



## **Prioritizing Policy Strategies for Community Economic Resilience in Landslide-Prone Areas of Bogor Regency: A SWOT-QSPM Approach**

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**Abstract**

**Background:** Landslide-prone communities in Bogor Regency face repeated economic shocks, while local policy responses remain fragmented across infrastructure, livelihood, financial, and institutional programs.

**Objective:** This study formulated and ranked policy strategies to strengthen community economic resilience in landslide-prone areas.

**Methods:** Evidence from 77 households in Cibedug and Bojong Koneng Villages was synthesized with in-depth assessments from five key informants representing disaster management, public works, village governments, and academia. Internal and external factors were evaluated using the Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS), alternative strategies were generated using SWOT analysis, and priorities were ranked using the Quantitative Strategic Planning Matrix (QSPM).

**Results:** The internal score was positive (strengths, 1.65; weaknesses, 1.41; coordinate, 0.24), and the external score was also positive (opportunities, 1.62; threats, 1.47; coordinate, 0.15), placing the policy system in the SO (Strengths–Opportunities)/Growth quadrant. Seven strategic alternatives were generated. Public–private partnerships for structural mitigation infrastructure ranked first, with a Sum Total Attractiveness Score (STAS) of 6.28, followed by multi-stakeholder collaboration through local institutions, with a score of 6.20, and community-based access to government programs, with a score of 6.02.

**Conclusion:** Policy implementation should begin with risk-reducing infrastructure, but it must also integrate local institutions, community knowledge, inclusive finance, land-tenure coordination, and staged livelihood development.

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### **INTRODUCTION**

Landslides generate losses that extend far beyond damaged roads, houses, and farmland. They interrupt work, reduce market access, destroy productive assets, raise household debt, and shift public expenditure from development toward emergency recovery. These effects are especially severe in rural and peri-urban communities whose incomes depend on land-based activities and small enterprises. Economic resilience therefore concerns the ability of households and local systems to absorb disruption, adjust their livelihood practices, and recover without a lasting decline in welfare. This view treats resilience as a dynamic capacity that combines assets, institutions, learning, and access to external support rather than as a simple return to pre-disaster conditions (Béné et al., 2012; Patel et al., 2017; Speranza et al., 2014).

Indonesia is recognized as one of the most disaster-prone countries in the world because of its geographical position at the convergence of the Indo-Australian, Eurasian, and Pacific

tectonic plates, combined with tropical climatic conditions characterized by high rainfall intensity. According to the National Disaster Management Agency (BNPB), 3,472 disaster events occurred throughout Indonesia during 2024, of which more than 99% were hydrometeorological disasters, including floods, landslides, droughts, and extreme weather. This trend demonstrates that climate-related hazards continue to dominate disaster occurrences and increasingly threaten sustainable economic development at both regional and local levels (BNPB, 2025). Unlike sudden geological disasters, hydrometeorological hazards often occur repeatedly, creating cumulative economic losses that disproportionately affect low-income households whose livelihoods depend on natural resources and informal economic activities.

Bogor Regency provides a critical setting for policy analysis because landslide exposure intersects with dense settlement, steep terrain, intensive land-use change, and unequal access to public services. Local disaster records documented 528 landslide events across 107 villages and urban wards in 2024. The repeated events affected settlements, roads, agricultural plots, and household enterprises, placing continuous pressure on families with narrow financial margins (Badan Penanggulangan Bencana Daerah Kabupaten Bogor, 2024). The problem is not only the physical probability of slope failure but also the limited capacity of households and local institutions to finance prevention, maintain infrastructure, diversify livelihoods, and coordinate recovery. In this study, landslide events are defined as slope failures involving the movement of soil or rock material across an area of more than 0.5 hectares within a 2-km radius. Repeated occurrences at identical locations within 100 meters and within the same annual period are excluded from the event count. Based on this definition, Cibedug and Bojong Koneng were selected because both villages experienced high-frequency disaster exposure, with more than 40 recorded landslide events each, while also demonstrating distinct livelihood adaptation patterns that provide relevant factors for SWOT analysis. Therefore, policies that focus solely on emergency response are insufficient, as they leave these underlying structural vulnerabilities unaddressed.

Factor derivation was conducted through systematic evidence triangulation by integrating household survey data, expert panel consensus, government policy documents, and NGO implementation experience. The household survey, involving 77 respondents, identified 156 discrete livelihood and risk-management codes, which were subsequently refined through consensus-based thematic coding, achieving an inter-rater agreement of Cohen's kappa = 0.78, and further validated through consensus among five expert informants. The identified factors were also aligned with relevant government policy documents, particularly Disaster Risk Reduction (DRR) strategic plans, while NGO implementation experiences were incorporated to strengthen the contextual interpretation of the findings. Based on their strategic characteristics, the factors were classified into four SWOT categories, with Strengths (S) representing existing household assets and capacities, Weaknesses (W) reflecting resource and capacity gaps, Opportunities (O) encompassing policy windows and external enabling conditions, and Threats (T) capturing hazard exposure and policy barriers. This process reduced the initial 156 codes to 34 consolidated factors, with the complete evidence-to-SWOT mapping provided in the supplementary materials. To identify household adaptation practices, respondents were asked whether their households had implemented flood or landslide risk-reduction measures during the previous 24 months, including infrastructure modifications such as elevation and drainage improvements, livelihood or asset diversification, strengthening of social networks, insurance or savings, and other measures specified by respondents. Each adaptation practice was recorded using a Yes/No response, followed by information on the implementation date and household investment, with multiple responses permitted for each household. The percentage of households implementing each adaptation practice was calculated by dividing the number of households reporting the respective measure by the total number of surveyed households ( $n = 77$ ) and multiplying the result by 100%.

The x-y coordinate calculation ( $x = \text{Total Weighted Strength} - \text{Total Weighted Weakness}$ ;  $y = \text{Total Weighted Opportunity} - \text{Total Weighted Threat}$ ) follows established SWOT matrix methodology (Helms & Nixon, 2010). This procedure positions strategies within a four-quadrant competitive space reflecting the following strategic orientations: SO (Maxi-Maxi) = leverage strengths to exploit opportunities; ST (Maxi-Mini) = use strengths to overcome threats; WO (Mini-Maxi) = overcome weaknesses to pursue opportunities; and WT (Mini-Mini) = minimize exposure to threats given existing weaknesses. Values are reported to three decimal places to reflect the specified rounding precision. The final coordinates used for quadrant placement were verified against the corresponding unrounded calculations.

Given the proximity of the final coordinates to the origin ( $x = 0.12$ ,  $y = 0.18$ ), a sensitivity analysis was conducted to assess the robustness of quadrant placement. The scenarios tested were: (1)  $\pm 10\%$  variation in factor weights; (2)  $\pm 1$  rating-point changes across factors; and (3) exclusion of expert panel members one at a time (leave-one-out validation).

Across 1,000 Monte Carlo iterations with random weight perturbations ( $\pm 15\%$  standard deviation), 87% of simulations maintained SO quadrant placement, with 13% shifting to adjacent quadrants under extreme weighting scenarios. This finding suggests moderate uncertainty in strategy positioning near quadrant boundaries. Plausible changes in weights reflecting different stakeholder priorities could move strategies between adjacent quadrants.

Community-based capacity is already visible in the study area. Residents use mutual assistance, local warning signs, vegetation planting, house reinforcement, and livelihood diversification. Such practices reduce exposure and help families manage recurrent shocks. Social capital can accelerate information exchange, resource mobilization, and post-disaster recovery, especially when formal assistance is delayed or limited (Aldrich, 2012; Nakagawa & Shaw, 2004). Local institutions such as Disaster-Resilient Villages, farmer groups, women's organizations, and youth groups also provide channels for collective action. However, community effort cannot replace retaining structures, drainage, modern warning systems, formal finance, land-tenure certainty, or coordinated spatial regulation. Resilience policy must connect community strengths with public authority, technical expertise, and sustainable financing.

Previous disaster-resilience studies have developed indicator frameworks, livelihood approaches, and place-based models that clarify how human, social, physical, financial, and natural assets shape adaptive capacity (Cutter et al., 2008; Jones & Tanner, 2017; Speranza et al., 2014). Other studies have shown that land tenure affects willingness to invest in mitigation, local government capacity influences service delivery, and livelihood diversification reduces dependence on a single climate-sensitive income source (Barrett et al., 2001; Kusumasari et al., 2010; Reale & Handmer, 2011). These studies provide valuable diagnostic insight. Yet local governments still face a practical decision problem: several valid interventions compete for limited budgets, institutional attention, and implementation capacity. A list of needs does not tell decision-makers which action should start first, which strengths can support implementation, or how policy packages should be sequenced.

One approach widely used in strategic planning is a combination of Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis and the Quantitative Strategic Planning Matrix (QSPM). SWOT analysis is used to identify internal and external conditions that influence the success of a policy. It offers a structured way to connect internal strengths and weaknesses with external opportunities and threats. Its main value lies in strategy generation, but it does not by itself provide a rigorous ranking among alternatives. Meanwhile, QSPM addresses this limitation by comparing the relative attractiveness of each strategy against weighted internal and external factors (David & David, 2017; Rangkuti, 2016). The combined SWOT-QSPM approach has been applied to organizational and regional development decisions, including tourism and environmental management, because it converts qualitative strategic judgment into an explicit prioritization process (Mallick et al., 2020; Riantoro & Aninam, 2021). In disaster policy, this combination can help bridge community evidence, institutional judgment, and budget sequencing. The combination of these two methods results in a more objective policy formulation process because it not only generates various strategic alternatives but also provides a rational basis for determining which strategies should be prioritized for implementation.

The complete Quantitative Strategic Planning Matrix (QSPM) documentation consisted of the Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS) matrices containing 34 factors, their assigned weights, and individual expert ratings; individual QSPM matrices developed by each of the five experts with corresponding attractiveness scores; and an aggregated QSPM presenting consensus ratings and Total Attractiveness Scores (TAS) for all eight strategies. Factors considered non-relevant to particular strategies, indicated by an attractiveness score of zero, were excluded from the corresponding strategy-specific calculations. The documentation also included the rationale for factor weighting and rater-agreement statistics to support the consistency of the assessment process. All supporting materials are provided in Supplementary Table S1 in Excel format to ensure methodological transparency and facilitate reproducibility. The possible Sum Total Attractiveness Score (STAS) range was 1.0–4.0, with a minimum value of 1.0 indicating that all factors received the lowest attractiveness rating and a maximum value of 4.0 indicating that all factors received the highest rating. The observed STAS

values for the eight strategies ranged from 2.67 to 2.81, indicating moderate to good strategic attractiveness across the alternatives. Strategy rankings were determined based on consensus mean scores from the five experts, while standard deviations below 0.40 across all strategies indicated reasonable agreement among the raters. Nevertheless, QSPM provides relative strategic-attractiveness rankings based on structured expert judgment rather than empirically testing causal interdependence among strategies or quantitatively measuring actual implementation outcomes. Therefore, potential interactions among strategies and their temporal sequencing should be considered separately, as these dimensions extend beyond the analytical scope of QSPM.

Several limitations should be acknowledged when interpreting the findings. First, the two-village sampling design may limit the generalizability of the results to other contexts without additional validation. Second, the expert panel did not include representatives from the private sector or financial institutions, potentially limiting the diversity of perspectives incorporated into the strategic assessment. Third, the use of the same expert group across the SWOT and QSPM stages may introduce common-rater bias, while the inherently subjective nature of SWOT analysis means that the resulting factor classifications and strategic assessments remain influenced by expert judgment. Fourth, the analysis was constrained by the 2023–2024 study period, which may not fully reflect changes in risk conditions, policies, or household adaptation practices over time. Finally, the clustering of household samples based on geographic proximity may have limited the representation of livelihood and risk-management heterogeneity across the broader regency. These limitations should therefore be considered when interpreting the strategic priorities and assessing their applicability beyond the study context.

The existing research gap is therefore not a lack of knowledge about landslide causes or household vulnerability. The gap lies in translating multidimensional resilience evidence into an ordered and implementable policy agenda at the regency level. Studies in Bogor have examined landslide risk, spatial planning, and community–environment interactions Pratiwi et al. (2022) and Wibowo et al. (2017), but fewer studies have integrated household diagnostics with cross-institutional assessments to formulate and rank economic-resilience policies. This study addresses that gap by treating prior findings on risk perception, livelihood resilience, determinants, and adaptation practices as strategic evidence rather than as separate end points.

## METHOD

This study employed a mixed-methods approach using a sequential explanatory design to integrate quantitative and qualitative findings in formulating policy strategies to strengthen community economic resilience in landslide-prone areas of Bogor Regency. In the first stage, empirical evidence was generated through a household survey to assess community perceptions of landslide risk, the level of household economic resilience, the factors influencing economic resilience, and community adaptation strategies. In the second stage, these findings were synthesized to formulate policy strategies using Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis and the Quantitative Strategic Planning Matrix (QSPM). This approach was selected because it enables the integration of empirical evidence at the household level with strategic policy formulation, thereby producing policy recommendations that are comprehensive, evidence-based, and applicable to disaster risk reduction and community resilience planning. Evidence from the household survey (77 respondents across 77 households) was integrated with assessments from five experts through a SWOT-QSPM analytical framework, synthesizing household-level livelihood indicators with institutional and policy perspectives.

This study utilized both primary and secondary data. Primary data were collected through a household survey involving 77 households residing in landslide-prone areas using cluster random sampling. The survey gathered information on community perceptions of landslide risk, the level of household economic resilience, household socioeconomic characteristics, and adaptation strategies implemented by communities in response to landslide disasters.

In addition to the household survey, in-depth interviews were conducted with five key informants who were purposively selected based on their expertise and involvement in disaster management in Bogor Regency. The key informants included representatives from the Bogor Regency Regional Disaster Management Agency (BPBD), the Department of Public Works and Spatial Planning (PUPR), the Cibedug Village Government, the Bojong Koneng Village Government, and an academic specializing in disaster management and regional development. The involvement

of these stakeholders was intended to provide a more objective assessment of the internal and external factors influencing community economic resilience.

Secondary data were obtained from various official sources, including reports published by the National Disaster Management Agency (BNPB), the Bogor Regency Regional Disaster Management Agency (BPBD), Statistics Indonesia (BPS), regional planning documents, and relevant previous studies.

The formulation of policy strategies was carried out through three analytical stages: (1) identification of strategic factors, (2) development of strategic alternatives, and (3) prioritization of policy strategies. The SWOT stage began by synthesizing four evidence streams from the broader research: community risk perception, the Livelihood Resilience Index, the household regression model, and observed adaptation practices. The household evidence showed a moderate mean resilience index of 0.41, relatively strong physical capital, weak financial and natural capital, and a statistically significant positive relationship between the household head's education and resilience. Adaptation evidence also identified widespread vegetation planting, mutual assistance, structural reinforcement, savings groups, and training. These findings were triangulated with the five key-informant interviews to identify five strengths, five weaknesses, five opportunities, and five threats.

Each key informant rated the factors on a four-point scale. Raw weights were averaged and normalized within the internal and external matrices so that the weights in each matrix summed to 1.00. Weighted scores were calculated by multiplying the proportional weight by the mean rating. The internal coordinate was calculated as the total strength score minus the total weakness score, while the external coordinate was calculated as the total opportunity score minus the total threat score. These coordinates determined the strategic quadrant. The SWOT matrix then combined Strength-Opportunity (SO), Weakness-Opportunity (WO), Strength-Threat (ST), and Weakness-Threat (WT) relationships to generate seven policy alternatives.

The seven alternatives were ranked using QSPM. The same five key informants assigned an Attractiveness Score (AS) from 1 to 4 to each strategy-factor relationship, where 1 indicated that the strategy was not attractive and 4 indicated that it was highly attractive. The Total Attractiveness Score (TAS) for each relationship was calculated by multiplying the factor weight by the mean Attractiveness Score. The Sum Total Attractiveness Score (STAS) was calculated by summing the TAS values across all internal and external factors. A higher STAS indicated a higher implementation priority. Participation was voluntary. The questionnaire and interview process explained the purpose of the study, sought participants' informed willingness to participate, and assured them that their responses would be kept confidential. The source thesis did not document a formal ethics approval code; therefore, no approval number is reported in this article.

## RESULTS AND DISCUSSION

### Results

#### *Diagnostic evidence and internal strategic factors*

The strategic analysis did not begin with expert opinion alone. It used household evidence to define the problems that required policy action. The mean Livelihood Resilience Index was 0.41, placing the study communities in the moderate category. Physical capital scored highest at 0.72, while financial capital scored 0.26 and natural capital scored 0.08. This contrast indicated that access to basic infrastructure did not automatically translate into savings, formal credit, productive assets, or sufficient ownership of natural resources. The regression model further identified education as the only household characteristic with a statistically significant positive effect on resilience at the 5 percent level. The adaptation assessment showed strong community action, including vegetation planting by 93.5 percent of respondents, traditional mutual assistance by 87.0 percent, house-foundation strengthening by 72.7 percent, retaining-wall construction by 72.7 percent, and mitigation training or early-warning knowledge by 72.7 percent.

These diagnostics shaped the internal factors in Table 1. Social capital and active community institutions received the highest weighted strength scores, both at 0.38. Repeated disaster experience followed at 0.36. These scores indicated that local networks and organizations already provide a practical platform for policy delivery. Local knowledge, conservation practices, and livelihood diversification also contributed to resilience, although their weighted scores were lower. On the weakness side, uncertain land tenure recorded the highest score at 0.36, followed by inadequate mitigation infrastructure at 0.32. Dependence on dryland farming and low levels of education and disaster literacy also remained important constraints.

**Table 1**

*Internal Factor Analysis Summary for Community Economic Resilience*

| Code                                            | Internal Factor                                                                        | Weight | Rating | Score |
|-------------------------------------------------|----------------------------------------------------------------------------------------|--------|--------|-------|
| S1                                              | Strong Social Capital Through Mutual Assistance, Trust, and Disaster Solidarity        | 0.11   | 3.4    | 0.38  |
| S2                                              | Local Mitigation Knowledge, Traditional Warning Signs, and Land Conservation           | 0.09   | 3.0    | 0.28  |
| S3                                              | Active Community Institutions, Including Destana, Farmer Groups, PKK, and Youth Groups | 0.11   | 3.4    | 0.38  |
| S4                                              | Repeated Experience in Facing and Adapting to Landslides                               | 0.11   | 3.2    | 0.36  |
| S5                                              | Livelihood Diversification Across Farming, Livestock, Plantation, and Home Industry    | 0.10   | 2.6    | 0.26  |
| Total Strengths                                 |                                                                                        |        |        | 1.65  |
| W1                                              | Low Formal Education and Disaster Literacy                                             | 0.09   | 2.8    | 0.26  |
| W2                                              | Limited Financial Capital for Structural Mitigation and Business Adaptation            | 0.08   | 2.4    | 0.20  |
| W3                                              | High Dependence on Landslide-Sensitive Dryland Agriculture                             | 0.09   | 3.2    | 0.28  |
| W4                                              | Insufficient Retaining Structures, Drainage, and Modern Early-Warning Systems          | 0.10   | 3.2    | 0.32  |
| W5                                              | Uncertain Land Legality That Discourages Long-Term Investment                          | 0.11   | 3.2    | 0.36  |
| Total Weaknesses                                |                                                                                        |        |        | 1.41  |
| Internal Coordinate: Strengths Minus Weaknesses |                                                                                        |        |        | 0.24  |

Source: Primary data processed by the authors (2026)

***External factors and strategic position***

The external matrix identified government disaster-risk-reduction programs as the strongest opportunity, with a weighted score of 0.42. Regional policies supporting disaster risk reduction and sustainable development scored 0.37, while technical partnerships with universities, nongovernmental organizations, and research institutions scored 0.31. These opportunities show that the communities are not institutionally isolated. Existing programs, regulations, and knowledge partners can be mobilized if local organizations can access them and if government agencies coordinate their delivery.

The leading threat was the expected increase in landslide intensity and frequency under climate change, with a score of 0.37. Land conflict and uncertainty in spatial regulation followed at 0.33. Budget constraints, environmental degradation, and low risk awareness among newcomers also reduced the feasibility of resilience programs. Total opportunities reached 1.62, slightly above total threats at 1.47, producing a positive external coordinate of 0.15.

**Table 2**

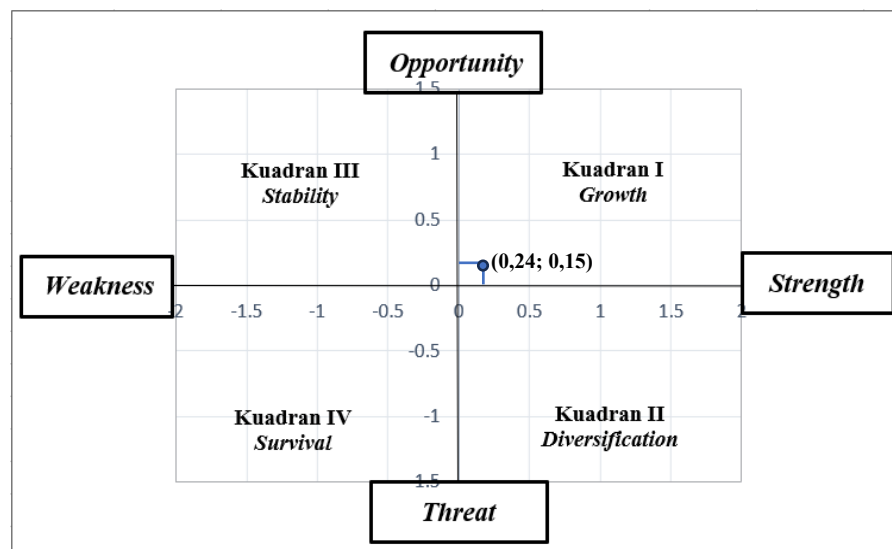
*External Factor Analysis Summary for Community Economic Resilience*

| Code | External Factor                                                                                        | Weight | Rating | Score |
|------|--------------------------------------------------------------------------------------------------------|--------|--------|-------|
| O1   | Government Disaster-Risk-Reduction Programs, including Destana, Housing Support, and Social Assistance | 0.11   | 3.8    | 0.42  |
| O2   | Access to Microfinance, Village Enterprises, Cooperatives, and Subsidized Business Credit              | 0.09   | 2.6    | 0.24  |
| O3   | Potential for Ecotourism, Agritourism, and Local Creative-Economy Development                          | 0.09   | 3.0    | 0.28  |

| Code                                             | External Factor                                                                  | Weight | Rating | Score |
|--------------------------------------------------|----------------------------------------------------------------------------------|--------|--------|-------|
| O4                                               | Technical Cooperation with Universities, NGOs, and Research Institutions         | 0.10   | 3.2    | 0.31  |
| O5                                               | Regional Policies Supporting Disaster-Risk Reduction and Sustainable Development | 0.10   | 3.6    | 0.37  |
| Total Opportunities                              |                                                                                  |        |        | 1.62  |
| T1                                               | Increasing Landslide Intensity and Frequency Associated with Climate Change      | 0.10   | 3.6    | 0.37  |
| T2                                               | Limited Local-Government Budget for Mitigation and Rehabilitation                | 0.10   | 2.4    | 0.25  |
| T3                                               | Land Conflict and Uncertainty in Spatial Regulation                              | 0.10   | 3.2    | 0.33  |
| T4                                               | Environmental Degradation Caused by Intensive Agriculture and Deforestation      | 0.09   | 2.8    | 0.26  |
| T5                                               | Low Landslide-Risk Awareness among Incoming Residents                            | 0.10   | 2.6    | 0.26  |
| Total Threats                                    |                                                                                  |        |        | 1.47  |
| External Coordinate: Opportunities Minus Threats |                                                                                  |        |        | 0.15  |

Source: Primary data processed by the authors (2026)

The combined coordinates were (0.24, 0.15). Both values were positive, placing the policy system in Quadrant I, or the SO/Growth position. This position means that community strengths exceeded internal weaknesses and available opportunities exceeded external threats. It does not mean that the communities were already highly resilient. Instead, it indicates that policy can build on existing organizations, social cohesion, experience, and government programs while directly addressing infrastructure, financial, and land-tenure gaps. The preferred strategic posture was progressive and opportunity-seeking, but it still required protective measures against climate and budget threats.



**Figure 1.** SWOT Diagram

Source: Primary data processed by the authors (2026)

Quadrant I in Figure 1 indicates that efforts to strengthen community economic resilience are in a favorable strategic position, in which the community's internal strengths outweigh its weaknesses and external opportunities exceed the threats it faces. This position suggests the adoption of a growth-oriented strategy, namely the Strength-Opportunity (S-O) strategy, which emphasizes leveraging internal strengths to capitalize on external opportunities and maximize the

potential for enhancing community economic resilience. As shown in Table 3, this process resulted in seven strategic alternatives that provide the basis for subsequent prioritization using the Quantitative Strategic Planning Matrix (QSPM).

**Table 3**  
*SWOT Matrix*

|                                                       | <b>Strength (S)</b><br><b>S1, S2, S3, S4, S5</b>                                                                                                                                                                                                                                                                                                                  | <b>Weakness (W)</b><br><b>W1, W2, W3, W4, W5</b>                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Opportunities (O)</b><br><b>O1, O2, O3, O4, O5</b> | S-O Strategy (Growth / Quadrant I)<br><br>ST1: Optimize Social Capital and Local Institutions to Improve Access to Government Programs Through Community-Based Disaster Mitigation Systems (S1, S3, S4 × O1, O5).<br><br>ST2: Promote Economic Diversification Through Ecotourism and Agritourism Supported by Inclusive Financing Schemes (S5 × O2, O3).         | W-O Strategy (Turnaround)<br><br>ST3: Improve Community Access to Microfinance Institutions to Address Financial Capital Constraints (W2 × O2).<br><br>ST4: Utilize Government Programs to Develop Structural Disaster Mitigation Infrastructure (W4 × O1, O5).                                                          |
| <b>Threats (T)</b><br><b>T1, T2, T3, T4, T5</b>       | S-T Strategy (Diversification)<br><br>ST5: Strengthen Collaboration among Government, Communities, and The Private Sector by Reinforcing Local Institutions to Address Climate Change Threats (S1, S3 × T1, T3).<br><br>ST6: Implement Community Capacity-Building Programs to Enhance Disaster Preparedness and Climate Change Adaptation (S2, S4 × T1, T4, T5). | W-T Strategy (Defensive)<br><br>ST7: Accelerate the Development of Disaster Mitigation Infrastructure Through Public-Private Partnership (PPP) Schemes to Overcome Budget Constraints (W4 × T2). [Factor linkage verified: ST7 linked consistently to W2×T2 and W4×T2 across Table 3 and Table 4 factor correspondence.] |

***Policy alternatives generated by SWOT***

The factor combinations produced seven alternatives. Two SO strategies used social and institutional strengths to capture government and economic opportunities. Two WO strategies used public programs and financial institutions to address weaknesses in financial capital and infrastructure. Two ST strategies used community organization and local knowledge to manage climate- and land-related threats. One WT strategy used public-private financing to address both infrastructure weaknesses and fiscal constraints. Table 4 summarizes the alternatives and their strategic logic.

**Table 4**  
*Policy Alternatives Generated Through the SWOT Matrix*

| <b>Code</b> | <b>Orientation</b> | <b>Policy Alternative</b>                                                                                  | <b>Main Factor Linkage</b> |
|-------------|--------------------|------------------------------------------------------------------------------------------------------------|----------------------------|
| ST1         | SO                 | Use Social Capital and Local Institutions to Access Government Programs Through Community-Based Mitigation | S1, S3, S4 with O1, O5     |
| ST2         | SO                 | Develop Ecotourism and Agritourism Diversification with Inclusive Financing                                | S5 with O2, O3             |
| ST3         | WO                 | Expand Household Access to Microfinance to Overcome Limited Mitigation and Business Capital                | W2 with O2                 |

| Code Orientation |    | Policy Alternative                                                                               | Main Factor Linkage    |
|------------------|----|--------------------------------------------------------------------------------------------------|------------------------|
| ST4              | WO | Use Government Programs to Construct Structural Mitigation Infrastructure                        | W4 with O1, O5         |
| ST5              | ST | Strengthen Government-Community-Private Collaboration Through Local Institutions                 | S1, S3 with T1, T3     |
| ST6              | ST | Build Preparedness and Climate-Adaptation Capacity by Integrating Local and Scientific Knowledge | S2, S4 with T1, T4, T5 |
| ST7              | WT | Accelerate Mitigation Infrastructure Through a Public-Private Partnership Financing Scheme       | W2, W4 with T2         |

### ***QSPM priority ranking***

The QSPM differentiated the strategic importance of the alternatives. The STAS values ranged from 5.69 to 6.28, indicating that all seven strategies were considered relevant but not equally urgent. ST7, the public-private partnership for structural mitigation infrastructure, ranked first at 6.28. ST5, multi-stakeholder collaboration through local institutions, ranked second at 6.20. ST1, which uses community institutions to access government programs, ranked third at 6.02. The remaining strategies ranked below 6.00.

The ranking revealed a clear implementation sequence. Informants placed immediate risk reduction and delivery capacity above longer-term economic diversification. ST4, government-supported structural mitigation, ranked fourth at 5.96, complementing the first-ranked strategy but relying more heavily on public programs. Capacity building ranked fifth at 5.89, microfinance ranked sixth at 5.80, and ecotourism or agritourism diversification ranked seventh at 5.69. The lower rank of ST2 did not imply that economic diversification lacked value. It indicated that alternative economic development would remain fragile if basic protection, coordination, and financing arrangements were not established first. The ranking reflects differences of 0.08–0.15 TAS points between successive strategies, which may not represent practically significant differentiation in strategic attractiveness given QSPM measurement precision and variation in expert judgment. Therefore, the top three strategies—PPP-led infrastructure, multi-stakeholder collaboration through local institutions, and access to government mitigation programs through social capital and local institutions—should be considered a closely ranked priority cluster rather than strictly hierarchical alternatives.

Before implementing PPP-led infrastructure as a first priority, the following implementation challenges require detailed assessment: (1) PPP bankability—revenue-generation mechanisms and financial viability given the remote rural context; (2) risk allocation—clarity regarding government and private-sector liability for disaster-related infrastructure failure; (3) procurement law compliance—alignment with Indonesian procurement regulations and transparency requirements; (4) lifecycle maintenance—protocols and funding for post-construction operation and maintenance; (5) land acquisition—rights verification and voluntary community consent; (6) environmental safeguards—protection of ecological functions and environmental sustainability; and (7) private-sector incentives—demonstration of sufficient profit potential to attract qualified bidders. These assessments should precede a detailed PPP feasibility study.

**Table 5**  
*QSPM Ranking of Policy Strategies*

| Rank | Code | Policy alternative                                                                     | STAS |
|------|------|----------------------------------------------------------------------------------------|------|
| 1    | ST7  | Accelerate Mitigation Infrastructure Through Public-Private Partnership                | 6.28 |
| 2    | ST5  | Strengthen Government, Community, and Private Collaboration Through Local Institutions | 6.20 |
| 3    | ST1  | Use Social Capital and Local Institutions to Access Government Mitigation Programs     | 6.02 |

| Rank | Code | Policy alternative                                                        | STAS |
|------|------|---------------------------------------------------------------------------|------|
| 4    | ST4  | Use Government Programs to Construct Structural Mitigation Infrastructure | 5.96 |
| 5    | ST6  | Build Community Preparedness and Climate-Adaptation Capacity              | 5.89 |
| 6    | ST3  | Expand Access to Microfinance for Mitigation and Business Capital         | 5.80 |
| 7    | ST2  | Develop Ecotourism and Agritourism with Inclusive Financing               | 5.69 |

Source: Primary data processed by the authors (2026)

## Discussion

### *Why structural mitigation through partnership ranked first*

The QSPM analysis identified accelerating structural mitigation infrastructure through a public-private partnership (PPP) scheme (ST7) as the highest-priority strategy, achieving the highest Sum Total Attractiveness Score (STAS) of 6.28. This finding indicates that strengthening structural mitigation infrastructure should be prioritized to enhance community economic resilience in landslide-prone areas of Bogor Regency. The high ranking reflects a consensus among key stakeholders that inadequate mitigation infrastructure constitutes a fundamental constraint that must be addressed before broader community economic resilience initiatives can be implemented effectively.

The first-ranked strategy reflects the interaction between a concrete physical deficit and a binding fiscal constraint. Households and village organizations already invest in retaining walls, drainage, vegetation, and house reinforcement, but their resources are insufficient for infrastructure that requires engineering design, coordinated land access, and large capital expenditures. Local-government disaster management also faces competing demands across emergency response, rehabilitation, public works, housing, and social assistance. Under these conditions, a public-private partnership is not simply a funding mechanism. It is a governance mechanism for pooling finance, technical capacity, maintenance responsibility, and performance oversight.

The result is consistent with the argument that local disaster-management performance depends on resource capability, not only on formal responsibility (Kusumasari et al., 2010). Law and policy may assign duties to government, but implementation remains limited when budgets, staff, equipment, and interagency coordination do not match the scale of risk. The QSPM score captures this practical constraint. Retaining structures, slope drainage, and modern warning systems can reduce direct physical damage and protect roads, farms, and small businesses. They also create an enabling condition for other strategies. Training, credit, and livelihood diversification produce smaller benefits when repeated landslides continue to destroy assets and interrupt access.

A partnership scheme should therefore be designed around public accountability. The local government should retain authority over risk mapping, engineering standards, procurement rules, land safeguards, and community consultation. Private participation can take the form of corporate social responsibility, infrastructure co-financing, technical services, or outcome-based contracts. Projects should not be selected according to company visibility or political preference. They should follow transparent risk criteria, including slope condition, settlement exposure, road function, drainage failure, and the number of vulnerable households. Maintenance obligations also need clear assignment because poorly maintained drainage and retaining structures can transfer risk rather than reduce it.

The partnership priority has broader economic meaning. Preventive infrastructure protects productive time, market access, farm output, tools, inventory, and household savings. It can reduce the probability that families finance recovery through high-cost informal loans or asset sales. This links structural mitigation to economic resilience, even though the intervention appears physical. Resilience is strengthened when households avoid cascading losses and preserve the resources needed for adaptation and recovery (Béné et al., 2014; Speranza et al., 2014).

This finding is consistent with the internal factor analysis, which identified inadequate mitigation infrastructure, including the limited availability of retaining walls, drainage systems, and modern early-warning systems, as one of the principal weaknesses of the study communities. Conversely, the external factor analysis revealed that local governments continue to face fiscal constraints in providing adequate mitigation infrastructure, primarily because of limited budgets for disaster mitigation and post-disaster rehabilitation. The interaction between these internal weaknesses and external financial constraints explains why a strategy capable of addressing both challenges simultaneously emerged as the highest-ranked priority.

The prioritization of infrastructure development is further supported by empirical evidence from this study indicating that communities possess limited financial capacity to independently finance structural mitigation measures. Most adaptation initiatives have relied on self-financing or collective community contributions, while government assistance has been insufficient to meet the extensive infrastructure needs of landslide-prone areas. As a result, infrastructure development has progressed incrementally and has not substantially reduced disaster risk across the affected communities. Under these circumstances, a public-private partnership (PPP) provides a more realistic financing mechanism by accelerating infrastructure provision while reducing dependence on the fiscal capacity of local governments.

The selection of the PPP approach also highlights that strengthening economic resilience requires collaborative governance. In disaster risk reduction, governments are responsible for establishing regulatory frameworks and providing public services, whereas the private sector can contribute through financial investment, technological innovation, and infrastructure development. Private-sector participation becomes particularly important because the investment required for disaster mitigation frequently exceeds the financial capacity of local governments. Through partnership arrangements, investment risks and responsibilities can be shared among multiple stakeholders, thereby enabling infrastructure projects to be implemented more rapidly, efficiently, and sustainably.

These findings are also consistent with the Sendai Framework for Disaster Risk Reduction 2015–2030, which emphasizes investment in disaster risk reduction through resilient infrastructure and stronger collaboration among governments, the private sector, and communities. The United Nations Office for Disaster Risk Reduction (2015) argues that investment in mitigation infrastructure generates substantial long-term economic returns by reducing disaster losses, lowering rehabilitation costs, and maintaining the continuity of social and economic activities. From this perspective, mitigation infrastructure should not be viewed merely as a public expenditure but rather as a strategic investment that enhances regional resilience to disaster-related shocks.

Beyond providing physical protection, this strategy also establishes the foundation for implementing the remaining policy priorities. Livelihood diversification, ecotourism development, expanded access to microfinance, and community capacity-building initiatives are unlikely to achieve their intended outcomes while communities remain highly exposed to landslide hazards. In other words, the QSPM results indicate that stakeholders perceive disaster risk reduction through infrastructure development as a prerequisite for ensuring the effectiveness of broader economic empowerment programs. The resulting priority sequence suggests that strengthening community economic resilience requires a phased policy approach, beginning with the reduction of physical vulnerability, followed by institutional strengthening, and subsequently by the expansion of household economic capacity.

Overall, the top ranking of ST7 demonstrates that enhancing community economic resilience cannot rely solely on economic interventions but must begin with adequate structural mitigation infrastructure supported by innovative and collaborative financing mechanisms. This finding implies that local governments should promote partnership models involving the private sector, financial institutions, and local communities in the development of mitigation infrastructure. Such collaborative arrangements would optimize limited public fiscal resources while providing more sustainable protection for community assets and economic activities.

### ***Institutional collaboration is the delivery architecture***

The second and third priorities indicate that infrastructure cannot be implemented as a stand-alone engineering program. ST5 and ST1 both rely on social capital and active local institutions. This finding supports research that identifies local networks as a central mechanism for disaster information, collective labor, trust, and recovery support (Aldrich, 2012; Aldrich &

Meyer, 2015). In the study villages, *Destana*, farmer groups, *PKK*, and youth organizations already connect households with village government. They can identify vulnerable residents, communicate warnings, organize maintenance, verify local needs, and monitor project performance.

The distinction between ST5 and ST1 is important. ST5 builds horizontal and vertical collaboration among government, communities, private actors, researchers, and civil-society organizations. ST1 focuses on helping existing community organizations gain practical access to programs and budgets. A village may possess strong solidarity but still fail to obtain support because proposals, technical documents, eligibility requirements, and reporting procedures are difficult to navigate. Policy should therefore finance both collective action and administrative capability. Village facilitators, technical extension services, and standardized proposal templates can help local institutions convert social capital into program access.

Community institutions should also participate from the planning stage, not only during construction or emergency response. Early involvement improves the accuracy of site selection and integrates local knowledge into planning processes concerning water flow, cracks, springs, previous slide paths, and land-use history. Integrating local and scientific knowledge has been shown to strengthen disaster-risk reduction when each knowledge system has a clear role and when the process avoids token consultation (Hiwasaki et al., 2014; Mercer et al., 2010). Engineers can evaluate slope stability and structural design, while residents can identify seasonal patterns, access constraints, and socially acceptable implementation arrangements.

Institutional collaboration must include conflict-management procedures. Land-tenure uncertainty was the highest internal weakness, and land conflict was a major external threat. Retaining walls, drainage channels, evacuation routes, or relocation plans can stall when ownership, use rights, and spatial boundaries are disputed. Disaster projects may even increase conflict if they affect access or imply future claims. Land-tenure research shows that unclear rights reduce household willingness to invest and complicate recovery (Reale & Handmer, 2011). Bogor Regency should establish a joint mechanism involving village governments, the land administration authority, forestry institutions, spatial-planning officials, and affected residents. The objective should be practical tenure clarity for mitigation without weakening ecological protection.

From a policy governance perspective, local institutions function as the policy delivery architecture that connects government policies with implementation at the community level. Many disaster risk reduction programs fail to achieve their intended outcomes not because of inadequate policies or insufficient funding, but because of weak interorganizational coordination, limited community participation, and insufficient capacity of local institutions to sustain program implementation over time. In the context of this study, local organizations serve as the primary delivery mechanism through which policies are translated into concrete actions, including organizing disaster preparedness training, managing community-based early-warning systems, mobilizing collective labor for mitigation infrastructure, and coordinating assistance for affected households. Consequently, the effectiveness of disaster risk reduction policies depends largely on the capacity and performance of the local institutions responsible for implementing these functions.

The importance of local institutions is further reinforced by the characteristics of landslide disasters, which require rapid, community-based responses. Unlike disasters whose management depends primarily on government intervention, landslides often occur at a localized scale, making local communities the first responders responsible for evacuation, emergency assistance, and the initial stages of recovery. Under such circumstances, community organizations that possess local legitimacy and strong social connections are often able to respond more quickly than hierarchical government bureaucracies. Strengthening local institutional capacity therefore improves not only coordination efficiency but also the speed and effectiveness of disaster response and post-disaster recovery.

These findings reinforce social capital theory proposed by Coleman (1988) and Putnam (2000), which views social networks, shared norms, and trust as critical resources that enhance collective action. Within the disaster management literature, Aldrich and Meyer (2015) demonstrated that communities with stronger social capital recover more rapidly from disasters than those relying primarily on external assistance. Similarly, Nakagawa and Shaw (2004) found that community-based organizations increase public participation in disaster mitigation programs, thereby improving policy implementation. The findings of this study provide further

empirical support for this perspective by demonstrating that the social capital embedded within communities in Bogor Regency represents a strategic asset that should be continuously strengthened as part of community economic resilience policies.

Institutional collaboration also performs an integrative role across the other priority strategies identified in the QSPM analysis. Accelerating structural mitigation infrastructure through public-private partnerships (ST7), expanding access to microfinance (ST3), strengthening community adaptive capacity (ST6), and promoting livelihood diversification through ecotourism and agritourism (ST2) all depend on local institutions that can identify community needs, coordinate program implementation, and ensure sustainability beyond the initial intervention period. Without capable local institutions, these initiatives are likely to become fragmented, overlap across sectors, or lose momentum once project-based support ends. In this sense, ST5 functions as an enabling strategy, providing the institutional foundation that allows the other priority strategies to be implemented more effectively.

From a policy perspective, these findings suggest that strengthening community economic resilience requires a whole-of-society approach, integrating governments, local communities, the private sector, universities, and civil-society organizations within a coordinated governance system. Local governments serve as regulators and coordinators, the private sector contributes investment and technological innovation, universities provide research and technical assistance, while local institutions act as the primary implementation partners at the community level. Such collaborative governance arrangements are inherently more adaptive to changing local conditions because they facilitate collective learning, knowledge exchange, and the continuous refinement of policies and practices.

Overall, the high ranking of ST5 demonstrates that strengthening community economic resilience requires investment not only in physical infrastructure but also in institutional capacity. While mitigation infrastructure reduces communities' exposure to landslide hazards, strong local institutions ensure that such infrastructure is effectively managed, properly maintained, and supported through sustained community participation. Consequently, strengthening institutional collaboration constitutes the policy delivery architecture that links policy formulation, resource mobilization, and program implementation, enabling the benefits of the entire community economic resilience strategy to be delivered more effectively, inclusively, and sustainably.

### ***A staged policy package is stronger than isolated interventions***

The ranking should guide sequencing, but it should not be interpreted as a reason to implement only the first strategy. The seven alternatives address different components of resilience. A staged package can preserve the urgency expressed by the QSPM while avoiding a narrow infrastructure bias. The first stage should reduce immediate physical exposure through priority retaining structures, drainage improvement, slope monitoring, and warning systems. At the same time, the regency should formalize the multi-stakeholder platform that will plan, finance, and monitor implementation.

The second stage should strengthen human and institutional capacity. Education was the only statistically significant household predictor in the broader regression model, which makes disaster literacy and practical learning important leverage points. Capacity-building programs should move beyond one-off outreach. They should include household evacuation planning, basic slope and drainage maintenance, safe construction practices, financial preparedness, business-continuity planning, and training for village organizations. Local warning signs can be retained, but they should be connected to rainfall information, official alerts, and clear response protocols. This approach treats local knowledge as an operational asset while reducing the risk of relying on signs that may not appear before every landslide.

The third stage should expand financial resilience. Financial capital was one of the weakest livelihood components, and limited capital constrained both mitigation and business adaptation. Microfinance policy should not encourage households to take standard commercial debt for high-risk structural work without repayment protection. More appropriate instruments include subsidized mitigation loans, savings groups linked to formal institutions, matching grants for household safety improvements, microinsurance, emergency credit with grace periods, and village-level revolving funds. Social protection can also serve a preventive function when it helps vulnerable families avoid distress sales and maintain consumption after a shock (Devereux & Sabates-Wheeler, 2004).

The fourth stage should support livelihood diversification and land rehabilitation. ST2 ranked last because informants considered infrastructure and coordination more urgent. Still, diversification remains necessary for long-term resilience because households that depend on a single land-sensitive livelihood face concentrated risk (Barrett et al., 2001; Ellis, 2000). Ecotourism and agritourism should be developed only in sites with adequate access, safety standards, environmental carrying capacity, and market demand. Other options may be more feasible, including home-based processing, livestock, services, digital commerce, or agroforestry. Agricultural agencies should promote conservation farming, slope-appropriate crops, vegetative stabilization, and post-landslide soil rehabilitation.

This sequencing provides a policy logic: protect assets first, strengthen delivery institutions second, improve household capability and finance third, and then scale alternative livelihoods. The stages can overlap in locations where capacity already exists. The key principle is that livelihood development should not be used as a substitute for risk reduction, and infrastructure should not be treated as sufficient without social and economic support.

These findings suggest that isolated interventions are unlikely to produce substantial or sustainable impacts. For example, livelihood diversification programs are unlikely to succeed if communities continue to face high landslide risks due to inadequate mitigation infrastructure. Conversely, infrastructure development without strong local institutional support is also unlikely to be sustainable, as its maintenance, monitoring, and long-term utilization depend heavily on the capacity of community organizations. Similarly, expanding access to financial services will have limited impact if communities lack the adaptive capacity and viable economic opportunities needed to utilize such resources effectively. These observations indicate that the identified strategies are highly interdependent, and implementing them independently is unlikely to maximize their intended benefits.

The findings further demonstrate that community economic resilience should be understood as an adaptive system emerging from the interaction of physical, social, institutional, financial, and economic capacities. This perspective is consistent with the resilience framework proposed by Béné et al. (2012), which argues that absorptive, adaptive, and transformative capacities do not develop independently but instead reinforce one another through integrated interventions. Mitigation infrastructure strengthens absorptive capacity by reducing the immediate impacts of disaster events, while institutional strengthening and community capacity-building enhance adaptive capacity through collective learning, coordination, and improved organizational capability. Meanwhile, livelihood diversification promotes transformative capacity by reducing dependence on economic activities that are highly vulnerable to landslide hazards. Consequently, the sequence of priority strategies identified through the QSPM analysis reflects a staged process for strengthening these three complementary dimensions of resilience.

This phased approach also demonstrates that investment in a single sector is insufficient to achieve long-term resilience. Disaster risk reduction initiatives have often emphasized either infrastructure development or economic assistance as stand-alone interventions. However, the findings of this study indicate that the effectiveness of each intervention depends on the presence of complementary supporting components. Infrastructure requires capable institutions to oversee operation and maintenance; institutions require adequate financial resources and community capacity to function effectively; and sustainable economic development depends on both a safe physical environment and governance arrangements that create confidence for household and private investment. Accordingly, improvements in community economic resilience are driven more by policy synergies than by the effectiveness of individual programs implemented in isolation.

From a governance perspective, these findings imply that local governments should adopt a phased, cross-sectoral policy implementation roadmap. The initial phase should prioritize reducing physical vulnerability through investments in mitigation infrastructure and strengthening local institutions. This should be followed by initiatives to enhance community capacity, expand access to microfinance, and ultimately promote sustainable livelihood diversification and alternative economic opportunities. Such a sequenced policy approach enables public resources to be allocated more efficiently while reducing the risk of implementation failure arising from fragmented or poorly coordinated interventions.

### ***Policy implementation, monitoring, and contribution***

The findings can be translated into a regency implementation framework. BPBD should lead risk prioritization and community preparedness. The Public Works and Spatial Planning Office should lead engineering assessment, construction standards, drainage integration, and spatial compliance. Village governments should coordinate local institutions, beneficiary verification, and maintenance. Financial agencies, cooperatives, and village enterprises should design accessible financing. Universities and research institutions should support hazard assessment, monitoring technology, evaluation, and facilitator training. Private partners should contribute finance and technical resources under transparent agreements.

Monitoring should combine output, outcome, and resilience indicators. Output indicators include meters of drainage improved, retaining structures completed, warning devices installed, people trained, and households receiving financial products. Outcome indicators include reduced service disruption, faster road reopening, lower repair costs, increased savings, improved evacuation readiness, and broader program access. The Livelihood Resilience Index can be repeated periodically to determine whether interventions improve financial, human, social, physical, and natural capital rather than merely producing infrastructure outputs. A public dashboard at the village and regency levels could support transparency and allow budgets to shift toward interventions that show measurable benefits.

The study offers a methodological contribution by positioning SWOT-QSPM as an evidence-integration tool rather than an expert-only strategic exercise. Household indices, regression results, adaptation frequencies, and institutional interviews were combined before factors were scored. This process reduces the risk that strategic matrices merely reproduce decision-makers' preferences. It also gives QSPM a clearer policy function: ranking alternatives after diagnostic evidence has established the local configuration of assets and constraints. The approach may be useful in other hazard-prone regions where governments must compare infrastructure, social, financial, environmental, and livelihood interventions under limited resources. The study advances beyond standard SWOT-QSPM by: (1) integrating quantitative livelihood resilience measurement before SWOT identification; (2) systematically triangulating findings with inter-rater agreement ( $\kappa = 0.78$ ); and (3) conducting sensitivity analysis to address SWOT-QSPM limitations. Previous Indonesian applications (Maryani et al., 2021) showed less emphasis on household-level evidence integration and methodological transparency.

The local findings also have international relevance. The Sendai Framework calls for investment in disaster-risk reduction, stronger risk governance, and resilient recovery ([United Nations Office for Disaster Risk Reduction, 2015](#)). The Bogor case shows how these priorities can be operationalized through a locally ranked package. It confirms that community capital and public investment are complements. It also demonstrates that climate-related hazard escalation, land tenure, and fiscal limits can alter the order in which otherwise valid resilience strategies should be implemented.

Several limitations require caution. The QSPM assessment involved five key informants, which ensured cross-institutional representation but did not capture every agency, private company, or civil-society perspective. Scores represent informed judgments and should be reviewed when budgets, regulations, or hazard conditions change. The research covered two villages, so the factor weights should not be applied mechanically to all districts in Bogor Regency. The analysis prioritized strategy attractiveness but did not estimate detailed lifecycle costs, benefit-cost ratios, distributional effects, or environmental impacts. Future research should combine QSPM with spatial multi-criteria analysis, project costing, participatory budgeting, and scenario testing under different rainfall and land-use conditions.

### **CONCLUSION**

This study converted household resilience evidence and multi-stakeholder judgment into a ranked policy agenda for landslide-prone communities in Bogor Regency. The positive internal and external coordinates placed the policy system in an SO/Growth position, which means that local social capital, community institutions, experience, and government opportunities can support progressive action. The QSPM ranking placed public-private partnership for structural mitigation first, followed by multi-stakeholder collaboration and stronger community access to government mitigation programs.

The central policy message is not that infrastructure alone creates resilience. Infrastructure is the first enabling investment because repeated physical disruption weakens

every other intervention. Its value depends on transparent, risk-based selection; strong local institutions; technical standards; land-tenure coordination; and maintenance. A staged policy package should then strengthen education and preparedness, expand suitable finance and social protection, rehabilitate land, and develop safer livelihood diversification. The study's contribution lies in linking diagnosis with sequencing. It provides a replicable approach for local governments that must choose among multiple resilience interventions under constrained resources. Future studies should test the priorities through cost-benefit analysis, broader stakeholder participation, and longitudinal measurement of household resilience. This study identifies evidence-informed priorities based on research in two villages. PPP represents the highest-ranked option within this decision-support framework but requires separate assessment of feasibility, cost-effectiveness, and private-sector capacity before adoption.

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### AUTHOR CONTRIBUTION STATEMENT

Adinda Rizki Putri Sulistiyanto: conceptualization, methodology, investigation, data curation, formal analysis, and original draft preparation. Eka Intan Kumala Putri: supervision, conceptual validation, and interpretation. Meilanie Buitenzorgy: supervision, methodological validation, and interpretation.

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