the tensions that may arise between the government and farmers due to differences in compensation levels during land acquisition. This tension underscores the importance of fair and consistent compensation policies to avoid conflicts.

Adrianto et al. [4] emphasize the need to establish standards and mechanisms for compensating agricultural land to ensure long-term compensation for affected individuals. Ghimire et al. [5] provide insights into the welfare impacts on farmers who lose their land and recommend revising land use policies, enhancing compensation, and improving the income and mental well-being of affected farmers. Therefore, the main issue is not only the willingness of the community to surrender their land for acquisition, but also how the government formulates policies related to incentives or other measures to compensate the community's willingness to surrender their land, so that land acquisition can achieve sustainable infrastructure development that benefits the public.

Land policies play an important role in land acquisition for toll road construction. The land acquisition process for toll road development is a major challenge, especially in unique regions such as West Sumatra, where customary (Ulayat) land complicates the process [6]. The importance of land policies in the land acquisition process for toll roads cannot be denied. Furthermore, research by Leksono et al. [7] underlines that land acquisition is the process of purchasing privately owned land that is traversed by toll roads, emphasizing the need for clear and effective land policies to facilitate this process [7].

Customary land issues, such as adat land, ulayat land, or sultanate land, face numerous challenges, particularly in the context of land acquisition. Weak mechanisms for acquiring customary land, land scarcity, and fears of land dispossession have led to the development of practices such as buying and leasing land to address these challenges [8]. The consolidation of land responsible for customary land faces obstacles such as the scope of land administration systems, land valuation approaches, and land reallocation methods that align with customary land ownership systems [9].

Yogyakarta is one of the Special Regions in Indonesia, as evidenced by the Special Region of Yogyakarta's Special Autonomy Law. One of Yogyakarta's special features is the existence of Sultanate land. According to the Special Region of Yogyakarta Regional Regulation Number 1 of 2017 concerning the Management and Utilization of Sultanate and Kadipaten Land, Sultanate land refers to land owned by the Sultanate, including Keprabon Land and Non-Keprabon Land or Non-Keprabon Land located in the districts/cities within the Special Region of Yogyakarta. The utilization of Sultanate and Kadipaten land is intended for cultural development, social interests, and community welfare. If the Indonesian Government or any other institution intends to use Sultanate land, they must obtain written permission from the Sultanate. The written permission is referred to as Serat Kekancingan.

The construction of the Solo-Yogyakarta-Yogyakarta International Airport (YIA) Kulon Progo Toll Road is one of the National Strategic Projects spanning 96.57 km. This toll road project has three sections. In the three stages of land procurement for the toll road, it is possible that there may be land belonging to the Sultanate in each stage. According to Penghageng Tepas Panitikismo of the Yogyakarta Palace, Gusti Kanjeng Ratu (GKR) Mangkubumi, the total area of Sultanate land affected by the toll road is not yet known. However, it has been emphasized that the Yogyakarta Palace does not want to lose its land.

The Sultanate land that cannot be freed (bought by the state and converted into state land) is governed by the policy adopted by the Yogyakarta Palace, which allows for its use solely for the Yogyakarta Toll Road with the status of land use rights. Compensation for this land use right is planned to be based on the rental value of the Sultanate land. The issue at hand is whether this Sultanate land policy supports and benefits the public interest or not, and how the application and utilization of Sultanate land have been so far, especially in terms of public infrastructure development. This is also complicated by the fact that the Yogyakarta Palace has its own land policy, while the Republic of Indonesia also has its own land policy.

Additionally, the land acquisition policy for the Toll Road in Yogyakarta is closely related to the approval of the Sultan of Yogyakarta. According to available data, the toll road in Yogyakarta is one of the toll roads with minimal impact on agricultural land compared to other regions. Based on information from the Head of the Department of Agriculture and Food Security of the Special Region of Yogyakarta, Mr. Sasongko, in order to minimize changes to agricultural land, the policy is to construct the Yogyakarta toll road elevated (over existing infrastructure such as ring roads, schools, etc.) and to find replacement land for the impacted agricultural land that has been designated as sustainable food crop land in the Special Region of Yogyakarta. This is done as part of realizing green infrastructure, starting with minimizing the conversion of agricultural land to non-agricultural use.

Environmentally friendly infrastructure is crucial for helping communities adapt to climate change and enhance their resilience [10]. Environmentally friendly highways promote environmental conservation and contribute to a greener future. By considering innovative solutions, highways can minimize environmental impact and contribute to a sustainable future [11].

Green Infrastructure is a strategically planned network of natural and semi-natural areas, including green and blue spaces, as well as other ecosystems [12] that is environmentally friendly to achieve a balance between urban development and natural systems [13]. It is essential in sustainable urban planning and city resilience strategies [14-16]. In the current process of developing sustainable green highways in Indonesia, greenbelt corridors are being established. The most crucial aspect of the planning process is land acquisition. Land acquisition is vital for infrastructure projects to provide the necessary facilities for the benefit of the community [17].

This research aims to evaluate government land policies and the Sultanate's land policies concerning the development of the Yogyakarta Toll Road, ensuring it benefits the Yogyakarta community. Additionally, it seeks to analyze the realization

of green toll infrastructure in Yogyakarta during the land acquisition process by minimizing the conversion of agricultural land.

2. Materials and Methods

The method used in this study is qualitative, with primary and secondary data. Primary data refers to information that is collected firsthand by researchers for a specific research purpose. Primary data can be gathered through various methods such as surveys, interviews, observations, and experiments, which allow researchers to tailor their data collection to the specific needs of their studies [18]. Secondary data refers to information that has been collected by someone other than the researcher for purposes other than the current research question. This type of data is often utilized in various fields, including health, education, and social sciences, to gain insights without the need for primary data collection, which can be resource-intensive and time-consuming [19]. Secondary data can come from a variety of sources, including government reports, academic publications, and existing datasets from previous research studies [20].

The secondary data referred to here pertains to policies and regulations on land acquisition. Primary data collection is carried out through the distribution of questionnaires and in-depth interviews with field data. In this context, primary data collection involves distributing questionnaires and conducting in-depth interviews with Panewu and Lurah, whose areas are affected by land acquisition for toll road construction. Panewu is the leader of a sub-district area, while Lurah is the leader of a village area. One sub-district can consist of several villages. This study collected data from 9 sub-districts and 24 villages, with a total of 33 respondents, which meets the minimum statistical standard for data processing. According to Kerlinger and Lee [21] the minimum sample size in quantitative research is 30 people. Secondary data is obtained from regulations, policies, literature studies, and data from the Central Statistics Agency of the Special Region of Yogyakarta.

2.1. Analytic Hierarchy Process (AHP)

The analytical tool used in this research to evaluate government land policies and the Sultanate's land policies concerning the development of the Yogyakarta Toll Road, ensuring it benefits the Yogyakarta community, is the Analytic Hierarchy Process (AHP). This method is employed to identify which evaluation aspects most influence land policies in the land acquisition process for the development of the Yogyakarta Toll Road.

The Analytic Hierarchy Process (AHP) is a structured, multi-criteria decision-making methodology developed by Thomas L. in the 1970s. It is designed to help decision-makers prioritize and evaluate complex problems by breaking them down into a hierarchy of more manageable sub-problems, each of which can be analyzed independently. This hierarchical structure allows for a systematic comparison of various criteria and alternatives, facilitating a more informed decision-making process [22, 23].

AHP has also been employed in research to develop alternative strategies, using multi-criteria decision-making tools [3]. The AHP method involves the following steps [24]:

- (a) **Defining the Problem and Determining Desired Solutions:** At this stage, the defined problem must be clear, detailed, and easily understood. From the problem, suitable solutions are identified. There may be more than one solution to the problem, which can be further developed in subsequent stages.
- (b) **Creating a hierarchical structure starting with the main objective:** After establishing the main objective, a hierarchy is structured below it, consisting of criteria suitable for considering or assessing alternatives to determine the best one. Each criterion has varying levels of intensity. The hierarchy may be further extended with sub-criteria if needed.
- (c) **Developing a Pairwise Comparison Matrix:** This matrix represents the relative contribution or influence of each element on the objective or criteria at the level above. The matrix is simple, has a strong position for the consistency framework, and provides other necessary information with all possible comparisons, allowing for a sensitivity analysis of priorities for changes in considerations. The matrix approach reflects dual aspects in priorities: dominance and being dominated.

Performing Pairwise Comparisons: This involves obtaining a total of $n \times (n-1)/2$ evaluations, where n is the number of elements being compared. Each comparison result is a number from 1 to 9, indicating the level of importance of an element. If an element is compared with itself, the comparison result is given a value of 1. The scale of 9 has proven to be acceptable and capable of distinguishing between the intensities of elements. The scale for pairwise comparisons and its meanings are as follows:

Table 1.

Intensity Definition AHP.

Intensity	Definition	Explanation
1	Equal importance	The two things being compared are equally important.
3	Slightly more important	One thing being compared is somewhat more important than the other component.
5	Somewhat more important	One thing being compared is more important than the other component.
7	Very much more important	One thing being compared is very much more important than the other component.
9	Absolute importance	One thing being compared is absolutely more important than the other component.
2,4,6,8	A compromise between the above values	Numbers between 3 and 5 (e.g., 4) represent a choice with qualifications between somewhat more important and more important.
Reciprocal	Reverse	If the pair is reversed, the intensity is the reciprocal of the original value.

Source: Suharyanto et al. [24].

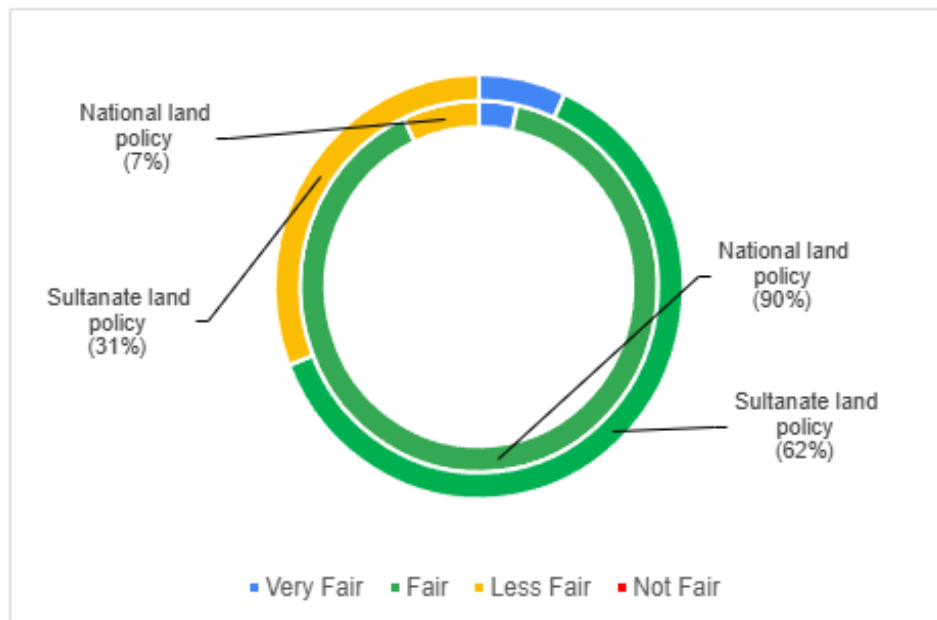
In the case of land policy, AHP is used to determine which land policy has the most dominant influence in the land acquisition process for toll roads. Policy evaluation criteria are needed to determine this. The policy evaluation criteria consist of six elements, namely:

- Effectiveness: The output values achieved (service units)
- Efficiency: The amount of effort required to achieve the desired outcome (cost-benefit ratio)
- Adequacy: The extent to which the desired results address the problem
- Equity: Whether costs and benefits are distributed fairly
- Responsiveness: Whether the policy outputs align with the desires, preferences, or values of specific groups
- Appropriateness: Whether the desired results (goals) are truly useful and valuable
- Filling out the matrix is based on the intensity of each criterion compared to its comparison criteria.

3. Result and Discussion

3.1. Analysis of the Fairness Principle In the Land Acquisition Process For the Yogyakarta Toll Road

This analysis examines how the principle of fairness is applied in the land acquisition process for the Yogyakarta toll road, with support from both national land policy and Sultanate land policy.

**Figure 1.**

Land policy for the construction of the Yogyakarta toll road.

According to the responses from the respondents regarding the usefulness of the current land policy on Figure 1, the following points can be highlighted:

- Improvement of Transportation Infrastructure. The construction of toll roads enhances intercity access, allowing for faster travel and smoother transportation. This positive impact is felt in terms of increased mobility and travel efficiency, which is beneficial for the wider community. Easier and quicker access between cities provides broader

economic, social, and cultural benefits, especially for local communities that can now more easily reach other areas. Overall, this infrastructure development brings tangible benefits to the public in the form of improved quality of life.

- (b) Positive economic impact. Toll roads also contribute to the enhancement of the local economy by facilitating access to Yogyakarta and opening new business opportunities. Areas surrounding the toll roads have the potential to experience faster economic growth, which can increase community income through trade, tourism, and local businesses. This benefit is sustainable, as better access will continue to support long-term economic growth.
- (c) (a)Community Support. The voluntary support from the community for the construction of toll roads indicates a positive acceptance and active involvement in the project. This voluntary acceptance can be an indication that the community views the toll road project as something that provides real benefits to them, both economically and socially. This support serves as evidence that the benefits of toll road development have been felt from the outset by the directly affected communities.
- (d) Compensation and Lease Agreements in Sultanate Land. The land policy of the Sultanate, particularly regarding compensation and lease agreements, provides direct benefits to communities using Pelungguh land. With compensation in the form of rent from the toll road authorities, Kalurahan and Pamong Kalurahan gain additional economic benefits. This demonstrates that Sultanate land can still provide economic benefits even when used for toll road construction, as land management is conducted through agreements that are advantageous for all parties involved.
- (e) Enhancement of the Local Economy. The presence of multiple toll exits in Yogyakarta has the potential to invigorate the local economy around the toll roads through increased business activity. Improved accessibility provides new business opportunities and enhances the flow of tourists and business actors, which can boost the local economic sector. Thus, the benefits of this infrastructure are not only enjoyed by toll road users but also by local communities who can take advantage of new business opportunities.
- (f) Management of Sultanate land. The management of Sultanate land remains under the control of the Sultanate through lease and Pisungsung mechanisms, which maintain land ownership while still utilizing the land for the toll project. This ensures that Sultanate land remains productive and provides economic benefits for both the Sultanate and the communities managing it. The long-term benefits of this policy are economic and social sustainability for the Sultanate and the communities involved in land management.
- (g) (a) Infrastructure Development from Lease Revenue. The Sultanate utilizes the income from land leases to fund major infrastructure projects such as the YIA Airport and railways. These infrastructures provide long-term benefits to the community in terms of improved accessibility and better transportation services. This indicates that the revenue from land acquisition for the toll project not only benefits the toll project itself but also supports broader infrastructure development, providing economic and social benefits for the Yogyakarta community.

The national and Sultanate land policies regarding land acquisition for the construction of the Yogyakarta toll road have fulfilled the principles of benefiting the community. These benefits can be observed in the form of adequate compensation, improved *transportation* infrastructure, positive economic impacts, and community support for the project. Additionally, the Sultanate's land policy ensures that the land remains productive and provides long-term economic benefits through appropriate lease agreements and land management. The perceived benefits are not only material but also social and economic, for both local communities and the Yogyakarta region as a whole. This aligns with previous research indicating that land policies related to toll road construction have positive impacts on economic growth, productivity, and community welfare [25-27].

3.2. Land Policy Evaluation in Land Acquisition for Yogyakarta Toll Road

To determine which land policy has the most dominant influence on the land acquisition process for toll roads, several questions were posed to a group of experts who have knowledge and experience in this field. This group consisted of 29 experts, including government officials at the levels of Kapanewon and Kalurahan. To establish the more important criteria for consideration, a priority weight calculation was conducted, and the results were then tested for consistency using the consistency ratio (CR). In this study, the collected data from the experts yielded a CR value of 0.81, indicating that the weight calculations met the requirements of the principle of logical consistency in AHP, specifically $CR < 0.1$. This means that the hierarchy in this study is consistent and does not require additional data collection.

The results of the final weight calculation using the Eigenvector method provide conclusive insights into the criteria that are most important to consider when determining the most dominant land policy influencing the land acquisition process for toll roads, as viewed from the governance of national and local land policies (Kasultanan) (as shown in Figure 1). The criterion of Appropriateness has a level of importance of 43%, making it the most significant consideration. The other criteria, in order, are responsiveness (22%), equity (17%), adequacy (10%), efficiency (5%), and effectiveness (3%).

This leads to the conclusion that the most important land policy to consider in relation to the toll road land acquisition process is how beneficial and valuable the policy is in achieving the desired goals while ensuring fairness in its implementation. This aligns with previous research stating that land policy is a crucial aspect affecting various dimensions of community welfare and sustainability [28]. Effective land policy indirectly impacts favorable and equitable conditions [29] and a clear policy framework can support a smooth land acquisition process, benefiting both investors and the government [30].

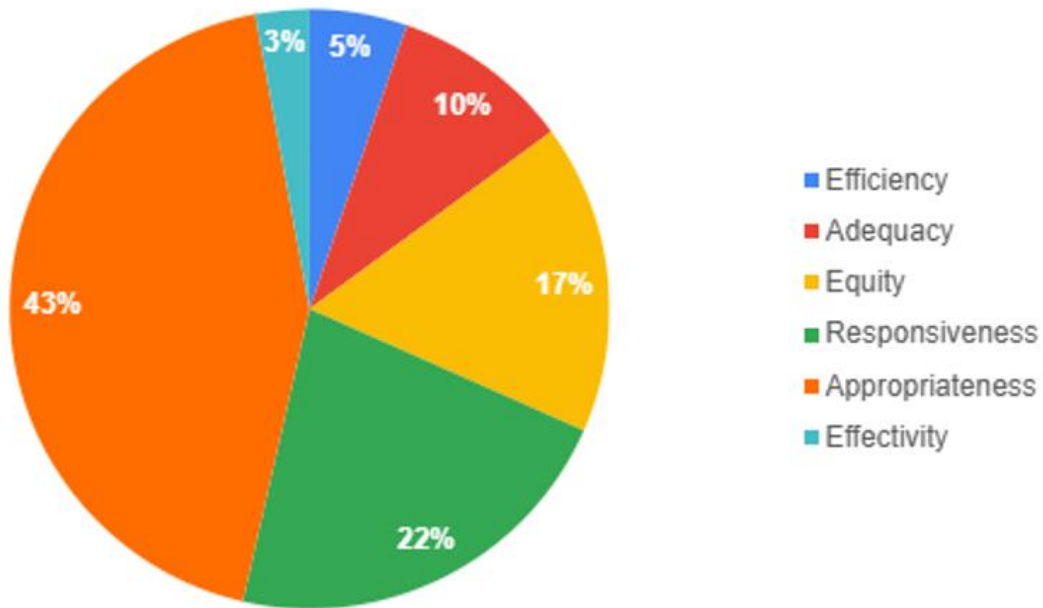


Figure 2.
The Impact of Land Acquisition from AHP.

The implementation of land policy can be examined from the perspectives of national land policy and the land policy of the Sultanate, assessed based on their benefits and fairness according to the results from the AHP. Generally, in the context of land policy, both the national and Sultanate land policies are considered fair, as evidenced by the majority of choices indicating fairness exceeding 50%. However, when comparing the two policies, the national land policy is regarded as more equitable than the Sultanate land policy (as shown in Figure 2). The Sultanate's land is also comparable to cases of customary land in several regions.

In the process of land acquisition for public purposes, which involves land consolidation, there are obstacles such as the scope of land administration systems, land valuation approaches, and land reallocation methods that align with customary land tenure systems [9]. The procurement of land, particularly in areas of customary land, occurs through unclear negotiations with customary authorities, disregarding government regulations and the interests of customary land users. This indicates a lack of transparency and potentially undermines the rights of local communities in the land procurement process [31]. Therefore, it is essential to integrate a collaborative decision-making process between the government and local communities, including land users and traditional owners, in land procurement. This collaborative approach is crucial to ensure that the interests of all stakeholders are taken into account [32].

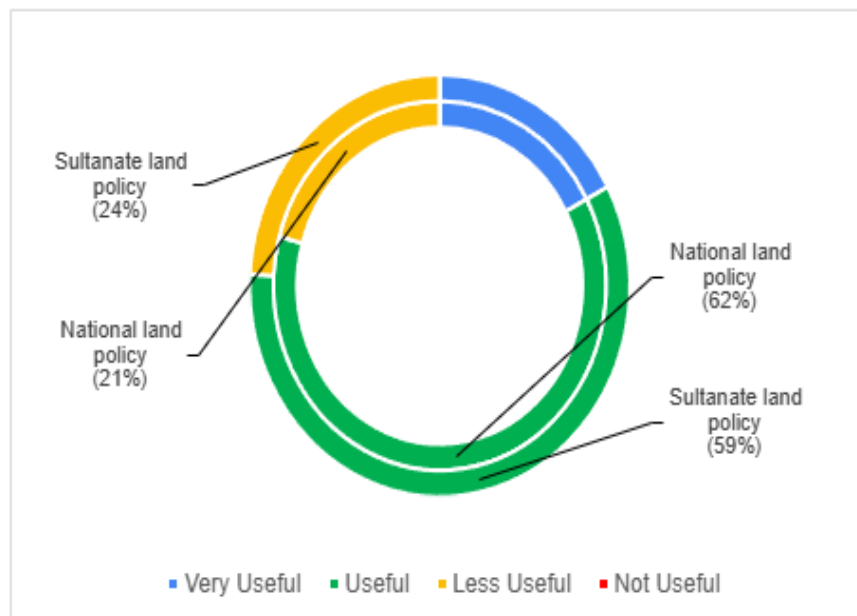


Figure 3.
National land policy and the Sultanate support land acquisition for the construction of the Yogyakarta toll road for the public interest.

National Land Policy, particularly regarding land acquisition for the construction of the Yogyakarta toll road, presents an analysis of the principles of justice for the community:

- (a) Fair and Adequate Compensation. The land acquisition policy has provided compensation that exceeds market prices, reflecting the principle of justice. The compensation received by the community is not only sufficient but also fair and reasonable. This ensures that affected communities are not financially harmed and may even gain additional benefits. Justice is achieved here because the community is compensated not just according to the value of their land but beyond that, allowing them to gain profit.
- (b) Appropriate valuation and compensation. Land prices are set based on location and utility, and are valued above the market average. This indicates that land assessment considers important aspects such as accessibility and economic value. Thus, this policy guarantees that the community receives compensation that balances with the economic potential of their land, emphasizing the aspect of justice in land evaluation.
- (c) Process and Transparency. The compensation process is conducted through consultations involving the community and relevant parties. Transparency in this process, particularly during the objection phase, reflects procedural justice, where all parties have an equal opportunity to express opinions and question decisions. Community participation in this process strengthens trust in the implemented policy.
- (d) Function and quality of infrastructure. The affected infrastructure, such as roads and other public facilities, is guaranteed to maintain its functionality after construction. This policy demonstrates concern for the sustainability of public services, ensuring that the community does not lose access to or benefits from existing facilities, thereby reinforcing the aspect of distributive justice.
- (e) Policy and Management of Residual Land. The community is given the opportunity to apply for residual land that can be included in the compensation. This demonstrates the flexibility of the policy and provides opportunities for the community to gain additional benefits, which overall supports social justice.
- (f) Sultanate Land Policy. The land policy of the Sultanate also adheres to the principle of justice, particularly for those living on Sultanate's land. Compensation for land taken for public interest, such as cemeteries and schools, with other sultanate land ensures the interests of the community are preserved. Moreover, compensation for crops on sultanate land is also provided, which underscores the justice in compensation for affected communities. The Yogyakarta Sultanate stipulates that evictions should be minimized, focusing on the welfare of the surrounding community. This policy ensures that the community does not feel threatened or unjustly lose their homes, providing social security guarantees. The sultanate land impacted by the toll road requests the amount of rent while the land is used for the toll road. The income from the rental of land contributes additional economic benefits to the local community, indicating a fair distribution of economic gains. Meanwhile, the rental of sultanate land for the toll project ensures that the project proceeds without compromising the long-term interests of the Sultanate.

Fair policies not only ensure adequate compensation for affected communities but also safeguard the welfare, security, and sustainability of assets and public interests. A transparent process, along with policies for managing residual land, demonstrates a commitment to openness and fairness in decision-making. The principles of distributive justice, procedural justice, and social justice are upheld through various mechanisms within these policies. The perception of justice and fairness is crucial in guiding the land acquisition process, as research shows that feelings of injustice significantly influence landowners' behavior during acquisition [33].

3.3. Analysis For Yogyakarta Toll Road Land Procurement (Green Toll Road Infrastructure)

Based on the information provided by Mr. Sasongko, Head of the Department of Agriculture and Food Security of the Special Region of Yogyakarta, the total sustainable agricultural land (LP2B) in the Special Region of Yogyakarta affected by the Yogya-Solo and Yogya-Bawen toll road projects is 35.48 hectares. This is significantly smaller compared to Central Java Province in Klaten Regency, which is also affected by the Solo-Jogja toll road construction, with an area of 375 hectares impacted.

The total of 35.48 hectares affected in the Special Region of Yogyakarta consists of 8.64 hectares from the Solo-Yogya toll route and 26.84 hectares from the Yogya-Bawen route. Therefore, using this data, only 8.64 hectares of sustainable agricultural land in Yogyakarta are affected by the toll road construction. The solution designed by the Department of Agriculture and Food Security of the Special Region of Yogyakarta for the affected sustainable agricultural land is to replace it with reserve land (to substitute the affected sustainable agricultural land) and to implement the policy of an elevated toll road (above buildings, schools, etc.) [34].

Assuming 1 hectare of land can produce 6 to 8 tons of rice per year, or an average of 7 tons of rice, with two to three harvests per year, the potential agricultural productivity lost due to the 35.48 hectares of affected land in Yogyakarta amounts to 248.36 tons per hectare. The price of 1 kilogram of unhusked rice is Rp7,000 in the Special Region of Yogyakarta, based on July 2024 data from the Central Statistics Agency. Economically, the loss of agricultural land is calculated as 35.48 hectares multiplied by 7 tons, then multiplied by Rp7,000, resulting in Rp1,738,520. This is still very small compared to Klaten Regency, which has 375 hectares of affected farmland, resulting in an economic loss of Rp18,375,000. From this, it can be concluded that the land acquisition policy for the construction of the Yogyakarta toll road already supports the development of a green toll road.

This study contributes to the field of agricultural economics and land use policy by quantifying the economic impact of land acquisition for infrastructure development in Yogyakarta. The findings highlight the significant loss of agricultural productivity due to land conversion, demonstrating the trade-offs between economic development and food security [24]. By estimating the economic losses in monetary terms, this research provides valuable insights for policymakers in balancing

infrastructure expansion with sustainable agricultural practices. Furthermore, this study supports the notion of a "green toll road" approach, which aims to mitigate environmental and economic consequences by integrating sustainable land management strategies [35].

The results of this study are in line with other research, such as Ghosh et al. [36] found that large-scale infrastructure projects often lead to significant reductions in agricultural output, emphasizing the need for compensation mechanisms to sustain rural livelihoods. They state that land acquisition for development projects should incorporate sustainability measures to offset agricultural losses and ensure food security in affected regions. Setiawan and Rachman [37] studied the economic trade-offs of land conversion in Indonesia and highlighted that while infrastructure development boosts regional connectivity and economic growth, it must be balanced with policies that protect agricultural productivity. Prawesthi et al. [32] analyzed the impact of toll road construction on rice farming in Java, concluding that the long-term economic benefits of infrastructure must be weighed against short-term disruptions in food production and local economies.

3.4. Discussion

The study on land policies for the Yogyakarta toll road reveals several critical factors influencing land acquisition and its alignment with green infrastructure development. Utilizing the Analytic Hierarchy Process (AHP), the research identifies key criteria such as appropriateness, responsiveness, equity, adequacy, efficiency, and effectiveness in evaluating land policies [38]. The findings underscore the importance of policy alignment in facilitating land acquisition processes that prioritize community welfare through fair compensation, economic growth, and transparency. This aligns with the Sultanate's leasing strategy, which seeks to balance cultural preservation with economic advancement, thereby fostering a cooperative relationship between the government and local communities [39, 40].

The perception of national land policy as fairer contributes to increased public trust, which is essential for successful project implementation. The study indicates that the construction of the toll road impacts approximately 35.48 hectares of agricultural land, necessitating effective mitigation measures to minimize environmental disruption. This aspect is crucial as it reflects the broader implications of infrastructure development on local ecosystems and agricultural productivity [11, 41]. The integration of sustainable practices in land acquisition and project execution is vital for ensuring that infrastructure development does not compromise environmental integrity or community interests [42]. Moreover, the research highlights the significance of community engagement in the land acquisition process. Public participation is essential in mitigating social risks associated with land acquisition, as it fosters transparency and accountability [40, 43].

The findings suggest that the involvement of local communities in decision-making processes can lead to more equitable outcomes and enhance the perceived legitimacy of land policies. This is particularly relevant in the context of Indonesia, where land conflicts and issues of social justice are prevalent [44, 45]. In conclusion, the study emphasizes that effective land policies for the Yogyakarta toll road must not only address the logistical aspects of land acquisition but also consider the socio-economic and environmental dimensions. By aligning land acquisition strategies with sustainable development goals and fostering community engagement, the project can contribute positively to both local economies and environmental conservation efforts [46, 47].

The study emphasizes that effective land policies for the Yogyakarta toll road must not only address the logistical aspects of land acquisition but also consider the socio-economic and environmental dimensions. By aligning land acquisition strategies with sustainable development goals and fostering community engagement, the project can contribute positively to both local economies and environmental conservation efforts [48-50].

4. Conclusion

4.1. Conclusion

First, the evaluation of land policy using the Analytic Hierarchy Process (AHP) highlights several key findings: Appropriateness, Responsiveness, Equity, Adequacy, Efficiency, and Effectiveness. The findings suggest that the most crucial aspect of land policy, particularly for land acquisition for toll roads, is its appropriateness and alignment with the policy's goals. The land acquisition process for the Yogyakarta toll road construction has been carried out in a manner that prioritizes community welfare, ensures adequate compensation, enhances transportation infrastructure, fosters economic growth, maintains transparency, and gains community support. This is also in line with the Sultanate's land policy, which serves the public interest by providing land for the development of the Yogyakarta toll road. The Sultanate's leasing strategy preserves control and generates steady rental income while supporting infrastructure development. This approach maintains traditional land use rights, boosts local economies through enhanced accessibility, and attracts businesses and tourism. Continued ownership allows the Sultanate to balance cultural preservation with economic growth. Lease revenues are reinvested in key projects like Yogyakarta International Airport and railways, reflecting a commitment to sustainable development and regional connectivity. The land management plan ensures productive use, benefiting both the Sultanate and local communities, and balances tradition with modern development for future generations.

Second, the higher rating of the national land policy suggests greater public trust in its fairness and effectiveness, with stakeholders likely viewing it as better aligned with principles of equity and justice compared to the sultanate land policy. To improve perceptions of fairness in the sultanate policy, it could be beneficial to address areas where it falls short, such as increasing transparency, enhancing stakeholder engagement, and ensuring equitable land distribution. Overall, while both policies are considered fair, the national policy is seen as a model of higher perceived justice. For the Yogyakarta toll road project, the national land policy demonstrates a strong commitment to fairness through generous compensation, accurate valuation, and a transparent process. The sultanate's policy also reflects a balanced approach, aiming to benefit both the community and the Sultanate by providing land replacements, compensating for losses, and minimizing displacement.

Third, based on information from Mr. Sasongko, Head of the Department of Agriculture and Food Security of the Special Region of Yogyakarta, the total area of sustainable agricultural land affected by the Yogya-Solo and Yogya-Bawen toll road projects is 35.48 hectares. This is significantly less compared to the 375 hectares impacted in Klaten Regency, Central Java. Specifically, the Solo-Yogya route affects 8.64 hectares, and the Yogya-Bawen route affects 26.84 hectares. The Department's solution includes substituting the affected land with reserve land and implementing an elevated toll road. The potential agricultural loss in Yogyakarta is calculated to be 248.36 tons of rice, with an economic loss of approximately Rp1,738,520, which is relatively small compared to Klaten Regency's loss of Rp18,375,000. This indicates that the land acquisition policy for the Yogyakarta toll road supports green development initiatives.

4.2. Recommendation

Based on the conclusions, the following recommendations are proposed:

- (a) Enhance appropriateness and alignment: Stakeholders involved in land acquisition, particularly for infrastructure projects like the Yogyakarta toll road, should ensure that policies are continuously assessed for their alignment with community welfare goals. This could involve regular reviews and adjustments to maintain the relevance of land acquisition practices to current social and economic conditions.
- (b) Strengthen community engagement and transparency: To foster greater trust and perceived fairness in the Sultanate's land policy, efforts should be made to increase stakeholder engagement. This can be achieved through public forums, consultations, and transparent communication regarding land acquisition processes, compensation strategies, and development plans. Implementing feedback mechanisms will allow for community input and foster a collaborative approach.
- (c) Address equity in land distribution: The sultanate should focus on addressing perceived inequities in land distribution by ensuring that compensation is fair and reflective of actual land value. Establishing clear criteria for compensation that are publicly available can help enhance perceptions of fairness and justice in the land acquisition process.
- (d) Implement sustainable development practices: Given the land acquisition policy's support for green development initiatives, it is essential to adopt practices that minimize environmental impacts and promote sustainability. This may include using reserve land for agriculture, investing in elevated toll road structures, and implementing practices that enhance biodiversity and ecosystem preservation.
- (e) Reinvest lease revenues wisely: The Sultanate should continue to reinvest revenues from land leases into key infrastructure projects that benefit local communities, such as transportation and public services. Prioritizing projects that enhance accessibility and economic growth can further support regional development and improve the overall welfare of the community.
- (f) Monitor agricultural impact: Given the impact on sustainable agricultural land, it is crucial to establish a monitoring system that evaluates the effects of land acquisition on agriculture in the region. This includes assessing potential agricultural losses and implementing strategies to mitigate adverse effects, such as supporting local farmers in transition or providing resources for alternative livelihoods.

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