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Budget Allocation Model Planning for Basic Infrastructure Development to Reduce Poverty: A Case of Local Government in Palembang City, Indonesia

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ABSTRACT

Fundamental social infrastructure, such as roads, water, energy, and sanitation, plays a vital role in sustaining economic activities, ensuring access to essential services, and enhancing the resilience of middle- to low-income communities. This study aimed to develop a budget allocation model for basic infrastructure development, supporting poverty reduction in Palembang City, South Sumatra Province, Indonesia. A survey method was employed, with data collected through direct observation, interviews, and Focus Group Discussions (FGDs). The study involved 30 respondents, consisting of nine poor households and twenty-one stakeholders from relevant government institutions and related sectors. Descriptive analysis was used, combining qualitative and quantitative approaches. The quantitative analysis employed the Analytical Hierarchy Process (AHP) using Expert Choice software version 11. The results indicate that habitable housing and environmental sanitation are the top priorities for basic infrastructure development, as they have a direct impact on improving the welfare of poor households. Drainage and neighborhood roads were identified as medium priorities, while clean water ranked lowest. The findings highlight that participatory and locally driven budgeting approaches are essential to align infrastructure development with community needs and to ensure that these efforts effectively contribute to sustainable poverty reduction in Palembang City.

1. INTRODUCTION

Fundamental social infrastructure, including roads, water, energy, and sanitation, plays a crucial role in supporting economic cycles, ensuring access to essential services, and enhancing resilience among middle- to low-income communities. Several cases in Indonesia suggest that fiscal fragmentation can reduce poverty when accompanied by improved local fiscal capacity and higher spending quality [1]. Nevertheless, such a fragmented system also presents challenges, including intergovernmental inconsistencies and capacity gaps [2]. These drawbacks highlight the importance of carefully modeling budget allocation at the local level.

In the specific case of East Nusa Tenggara, Indonesia, fiscal fragmentation, together with human development and infrastructure completeness, collectively influences poverty levels [3]. Uncertain progress in infrastructure development is often associated with irregular fiscal autonomy and variations in governance performance across districts [4]. These differences emphasize the need for allocation models that are tailored to the contextual fiscal and governance realities of cities such as Palembang.

Analyses of Indonesia's fiscal fragmentation indicate that improved fragmentation can enhance governance performance, particularly in districts outside Java Island, with positive implications for service delivery and poverty reduction [4]. However, village-level funding (village funds) produces inconsistent poverty outcomes that depend on administrative capacity and accountability mechanisms [5, 6]. These findings suggest that the allocation model should incorporate governance safeguards and adopt differentiated strategies to address the distinct infrastructure needs of urban and rural areas.

Urban studies emphasize that access to infrastructure is often lower in underprivileged communities, reflecting spatial inequality and discrimination [7]. In Indonesia's urbanizing context, poor infrastructure in peri-urban and rural areas pushes migration and intensifies poverty [8]; without proper infrastructure, the poorest are systematically abandoned. For cities like Palembang, spatial targeting should therefore be indivisible from infrastructure budget planning.

This study proposes a budget allocation model specifically designed for Palembang City, South Sumatra, Indonesia, that integrates poverty reduction metrics, local fiscal capacity, infrastructure accessibility, and governance indicators. It draws on several strands of recent empirical research, including the poverty impacts of fiscal fragmentation [1], regional infrastructure–poverty dynamics [3], governance

performance relationships [4], village fund effectiveness [5, 6], and spatial infrastructure disparities [7, 8]. The model is implemented using community-level data from Palembang to assess its potential for promoting pro-poor infrastructure investment with spatial equity and strengthened accountability. The study ultimately aims to provide actionable guidance for local policymakers operating within the constraints of fragmented governance systems.

2. METHODOLOGY

2.1 Location and time of the study

This study was conducted in Palembang City, South Sumatra Province, Indonesia, as shown in Figure 1. The research location was determined using the Simple Random Sampling method, considering that Palembang City has the largest poor population in South Sumatra Province. This study was conducted in July 2025.

2.2 Data collecting methods

This study employed a survey method, with data collected through direct observation, interviews, and Focus Group Discussions (FGDs). The sampling technique used was judgment sampling, in which participants were selected based on specific criteria and expertise [9]. Respondents consisted of individuals involved in, and authorized to make, decisions related to the formulation of a budget allocation planning model for basic infrastructure development in Palembang City. The total sample comprised 30 respondents, including 9 poor households and 21 stakeholders from government institutions and related sectors.

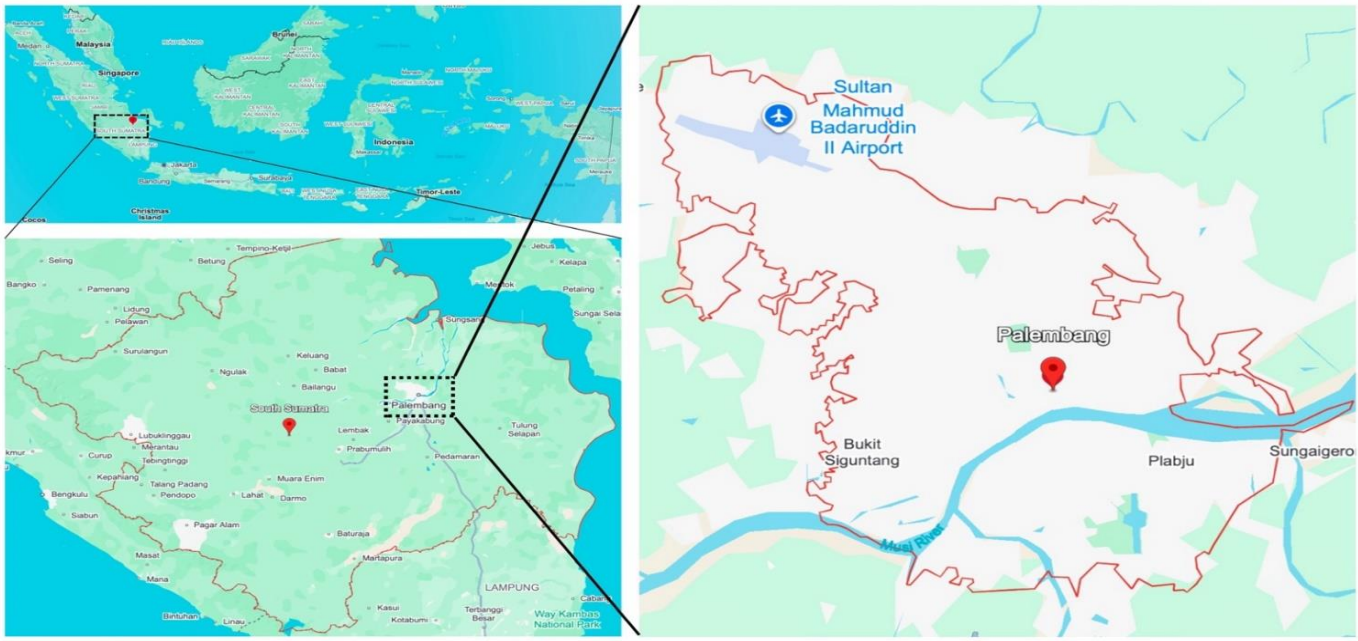

Figure 1. Research location map

The poor households were selected based on the following criteria: (1) a high level of poverty or vulnerability, (2) residence in slum areas or along riverbanks, and (3) direct experience with limited access to basic services such as housing, water, sanitation, and drainage. The stakeholder group included representatives from Bappeda/Litbang (research and development), the Housing and Settlement Agency, the Public Works and Spatial Planning (PUPR) Agency, PDAM (regional water company), the Health Agency, the Education Agency, the Social Agency, the Cooperative and MSME Agency, the Central Statistics Agency (BPS), academia, community leaders, and representatives from sub-districts and villages.

2.3 Data analysis methods

The analytical method employed in this study was descriptive analysis using both qualitative and quantitative approaches. The qualitative analysis was utilized to develop a model for the allocation of the basic infrastructure development budget for poverty reduction in Palembang City. In contrast, the quantitative analysis was applied to identify the optimal criteria and priorities for allocating the basic infrastructure development budget. The quantitative analysis employed the Analytical Hierarchy Process (AHP) using Expert Choice software version 11 [10, 11].

2.3.1 AHP

The AHP is a multi-criteria decision-making method used to analyze complex and unstructured problems across various decision-making contexts [12]. This approach is recognized for its precision in evaluating the relative strengths, preferences, qualitative judgments, and conflicting opinions of decision makers [13]. AHP offers flexibility, enabling development stakeholders to prioritize factors through pairwise comparisons. In AHP analysis, community participation together with stakeholder input represents the initial stage in developing critical indicators, achieving overall objectives, and determining the appropriate weighting of each criterion [14]. The process involves the following steps [15-18]:

(1) Identification of the related problem and objective

Years of observation and interaction with communities in Palembang, South Sumatra, reveal that external projects

intended to improve basic infrastructure often fail to achieve their targeted outcomes. This study applies the AHP approach to evaluate both previous and ongoing basic infrastructure development projects in Palembang City. The primary objective is to develop a planning model for allocating basic infrastructure budgets aimed at poverty reduction in the city. The successful implementation of this assessment is expected to provide strong implications for adopting the AHP approach in evaluating and optimizing real infrastructure projects in Palembang City.

(2) Clearly defining the criteria necessary to achieve the goal

Through discussions with relevant stakeholders, five criteria, including impact on poverty reduction (IPR), number of people affected (NPA), construction and maintenance costs (CMC), land availability and project readiness (LPR), and community and OPD support (COS) were selected as indicators for the assessment.

(3) Identifying each alternative or option available

In this study, clean water, environmental sanitation, neighborhood roads, drainage, and habitable houses in Palembang city are used as an alternative to basic infrastructure.

(4) Construction of a hierarchy tree (Figure 2) with the goal at the top, the criteria necessary to achieve the goal below, and the various alternatives at the bottom.

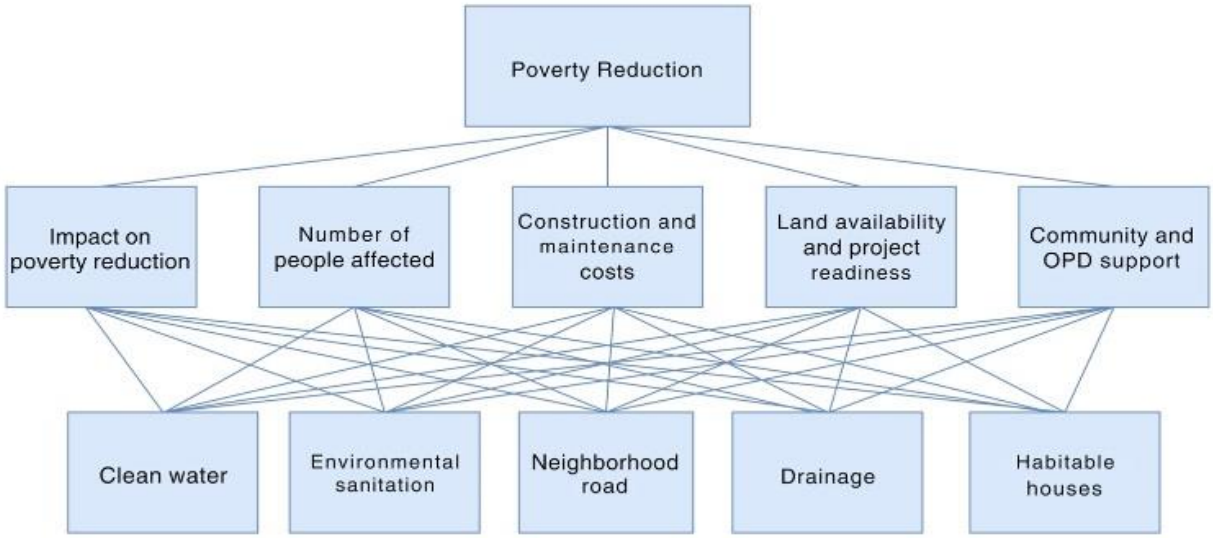

Figure 2. Decision tree for selecting basic infrastructure budget allocation alternatives

Table 1. Fundamental scale for pairwise comparison

Level of Importance	Definition
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extremely strong importance
2, 4, 6, 8	Compromises in between levels

(5) Data were obtained from the community (poor households) and decision makers. In this process, experts (stakeholders) were asked to provide comparative judgments regarding the relative importance of each pair of indicators based on the measured criteria. The decision-making procedure employed a scale ranging from 1 to 9, as presented in Table 1. The resulting pairwise comparisons were subsequently transformed into a pairwise comparison matrix, in which each entry indicates the degree of importance or relative dominance of one factor over another.

(6) The next step is the determination of the consistency index (CI) as follows: $CI = (\lambda max – n)/(n-1)$, where n is the size of the matrix. Consistency Ratio (CR) is then obtained by dividing the CI by the Random Index (RI), which denotes the average CI derived from a randomly generated matrix of order n. The CR value indicates the level of consistency in the respondents' judgments and should not exceed 0.10. A higher CR value suggests inconsistency in the pairwise comparisons, in which case the assessment process should be repeated.

(7) The relative weights of the thematic and individual indicators were aggregated to produce a composite weight vector for each alternative (basic infrastructure), which was then ranked accordingly.

(8) The final procedure involves planning a budget allocation model for basic infrastructure development aimed at reducing poverty in Palembang City, based on the results obtained from the AHP analysis.

3. RESULT AND DISCUSSION

3.1 Condition and habitability of respondents

Most respondents (poor households) live in modest dwellings constructed from wood, bamboo, or concrete, which are generally cramped, fragile, and unfit for habitation. The majority of these houses range in size from 16 to 24 m^2, with some as small as 6 m^2, and lack partitions or separate bedrooms, causing the family room to function simultaneously as a living and sleeping area. Several houses are in severely deteriorated condition, characterized by unplastered walls, leaky roofs, decayed wooden floors, and weak bamboo supports that pose a risk of structural collapse.

Sanitation facilities remain one of the major challenges faced by poor households [19]. Most respondents' houses are not equipped with permanent toilets, resulting in open defecation and the direct disposal of household waste into rivers. In several research locations, public bathing, washing, and toilet facilities are also unavailable, forcing residents to

rely on the river to meet their daily sanitation needs. It is estimated that approximately 70% of residents in the area use the Musi River for bathing, washing, and defecating. The lack of basic sanitation infrastructure reflects not only the poor housing conditions but also the low standard of living experienced by impoverished communities in the study area [20].

Clean water is a fundamental form of basic infrastructure that plays a crucial role in fulfilling the daily needs of the community [21-23]. However, most poor households in the study area still lack access to clean water provided by the PDAM. Consequently, they rely entirely on the Musi River as their primary source of water for daily activities such as washing, bathing, and other household uses. Some residents also depend on their neighbors' water connections for bathing and washing, while drinking water is obtained through the purchase of refillable gallon bottles. This condition underscores the community's limited access to adequate clean water infrastructure, leaving them with no alternative but to wait for the installation of PDAM pipeline networks in their residential areas.

The absence of public street lighting increases the potential risk of social conflict and criminal activity in residential areas [24]. One respondent reported the lack of both night patrols and street lighting around his home, and he had even heard of incidents of robbery and theft occurring in the neighborhood. This condition underscores the importance of providing adequate public street lighting and strengthening community-based security systems to enhance residents' sense of safety. In addition, damaged footpaths frequently cause accidents and harm to residents' merchandise, particularly among those whose livelihoods depend on daily economic activities

3.2 Analysis of criteria and priority determination for basic infrastructure budget allocation

Effectively allocating basic infrastructure budgets to reduce poverty is a complex and multidimensional challenge; therefore, budgetary decisions cannot rely solely on intuition. Policy formulation requires a transparent and auditable analytical framework capable of comprehensively balancing multiple public objectives. In this context, the Analytic Hierarchy Process (AHP) represents a highly relevant approach [15-17]. This method not only generates quantitative weights for each criterion but also provides a rational and accountable basis for policy decisions, particularly in establishing priorities among various alternatives. The results of the AHP-based weighting of criteria and alternatives used in the decision-making process are presented in Tables 2-3.

Substantively, the weighting composition reinforces an orientation toward outcome-based budgeting, in which the primary emphasis is placed on achieving tangible impacts in poverty reduction. At the same time, the dimensions of fiscal efficiency (cost), legitimacy and collaboration (support), feasibility (readiness), and coverage (number of beneficiaries) function as balancing factors to prevent bias in budget allocation decisions. The prioritization of impact as the central anchor indicates that interventions addressing the most fundamental forms of deprivation, such as the provision of adequate housing and access to sanitation, tend to receive the highest priority in the overall ranking.

Based on the results of the AHP modeling, decision-making regarding the allocation of basic infrastructure budgets in Palembang City is primarily oriented toward social effectiveness. This orientation is evident from the weighting of criteria, which places IPR (0.424) as the most influential factor, followed by CMC (0.171), Community and Regional Apparatus Organization (OPD) Support (0.167), LPR (0.121), and NPA (0.117). The consistency ratio (CR) values at both the criteria and alternative matrix levels are below the acceptable threshold of 0.10, indicating an adequate level of logical consistency. These results confirm that the model provides a sound and transparent analytical basis for auditable decision-making.

The near-identical weights of NPA at 0.171 and CMC at 0.167 indicate that, within the framework of AHP-based decision-making, both criteria are considered to have a relatively balanced level of importance in supporting poverty reduction objectives. This finding reflects a policy approach that not only emphasises the breadth of beneficiary coverage as a manifestation of the principles of equity and inclusiveness, but also considers cost efficiency as a prerequisite for fiscal sustainability and programme implementation quality. This equal weighting indicates a conscious policy trade-off between the scale of social impact and financing capacity.

Table 2. Scores of criteria are necessary

Criteria	Weight	CR	CI	Rank
IPR	0.424	0.007	0.008	1
NPA	0.171	0.030	0.034	2
CMC	0.167	0.030	0.034	3
LPR	0.121	0.006	0.006	4
COS	0.117	0.020	0.022	5

Table 3. Scores of alternatives for each criterion

Alternatives	IPR	NPA	CMC	LPR	COS	Weight	Rank
Habitable house	0.311	0.293	0.223	0.277	0.296	0.280	1
Environmental sanitation	0.232	0.212	0.210	0.188	0.197	0.208	2
Drainage	0.169	0.176	0.196	0.187	0.177	0.181	3
Neighborhood road	0.148	0.173	0.188	0.179	0.171	0.172	4
Clean water	0.140	0.146	0.183	0.169	0.159	0.159	5

The placement of IPR as the most influential criterion in the AHP results (0.424) reflects the priority of public policy effectiveness in the context of basic infrastructure development, emphasizing that budget allocations should be directed towards interventions that are most capable of directly changing the living conditions of poor households. Basic infrastructure such as drinking water services, sanitation, electricity, transportation, and educational facilities has been empirically proven to correlate with a decrease in poverty levels because they improve access to economic opportunities, social services, and increase the productivity of underprivileged households, thereby generating greater welfare impacts than simply the number of people affected or other administrative variables. Empirical studies in various

regions of Indonesia have shown that improvements in sanitation, electricity, and road infrastructure have a significant negative impact on poverty rates, indicating that better infrastructure is associated with lower poverty rates [25, 26].

The analysis results show that the habitable houses programme ranks first with the highest weight of 0.280, indicating that this alternative is considered the most optimal in meeting all the criteria used in the study. The relatively high and consistent habitable house score across almost all criteria, particularly in terms of IPR, NPA, and LPR, shows that the housing programme has the strongest capacity to produce direct and tangible impacts on poor households, supported by a good level of implementation readiness. This finding reinforces the view that decent housing not only serves to fulfil basic needs, but also acts as a multidimensional intervention capable of improving the health, security, economic stability, and psychosocial well-being of poor households, thereby contributing substantially to poverty reduction.

Environmental sanitation alternatives ranked second with a weight of 0.208, indicating their role as a strategic intervention with broad benefits at the community level. The relatively high Environmental Sanitation score on the NPA and COS criteria indicates that this programme tends to gain strong social acceptance and can reach larger community groups. Although its impact on poverty reduction is more indirect than housing, environmental sanitation contributes significantly to reducing the risk of environment-based diseases, improving quality of life, and creating conditions that support community economic productivity, thus remaining relevant as a supporting policy priority.

Furthermore, drainage ranks third with a weight of 0.181, reflecting its role as protective infrastructure against environmental risks, particularly flooding and waterlogging. The drainage score, which is fairly balanced in terms of cost and readiness criteria, indicates that this programme is relatively feasible to implement, but its impact on poverty reduction is more preventive than transformative. In other words, drainage serves to prevent the socio-economic conditions of the community from deteriorating due to environmental shocks, but its contribution to improving the welfare of poor households is not as strong as housing and sanitation interventions.

Neighbourhood road development ranked fourth with a weighting of 0.172, indicating that although accessibility is an important factor in supporting economic activity and community mobility, its impact on poverty reduction is considered to be more indirect. The relatively even scores for neighbourhood roads across various criteria indicate that this programme functions as enabling infrastructure that strengthens the effectiveness of other programmes, such as housing and sanitation, but is less effective on its own as a primary instrument for poverty alleviation.

Meanwhile, Clean Water ranked last with a weight of 0.159, although this programme showed relative superiority in terms of the CMC criterion, indicating cost efficiency. The low total weight of clean water does not mean that this programme is unimportant, but rather reflects that in the context of this study, its benefits are more complementary and are often covered by other programmes, particularly housing and sanitation. Therefore, its contribution to poverty reduction is considered more optimal when integrated with more comprehensive interventions.

The policy implications are evident: to achieve rapid social effectiveness, the habitable house and environmental sanitation programs should be prioritized, as both directly address the most fundamental forms of deprivation, housing quality and environmental health, and possess strong social legitimacy at the community level. Meanwhile, the Clean Water and Drainage programs demonstrate advantages in terms of fiscal efficiency and technical readiness across multiple locations, making them suitable instruments for acceleration to sustain implementation momentum and regional fiscal stability. The Neighborhood Roads program, on the other hand, is context-dependent, delivering significant benefits when aligned with basic service corridors and centers of economic activity. Therefore, project prioritization in this sector should be guided by spatial evidence, including proximity to schools, health centers, and markets, as well as a location-specific benefit analysis.

3.3 Budget allocation model for basic infrastructure development

The budget allocation model was developed based on the results of decision-making criteria using the AHP [27]. The weight of each decision-making criterion serves as the basis for determining infrastructure development priorities and sequencing their implementation. The resulting priority weights were as follows: IPR (42.4%), CMC (17.1%), COS (16.7%), LPR (12.1%), and number of people affected (11.7%) (Figure 3). These criteria weights collectively reflect a balance of social effectiveness, economic efficiency, and institutional readiness in determining the priorities for basic infrastructure development.

Furthermore, a priority order was established for the types of basic infrastructure that significantly contribute to poverty reduction in Palembang City, namely habitable house, environmental sanitation, drainage, neighborhood roads, and clean water. The priority sequence indicates that meeting fundamental needs, such as adequate housing and proper sanitation, serves as the primary foundation for improving the quality of life among low-income households before developing other supporting infrastructure. Moreover, the allocation mechanism was designed by structuring the implementation of infrastructure programs in sequential stages to ensure that development efforts are more focused, efficient, and sustainable [28]. The model consists of three main stages:

First stage: Habitable house and environmental sanitation

Addressing the basic needs for healthy housing and a hygienic environment as prerequisites for the welfare and health of the poor.

Second stage: Drainage and clean water

Improving physical environmental conditions through flood control (SUDS) and clean water provision, thereby supporting sustainable and healthy living. Sustainable Urban Drainage Systems (SUDS) prioritise infiltration and mimic natural hydrological processes to reduce flood risk, improve water quality, and support ecosystems in urban environments. Effective SUDS designs integrate various components, such as permeable pavements, green roofs, and rain gardens, that are tailored to the local context [29, 30].

Third stage: Neighbourhood roads

Promoting economic accessibility and social mobility for communities, strengthening connectivity between poor residential areas.

To ensure the allocation process operates effectively, the proposed model emphasizes participatory, transparent, and

outcome-oriented development governance, grounded in four key principles: citizen participation, transparency, cross-sector collaboration, and continuous monitoring and evaluation [31].

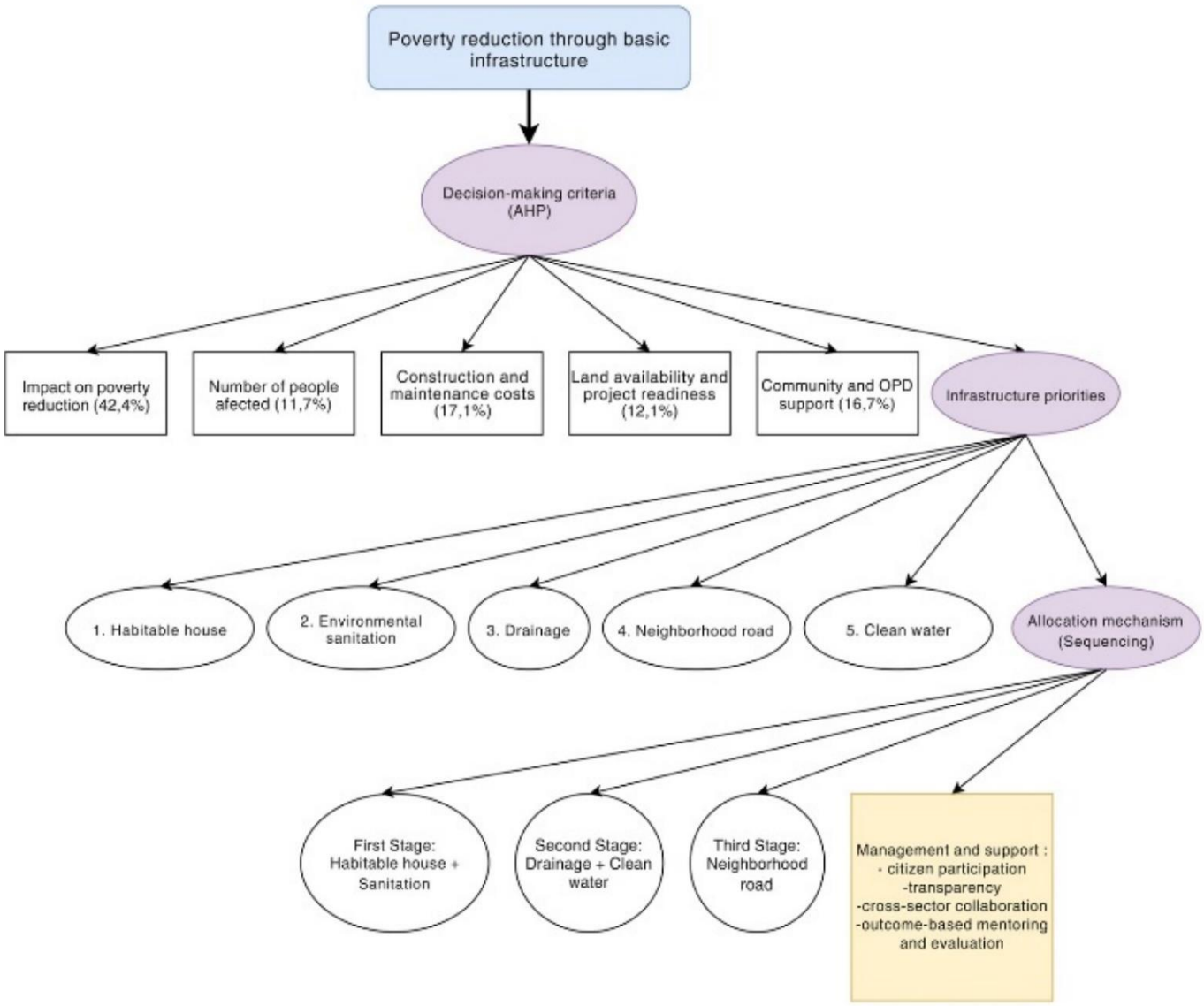

Figure 3. Budget allocation model planning for basic infrastructure development

4. CONCLUSION

Habitable houses and environmental sanitation are identified as the top priorities for basic infrastructure development in Palembang City, as they directly influence the welfare of poor households. Drainage and neighborhood roads hold medium priority, while clean water ranks lowest. The AHP-based budget allocation model indicates that the misalignment between actual community needs and existing budget allocations has slowed poverty reduction efforts. Therefore, implementing a participatory and locally driven budgeting approach is crucial to ensure that infrastructure development effectively contributes to sustainable poverty reduction in Palembang City.

Due to the limitations of this study, future research should focus on comparative analyses across different regions and on long-term evaluations of the impacts resulting from the implementation of basic infrastructure budget allocation models for poverty reduction.

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