

LAVA TOUR MERAPI AND COMMUNITY ECONOMIC WELFARE: A STRUCTURAL ANALYSIS OF COMMUNITY-BASED TOURISM IN UMBULHARJO VILLAGE, YOGYAKARTA

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Abstract:

The rapid growth of post-disaster tourism in the Mount Merapi area, particularly through Lava Tour activities, has generated significant economic opportunities for local communities. However, empirical evidence on whether this income growth translates into improved community welfare remains limited. This study aims to examine the impact of Lava Tour activities on community income and welfare in Umbulharjo Village, Sleman Regency. This study employs a quantitative approach using a descriptive-associative survey design. A total of 100 respondents, consisting of jeep drivers, homestay operators, culinary entrepreneurs, and souvenir vendors, were selected using purposive snowball sampling. Data were collected through structured questionnaires and analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS) with SmartPLS. The results indicate that all dimensions of Lava Tour activities—jeep tours, culinary businesses, souvenir enterprises, and homestays—have a positive and significant effect on community income. However, increased income does not significantly affect community welfare, particularly in terms of education, healthcare access, and long-term financial security. These findings suggest that income growth alone is insufficient to improve overall community welfare. Therefore, integrated policy interventions, including institutional strengthening, capacity building, and inclusive governance, are required to ensure sustainable and equitable outcomes in community-based tourism development.

Keywords: Merapi Lava Tour, Community-Based Tourism, Post-Disaster, Community Welfare

INTRODUCTION

Post-disaster tourism has emerged as one of the fastest-growing forms of attraction over the past two decades. This phenomenon illustrates how disaster-affected regions can transform into tourism destinations with high economic, educational, and social value (Ritchie, n.d.). In Indonesia, a prominent example is the Lava Tour Merapi, which has developed within the Disaster-Prone Area III of Mount Merapi, Sleman Regency. Despite being located in a former disaster zone, the Lava Tour has successfully attracted a substantial number of visitors. Data from the Sleman Tourism Office indicate a steady increase in tourist arrivals between 2019 and 2023, with the highest record in 2023 reaching more than 500,000 visits (Zayid, 2024).

The growth of this tourism activity not only reflects tourists' interest in post-disaster geological landscapes but also generates economic opportunities for local communities. Its impacts extend across multiple sectors, including tourism transport (such as jeep Lava Tour services), culinary enterprises, souvenir sales, and homestay-based accommodations. Consequently, Lava Tour Merapi can be classified as an initial form of Community-Based Tourism (CBT), an approach that emphasizes the active involvement of local communities in the management and equitable utilization of tourism benefits (Boronyak, 2010; Potchana, 1997).



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Community-Based Tourism (CBT) focuses on empowering local communities in decision-making, benefit distribution, and capacity building to support economic, social, and environmental sustainability (Giampiccoli & Saayman, 2018). In the context of the Lava Tour Merapi, community participation is reflected through activities such as renting out jeep vehicles, operating food and beverage businesses, selling handicrafts, and providing guiding services. (Dolezal & Novelli, 2022a) Highlight that community involvement in managing tourism attractions within disaster-affected areas holds significant potential to strengthen local economic structures.

Beyond empowerment, CBT also enhances community resilience, the ability of communities to cope with, adapt to, and recover from disturbances by integrating social and economic systems to support recovery and adaptation (Horne et al., 2016; Magis, 2010). Locally managed tourism can thus serve as a resilience-building mechanism in post-disaster contexts. Additionally, CBT contributes to livelihood diversification, offering multiple income sources such as homestay accommodations, culinary ventures, jeep tours, and handicraft sales, reducing reliance on a single sector and strengthening communities' sustainable livelihood prospects (Chambers et al., 1989).

Empirical evidence supports this theoretical linkage. A study in Corrientes, Argentina, shows that tourism involvement led to increased adaptive capacity through entrepreneurial engagement and self-organization, key components of community resilience. Nevertheless, the extent to which Lava Tour Merapi activities genuinely contribute to improving household income and community welfare remains underexplored. Existing literature tends to emphasize community-based tourism in cultural or nature-based villages, while studies on CBT within the domain of disaster tourism remain scarce (Giampiccoli & Saayman, 2018; Salazar, 2012a). However, assessing both the direct and indirect economic contributions of community-based tourism initiatives is crucial for evaluating the effectiveness of tourism programs and formulating sustainable management strategies (Nunkoo & Ramkissoon, 2012; Scheyvens, 2017).

Based on the foregoing discussion, there is an urgent need for an empirical study that comprehensively assesses the contribution of Lava Tour Merapi activities to household income and welfare indicators, including family economy, access to education and healthcare services, as well as the ability to save for long-term needs such as retirement. The central issue in this research lies in the lack of clear evidence regarding the actual extent to which Lava Tour activities enhance the welfare of local communities. It is particularly important since the core principle of Community-Based Tourism (CBT) emphasizes equitable benefit distribution and active community participation in all aspects of tourism development (Boronyak, 2010; Dolezal & Novelli, 2022a).

In line with this research gap, the study is designed to address three key questions. First, how do local communities perceive the existence of Lava Tour Merapi and its impact on their income levels? Second, to what extent do Lava Tour activities quantitatively contribute to increasing community income? Third, how does community involvement in Lava Tour Merapi affect broader welfare indicators, such as household economic conditions, access to education, healthcare services, and long-term financial sustainability?

In general, this study aims to analyze the contribution of Lava Tour Merapi activities to the improvement of community economic welfare in the surrounding area. Specifically, the objectives of this research are to: (1) Assess local community perceptions regarding the impact of Lava Tour activities on their household income; (2) Quantitatively measure the extent to which Lava Tour activities influence community income and ; (3) Evaluate the effects of community participation in Lava Tour activities on household welfare indicators, including economic conditions, access to education and healthcare, and the ability to save for long-term needs. The findings of this study are

expected to contribute to the development of sustainable strategies for community-based tourism management in the Mount Merapi area as well as in other disaster-prone regions of Indonesia.

METHODS

This study was conducted in Umbulharjo Village, Cangkringan District, Sleman Regency, Special Region of Yogyakarta. The site was purposively selected as it represents the central hub of disaster-based tourism activities, particularly the Lava Tour Merapi, which directly involves local communities as primary actors in tourism management, service provision, and the distribution of economic benefits. The research seeks to empirically assess community perceptions of the impact of Lava Tour Merapi on the improvement of economic welfare, represented through key indicators such as household economy, education, healthcare, and retirement savings. The conceptual framework of this study is outlined as follows:

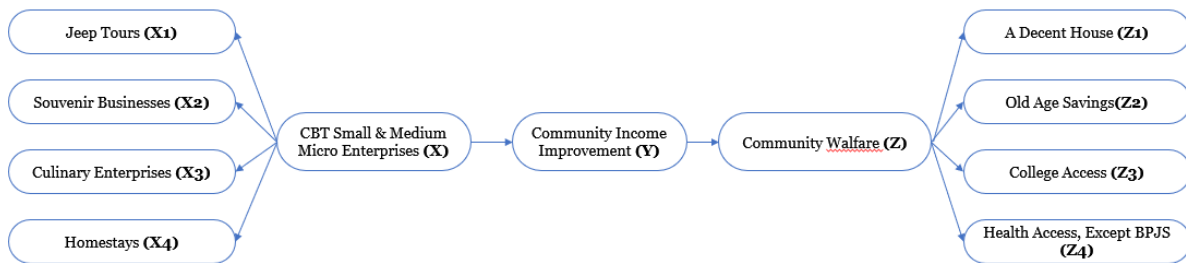


Figure 1. Research Conceptual Framework

This study employed a quantitative approach with a descriptive-associative survey design. The survey was conducted to identify community perceptions and to examine the causal relationships between participation in tourism activities and levels of economic welfare. Sampling was carried out using a purposive snowball sampling technique, a chain-referral method in which initial informants recommend subsequent participants based on relevant characteristics. This technique was considered appropriate for reaching a limited population that is directly and intensively involved in Lava Tour activities, such as jeep drivers, small-scale entrepreneurs (MSMEs), homestay operators, and tour guides. According to Etikan (2016), snowball sampling is effective in social research targeting participatory groups with strong social relations.

The sample size was determined with reference to statistical requirements in Partial Least Squares Structural Equation Modeling (PLS-SEM). (Hair et al., 2017) suggest that the minimum number of respondents should be five to ten times the number of indicators in the model. In this study, sixteen key indicators were identified, leading to a recommended minimum of 80 respondents. To enhance the reliability of the analysis and to account for potential invalid data, a total of 100 respondents were surveyed.

Data analysis was carried out using the Structural Equation Modeling-Partial Least Squares (SEM-PLS) approach with the SmartPLS software. SEM-PLS was selected because of its ability to estimate causal relationships among latent variables within complex research models without requiring data normality (Henseler et al., 2016). Prior to testing the structural hypotheses, the analysis began with the evaluation of the measurement model (outer model) and the structural model (inner model).

The measurement model was assessed to establish construct validity and reliability. Convergent validity was examined through the Average Variance Extracted (AVE), with a



minimum threshold of 0.50 required to confirm validity (Fornell & Larcker, D. F., 2016). Construct reliability was further tested using Composite Reliability (CR) and Cronbach's Alpha, with recommended minimum values of 0.70 and 0.60, respectively, to ensure adequate internal consistency (Hair et al., 2017). Indicators with factor loadings greater than 0.70 were considered valid. However, in exploratory research, loadings between 0.60 and 0.70 may still be retained if they contribute meaningfully to the construct (Chin & Newsted, 1998).

Once the measurement model was confirmed to be both valid and reliable, the next step involved evaluating the structural model. This stage assessed the relationships among latent constructs using path coefficients and the coefficient of determination (R^2). The R^2 values represent the proportion of variance in the dependent variables that can be explained by the independent variables. According to (Hair et al., 2017), R^2 values of 0.75, 0.50, and 0.25 can be interpreted as substantial, moderate, and weak explanatory power, respectively. The significance of the hypothesized relationships was tested using a bootstrapping procedure with 5,000 subsamples. A t-statistic of ≥ 1.96 indicates significance at the 5% level ($p < 0.05$), while a value of ≥ 2.58 indicates significance at the 1% level ($p < 0.01$).

To assess the overall model fit, the Goodness of Fit (GoF) index was employed, calculated as the square root of the product between the Average Variance Extracted (AVE) and the R^2 value. Following (Tenenhaus et al., 2005), GoF values of ≥ 0.10 , ≥ 0.25 , and ≥ 0.36 are categorized as small, medium, and large, respectively. In addition, the Standardized Root Mean Square Residual (SRMR) was used as a measure of global model fit, where values ≤ 0.08 are considered indicative of an acceptable and well-fitted model (Hu L.T. & M., 1999).

All analytical procedures in this study were systematically designed to ensure that the proposed structural model provides a valid, reliable, and statistically significant explanation of the relationship between community participation in Lava Tour activities and the enhancement of local economic well-being. Through this methodological rigor, the study aims to offer both theoretical contributions and practical implications for advancing community-based tourism development in disaster-prone destinations.

RESULT AND DISCUSSION

Descriptive Analysis. Mount Merapi has become one of the leading natural tourism destinations in the Special Region of Yogyakarta (DIY), specifically located in Umbulharjo Village, Cangkringan District, Sleman Regency. One of the primary attractions in this area is the Merapi Lava Tour, an adventure tourism package that utilizes jeeps to explore the landscapes affected by the 2010 volcanic eruption. The tour packages vary in price depending on the route and duration, ranging from IDR 350,000 to IDR 900,000 per trip.

According to the Chairperson of the Merapi Slope Jeep Tourism Association, the number of tourists has continued to increase annually. During the 2023 Eid holiday, Lava Tour visits reached approximately 10,000 visitors per day (Jogja, 2023). For the 2024 Eid holiday, the target was set at 15,000 visitors per day (Tribun Jogja, 2024). This upward trend highlights the growing appeal of post-disaster adventure tourism and demonstrates its potential to generate significant economic opportunities for the local community.

In general, supporting sectors such as culinary services, accommodations, souvenir businesses, and vehicle rentals have expanded alongside the growth of the Merapi Lava Tour. Data from the Central Statistics Agency (BPS) of Sleman Regency indicate that the number of accommodation units in Umbulharjo Village increased significantly, from 21 units in 2021 to 37 units in 2022. This growth reflects a positive community response to the economic opportunities created



by Lava Tour activities. Meanwhile, the number of convenience stores and restaurants temporarily declined in 2021, presumably due to the impacts of the COVID-19 pandemic, but recovered and stabilized following the relaxation of social restrictions.

Respondent Characteristics. This study involved a total of 100 respondents, all of whom were tourism entrepreneurs engaged in Lava Tour activities in Umbulharjo Village. The sample composition consisted of 68 jeep tour operators, 8 culinary business owners, 12 souvenir vendors, and 12 homestay managers. The majority of respondents were male (64%), and most had been operating their businesses for more than five years (33%).

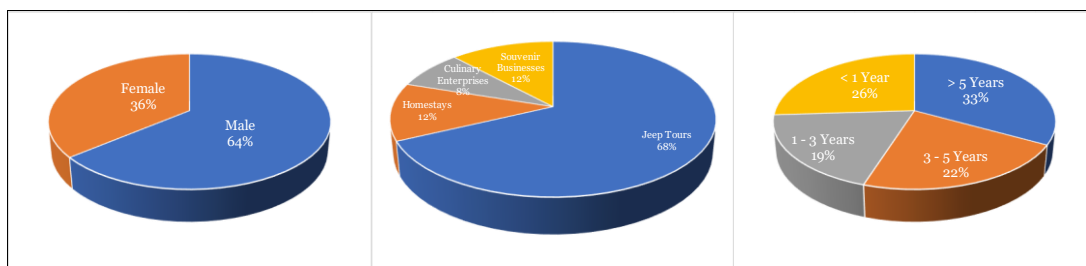


Figure 2. Respondent Characteristics by Gender, Business Type, and Years of Operation

In terms of gender and business type, jeep tour, culinary, and souvenir enterprises were predominantly managed by men, while women mostly operated homestay businesses. The majority of jeep tour operators had business experience that was relatively evenly distributed across all categories of business duration. In contrast, culinary and souvenir entrepreneurs were concentrated in the category of more than five years of business operation.

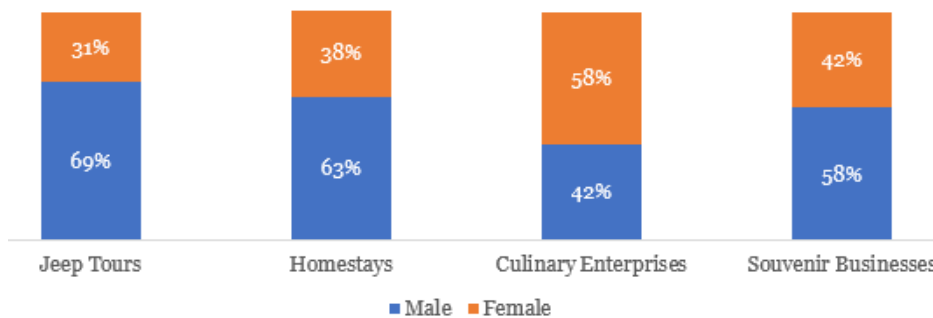


Figure 3. Distribution of Respondents by Business Type and Gender

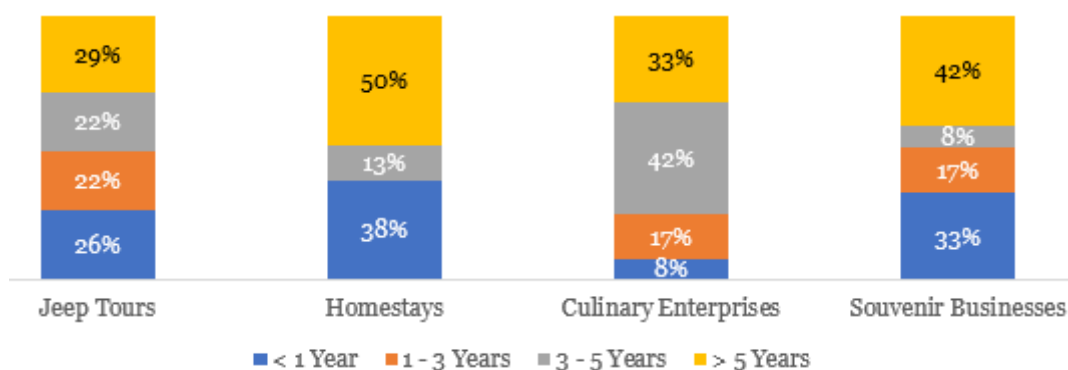


Figure 4. Distribution of Respondents by Business Type and Length of Operation



Structural Equation Modeling (SEM) Analysis. The structural modeling in this study was conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach with the SmartPLS software. The model was designed to examine the contribution of four dimensions of Lava Tour activities—jeep tours (WJ), culinary enterprises (K), souvenir businesses (S), and homestays (H)—to community income improvement (PP), as well as their subsequent effects on community welfare.

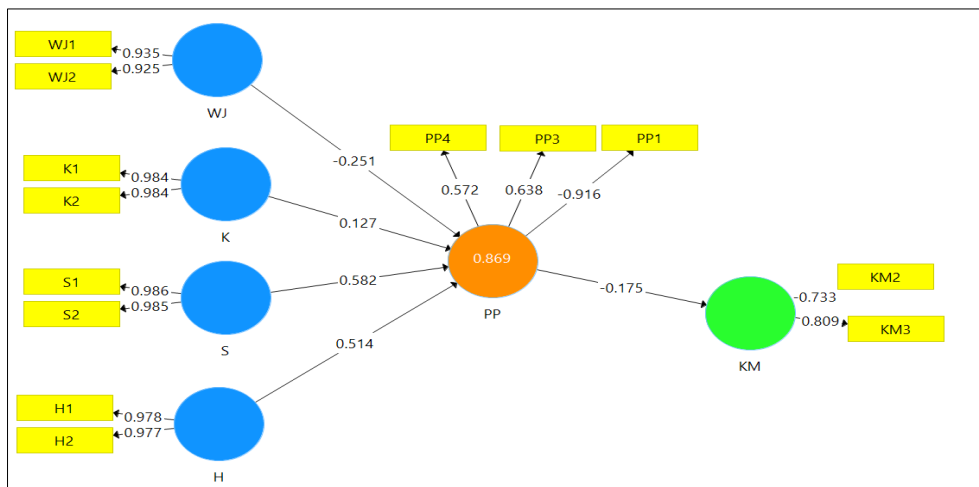


Figure 5. Final PLS-SEM Path Diagram (SmartPLS Output)

The initial evaluation of the measurement model was conducted by testing convergent validity and construct reliability. The results of the Average Variance Extracted (AVE) indicated that all constructs achieved AVE values greater than 0.50, confirming convergent validity (Hair et al., 2017). However, only four constructs met the reliability requirement based on Composite Reliability (CR > 0.70), namely jeep tours (WJ), homestays (H), culinary enterprises (K), and souvenir businesses (S). Although the constructs of community income improvement (PP) and community welfare (KM) achieved convergent validity, they did not meet the reliability threshold, as their CR values were below 0.70.

Table 1. Average Variance Extracted (AVE) and Composite Reliability

Variable	Composite Reliability	AVE	Decision
Jeep Tours	0.928	0.865	Valid and Reliable
Homestays	0.977	0.955	Valid and Reliable
Culinary Enterprises	0.984	0.968	Valid and Reliable
Souvenir Businesses	0.986	0.971	Valid and Reliable
Community Income	0.057	0.525	Valid but Not Reliable
Community Welfare	0.007	0.595	Valid but Not Reliable

The path analysis results indicated that all four exogenous variables exerted a significant influence on community income improvement. Both the path coefficients and t-statistics exceeded the minimum threshold of significance ($t > 1.96$, $p < 0.1$), confirming that the relationships were statistically valid (Henseler et al., 2016).



Table 2. Direct Effects on Community Income Improvement

Latent Variable Path	Coefficient	t-Statistic	p-Value	Interpretation
Homestays → Income	0.514	4.53	0.00	Significant
Culinary → Income	0.127	2.47	0.01	Significant
Souvenirs → Income	0.582	4.75	0.00	Significant
Jeep Tours → Income	0.251	2.53	0.01	Significant

Based on these results, the regression equation can be formulated as follows:

$$PP = 0.251 \text{ Jeep Tours} + 0.127 \text{ Culinary} + 0.582 \text{ Culinary} + 0.514 \text{ Homestays}$$

This equation indicates that all dimensions of Lava Tour activities make a positive contribution to community income improvement. Among these, souvenir businesses and homestays demonstrate the highest contributions compared to other dimensions. These findings are consistent with (Telfer & Sharpley, 2007) as well as (Richards, 2007), who emphasize that local handicraft enterprises and homestays play a crucial role in driving local tourism-based economies.

To assess the indirect effects on community welfare through income improvement, a mediation test was conducted. The t-test results revealed that none of the paths were statistically significant ($t < 1.96$), indicating that the indirect effects of tourism-related variables on community welfare were not supported statistically.

Table 3. Indirect Effects on Community Welfare

Pathway	Coefficient	t-Statistic	p-Value	Interpretation
Homestays → Income → Welfare	4.672	0.923	0.357	Not Significant
Culinary → Income → Welfare	2.391	0.864	0.388	Not Significant
Souvenirs → Income → Welfare	0.923	0.988	0.324	Not Significant
Jeep Tours → Income → Welfare	4.547	0.928	0.354	Not Significant

The coefficient of determination results indicate that the Lava Tour tourism variables were able to explain 86.3% of the variance in community income improvement, but only 2.1% of the variance in community welfare. It suggests that other external factors outside the model play a more dominant role in explaining variations in community welfare.

Table 4. Coefficient of Determination

Variable	R-square	Adjusted R-square	Interpretation
Community Income Improvement	0.869	0.863	Strong Effect
Community Welfare	0.030	0.021	Weak Effect

The findings indicate that all dimensions of Lava Tour Merapi activities – including jeep tours, culinary enterprises, souvenir businesses, and homestays – contribute positively to community income. Among these sectors, souvenir businesses and homestays emerge as the most influential, suggesting that tourism activities rooted in local creativity and household-based services generate higher economic value. It underscores the strategic role of locally embedded economic activities in strengthening community-based tourism systems.

These results reinforce the argument that value-added tourism products and innovation are key drivers of local economic development. As emphasized by Eddyono et al. (2025), the integration of sustainability principles, the utilization of local resources, and innovation significantly enhance



tourism productivity and community income. Similar findings have been reported in studies on village-based tourism, where creative industries and homestay development function as primary drivers of local economic growth (Giampiccoli & Mtapuri, 2012; Salazar, 2012b).

However, despite the positive contribution to income, the findings reveal that increased income does not significantly translate into improvements in community welfare. It indicates the presence of a structural gap between economic gains and broader well-being outcomes. In line with Hadiningsih & Eddyono (2025), community-based tourism often succeeds in generating income but requires stronger institutional support, human capital development, and governance mechanisms to produce meaningful improvements in welfare.

This phenomenon is also supported by previous studies, which show that tourism benefits are often unevenly distributed among community members, thereby limiting their overall impact on welfare (Nunkoo, 2017; Scheyvens, 2002). In many cases, only groups directly involved in tourism activities experience significant economic gains, while others benefit only marginally. Consequently, equitable benefit distribution becomes a critical issue in ensuring inclusive tourism development.

From a tourism competitiveness perspective, these findings can be interpreted through the framework proposed by Eddyono et al. (2020, 2022), which demonstrates that tourism competitiveness drives economic performance but does not inherently guarantee equitable benefit distribution. Without inclusive governance and effective policy interventions, tourism development may lead to economic growth without corresponding improvements in social welfare.

Furthermore, the limited impact of income on welfare suggests that tourism-generated income is predominantly consumptive rather than productive. It aligns with previous research indicating that limited financial literacy, a lack of reinvestment mechanisms, and restricted access to capital hinder the transformation of income into long-term welfare improvements (Chambers, 1994; Scheyvens, 2002). As a result, tourism income is not optimally utilized to support education, healthcare, or long-term financial security.

In post-disaster tourism contexts, resilience and adaptability also play critical roles. The study by Saadah & Eddyono (2025) highlights that community self-reliance, digital adaptation, and participatory governance are essential for sustaining tourism benefits under conditions of uncertainty. It is particularly relevant in the context of Lava Tour Merapi, where environmental risks and fluctuating tourist demand require adaptive management strategies.

In addition, governance and institutional coordination play a central role in determining the effectiveness of tourism development. As emphasized by Eddyono et al. (2021), strong governance structures and multi-stakeholder collaboration are essential to ensure that tourism development produces inclusive and sustainable outcomes. Supporting studies also highlight the importance of local institutions and destination management systems in facilitating coordination, strengthening capacity, and ensuring equitable benefit distribution (Dolezal & Novelli, 2022b).

Moreover, recent research on digital tourism transformation suggests that integrating digital experiences and engaging younger tourist segments can enhance sustainability practices while creating new economic opportunities for local communities (Dianggorobles & Eddyono, 2025). It indicates that digital innovation can serve as a key enabling factor in strengthening the impact of community-based tourism on both income and welfare.

Overall, the findings demonstrate that while Community-Based Tourism (CBT) in Lava Tour Merapi is effective in generating income, its contribution to community welfare remains limited due to structural, institutional, and capacity-related constraints. Therefore, tourism development strategies must move beyond income-oriented approaches and adopt a more integrated framework

that emphasizes governance strengthening, capacity building, financial inclusion, innovation, and equitable benefit distribution in order to achieve sustainable and inclusive welfare outcomes.

CONCLUSION

This study aimed to analyze the contribution of Lava Tour Merapi activities to the improvement of community economic welfare in Umbulharjo Village, Sleman. Specifically, it assessed community perceptions of the impacts of Lava Tour activities, measured the extent of their influence on household income, and evaluated the effects of community involvement in tourism on key welfare indicators.

The findings revealed that all dimensions of Lava Tour activities, including jeep tours, culinary enterprises, souvenir businesses, and homestays, significantly contributed to community income improvement. Among these, souvenir businesses and homestays demonstrated the strongest effects in stimulating local economic growth. However, the increase in income did not translate into significant improvements in community welfare, particularly with respect to access to education, healthcare, and retirement savings.

Therefore, a more comprehensive strategy for strengthening Community-Based Tourism (CBT) is required. Local governments and tourism managers should encourage the establishment of institutional frameworks such as Destination Management Organizations (DMOs), while also expanding access to financial capital, business training, and supporting infrastructure. With an inclusive and sustainable approach, the potential of post-disaster tourism can be optimized not only as a source of income but also as an instrument for enhancing overall community welfare.

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