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Intellectual development and social welfare in ecotourism areas

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ABSTRACT

The purpose of this study was to examine the influence of education level, religious knowledge, and geographical climate on the social welfare of communities in the Tangkahan ecotourism area, with intellectual development serving as a mediating variable. This study employed a quantitative explanatory approach, focusing on specific variables related to the social welfare of the Tangkahan community. Respondents were therefore selected using a non-probability convenience sampling approach. A total of 230 MSME actors voluntarily participated in the survey. Although this sampling technique limits the statistical generalizability of the findings to the broader population, it remains appropriate for exploratory and explanatory research aimed at examining relationships among variables and testing theoretical models. Data were collected using a structured questionnaire with a 5-point Likert scale and analyzed using partial least squares structural equation modeling (PLS-SEM) with SmartPLS. The findings reveal that education level, religious knowledge, and geographical climate significantly influence intellectual development. However, only religious knowledge and geographical climate have direct and significant effects on social welfare. Intellectual development significantly mediates the relationships of religious knowledge and geographical climate with social welfare, but it does not mediate the relationship between education level and social welfare. In light of these findings, cross-sector collaboration among government agencies, educational institutions, and religious leaders is essential for achieving sustainable development in ecotourism regions. The growing number of environmental activists reflects increasing intellectual awareness among communities of the importance of preserving nature as a legacy for future generations.

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1. Introduction

Tangkahan is a region located within the Gunung Leuser National Park in Langkat Regency, Indonesia. This area offers spectacular scenery and fresh air. The combination of tropical rainforest vegetation and hilly topography makes Tangkahan an ideal tourist destination (Wiratno et al., 2022). The region encompasses both lowland and highland ecosystem types, with forests that have preserved their natural integrity. The flora and fauna within this area remain relatively complete and well-conserved. The Tangkahan tourism area is one of the tourist destinations in Langkat Regency, Indonesia. The social welfare of the communities surrounding the ecotourism area is an essential aspect that requires serious attention, as it is expected to create opportunities for the development of small-scale enterprises managed by residents. The presence of ecotourism significantly affects the social welfare of surrounding communities. Ecotourism development has transformed the socioeconomic conditions of local communities by improving the quality and accessibility of education facilities, enhancing environmental cleanliness awareness, and generating employment opportunities that are utilized by residents living around the ecotourism area.

Data from the Central Bureau of Statistics of Indonesia indicate that the number of people living in poverty in the ecotourism area was 1,537 individuals, with total populations of 35,764 and

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35,810 in the respective years. These figures reflect a stagnant condition over the two years, despite a slight increase in the overall subdistrict population. However, a significant decline occurred in 2022, when the number of impoverished residents in the tourism area decreased to 751 individuals, almost half of the previous year's figure. This downward trend continued in 2023, with the poverty rate further decreasing to 675 individuals, even as the total population rose to 36,781.

This trend suggests a reduction in poverty levels both at the local level (Batang Serangan sub-district) and across the broader Langkat Regency. The sharp decline observed in Batang Serangan during 2022 and 2023 may reflect the positive impact of regional economic development initiatives, such as the expansion of ecotourism in Tangkahan and community economic empowerment programs, which have begun to produce tangible improvements in local welfare. Sustainable ecotourism management requires human resources that possess intellectual capital, which is essential for achieving its objectives. Intellectual capital in human resources includes the knowledge, experience, competence, and creativity of the staff members within an organization (Kostagiolas, 2012).

Together, these elements contribute to enhancing organizational productivity. An increase in the intellectual capacity of human resources is an indicator of effective human resource management within the organization. In addition, religious knowledge, or religiosity, is crucial as a source of strength and personal conviction in an individual's relationship with God (Ritchie et al., 2014). Wahyudin and Wulandari (2018) defined religiosity as an individual's connection with God, which motivates a commitment to fulfilling divine commands and avoiding prohibited actions. It is essential to recognize that religiosity encompasses obligations that people need to implement the values in their daily activities. It should not be viewed solely as visible ritualistic practices; instead, it also consists of internalized beliefs and convictions (Sari et al., 2022).

Religious knowledge plays a vital role in promoting both individual and social well-being. Higher levels of religiosity are often associated with greater happiness and an increased sense of well-being. The considerable number of places of worship in the Batang Serangan Subdistrict, comprising 62 mosques, 23 prayer halls (musholla) for Muslims, and 26 Protestant churches, indicates a balanced availability of religious facilities to meet the community's spiritual needs. This suggests that religion holds a significant position in the social structure and daily life of the community. While the abundance of places of worship reflects an active religious life, additional data on community participation in religious activities is necessary to assess the actual level of religiosity.

Geographical climate conditions are also among the factors influencing social welfare and the intellectual quality of human resources. A well-preserved geographical climate is closely related to the extent to which local communities maintain their surrounding environment. When humans care for nature responsibly, nature reciprocates with positive benefits. Currently, climate change has become a primary global concern due to the increasing frequency of activities such as illegal logging (Purwoko et al., 2022), land clearing by burning, and other forms of environmental degradation, all of which contribute to changes in geographical climate Park and Reisinger (2010).

These activities not only harm the state but also adversely affect local communities, as the natural resources that serve as their sources of income and food security are being depleted through illegal exploitation. In response, an increasing number of environmental activists have emerged, reflecting the growing intellectual awareness among communities to preserve nature as a legacy for future generations. These activists engage in environmental campaigns aimed at restoring and protecting ecological conditions. Therefore, the geographical climate significantly influences both social welfare and the enhancement of environmental quality. To date, social welfare has been chiefly studied from environmental or economic perspectives, rather than through an integrated approach that considers socio-religious and intellectual factors.

This study aims to develop and test a model that examines the relationships between religious knowledge, geographical climate, and educational levels on social welfare, with intellectual development acting as a mediating variable. Such a comprehensive model has rarely been explored in the context of community-based ecotourism. This approach contributes to the existing literature by integrating spiritual, environmental, and intellectual dimensions to explain social welfare in the Tangkahan ecotourism area. This region has traditionally been analyzed mainly through environmental or economic lenses, rather than through a combined perspective that includes socio-religious and intellectual influences.

2. Literature review

2.1. Human capital

Human Capital Theory provides the primary theoretical foundation for understanding how individual knowledge and competencies contribute to social and economic welfare. Becker (1993) defined human capital as the stock of knowledge, skills, education, and experience possessed by individuals that enhances productivity and improves economic outcomes. According to this theory, investments in learning, training, and knowledge development increase an individual's ability to create value, solve problems, and adapt to environmental changes. Consequently, communities with stronger human capital tend to experience better welfare conditions due to higher productivity, improved income opportunities, and stronger social

resilience. In the context of ecotourism, human capital becomes particularly important because local communities are expected not only to participate in economic activities but also to manage natural resources sustainably. Ecotourism destinations require community members to possess environmental awareness, managerial competence, entrepreneurial skills, and adaptive capabilities to ensure long-term sustainability. Therefore, Human Capital Theory offers an appropriate framework for explaining how religious knowledge and geographical conditions may influence social welfare through intellectual development.

2.2. Religious knowledge

Religious knowledge refers to an individual's understanding of religious teachings, values, principles, and ethical guidance that shape attitudes and behavior in daily life. Religious knowledge extends beyond ritual practices and includes the internalization of moral values such as honesty, responsibility, discipline, mutual cooperation, environmental stewardship, and social concern. According to Glock and Stark (1965), the intellectual dimension of religiosity reflects an individual's level of understanding regarding religious doctrines and teachings.

Several scholars argue that religious knowledge contributes to human capital development by fostering positive behavioral traits and ethical decision-making. Individuals with strong religious understanding are often more committed to social responsibility, cooperation, and sustainable resource management. In many communities, religious teachings encourage the preservation of nature as a moral obligation, thereby supporting environmentally responsible behavior and sustainable economic activities.

Within ecotourism destinations, religious knowledge can influence community welfare by encouraging ethical entrepreneurship, environmental conservation, and collective participation in tourism development. Religious values may strengthen social cohesion and motivate local residents to engage in productive economic activities while maintaining environmental sustainability. Therefore, religious knowledge can be considered an important intangible resource that contributes to intellectual development and ultimately enhances social welfare.

2.3. Geographical climate

Geographical climate refers to the physical environmental conditions within a region, including weather variations, topography, and ecosystems that influence human activities and lifestyles. A well-preserved geographic climate is closely linked to how local communities maintain their surroundings. When humans care for nature responsibly, nature reciprocates with positive benefits. Referencing Wong and Chen (2009), the characteristics of a region's geographical climate can be identified through three indicators:

- Temperature and humidity: how warm or cool and how damp the air is, which affects daily life.
- Solar radiation: The intensity of sunlight that influences natural vegetation and wildlife life cycles.
- Rainfall and wind patterns: Seasonal cycles that determine environmental stability and the calendar of local economic activities (such as household consumption or tourism patterns).

For ecotourism destinations like Tangkahan, located within a pristine tropical rainforest ecosystem, unique environmental features offer practical opportunities for nature-based education. These experiences help the community develop ecological intelligence and directly support the livelihoods of local MSMEs through sustainable tourism activities.

2.4. Intellectual development

Intellectual development refers to the accumulation of knowledge, practical experience, competence, and creativity possessed by human resources within an organization or community. In this study's framework, intellectual capital serves as a strategic mediating variable that links spiritual factors (religious knowledge) and environmental factors (geographical climate) to enhance community welfare. This variable is measured through the following adaptive indicators:

- Scientific and technological competence: The mastery of practical knowledge and the adoption of modern tools (such as digital marketing or social media literacy for MSMEs).
- Problem-solving ability: The community's capacity to analyze obstacles and innovate around real-world challenges, such as environmental conservation efforts or eco-friendly product development.
- Adaptability: Flexibility in adjusting to environmental shifts, changing weather patterns, or evolving tourism market trends.

In this context, intellectual development is reflected not only through formal paths but also significantly through non-formal educational initiatives and capacity-building training programs organized by external stakeholders.

2.5. Social welfare

Social welfare is a multidimensional concept in which the basic necessities of individuals or a community are met in a decent, secure, and sustainable manner. This concept is not measured solely by material or financial income but also by the accessibility of community fundamental facilities. According to Midgley (1997), in the context of a

community-based ecotourism area like Tangkahan, social welfare is reflected in the extent to which tourism transformation contributes to improved socio-economic conditions, poverty reduction, and the creation of small-scale business opportunities managed by local MSMEs.

2.6. Education level

Education level reflects the formal stages an individual has completed in the process of internalizing knowledge, developing skills, and shaping critical thinking capacities. Drawing upon the Human Capital Theory pioneered by Becker (1993), education is viewed as a strategic, long-term investment to enhance human resource competencies. To measure the dimension of formal education and its relevance to practical working environments, several key indicators are required:

- Level of education: The formal academic stages successfully completed by an individual (e.g., junior high school, senior high school, diploma, or undergraduate degrees).
- Relevance of field of study: The degree to which an individual's formal educational background aligns with the actual demands or economic activities pursued in the field.
- Competence: The tangible output of cognitive or practical skills mastered by an individual following the learning process.

For communities in tourism areas, an adequate educational attainment serves as a crucial foundation, enhancing their cognitive abilities to manage tourism activities and optimize its benefits for local welfare.

3. Methodology

This study employed a quantitative explanatory research design to examine the relationships among education level, religious knowledge, geographical climate, intellectual development, and social welfare in the Tangkahan ecotourism area.

The study focused specifically on Micro, Small, and Medium Enterprise (MSME) actors who actively participate in tourism-related economic activities within the community-based ecotourism system. The population consisted of MSME actors operating in the Tangkahan ecotourism area. Due to the absence of a comprehensive and updated sampling frame of all MSME actors, probability sampling could not be implemented. Therefore, respondents were selected using a non-probability convenience sampling approach. A total of 230 MSME actors voluntarily participated in the survey. Although this sampling technique limits the statistical generalizability of the findings to the broader population, it remains appropriate for exploratory and explanatory research aimed at examining relationships among variables and testing theoretical models. The measurement of education level consists of three indicators: (1) level of education, (2) relevance of field of study, and (3) competence. Geographical climate was measured using indicators adapted from Wong and Chen (2009), including: (1) temperature and humidity, (2) solar radiation, and (3) rainfall and wind patterns. Intellectual development was measured through: (1) scientific and technological competence, (2) problem-solving ability, and (3) adaptability. Religious knowledge was measured using four indicators derived from Haneef (2005) and Hong et al. (2023): (1) patience (sabar), (2) gratitude (syukur), (3) trust in God (tawakkul), and (4) avoidance of sinful behavior. Social welfare was measured based on Midgley (1997), including: (1) access to healthcare, (2) access to economic resources, and (3) access to social services.

Data were collected through a structured self-administered questionnaire employing a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software. PLS-SEM was selected because it is suitable for predictive and explanatory research involving complex relationships among latent constructs and can accommodate non-probability samples and data that may not meet multivariate normality assumptions. But this research has limitation employed a convenience sampling technique involving 230 MSME actors in the Tangkahan ecotourism area. Although the sample size is adequate for PLS-SEM analysis, the non-probability sampling approach limits the statistical generalizability of the findings. Therefore, the results should be interpreted as representative of the surveyed respondents rather than the entire Tangkahan community. Future studies should employ probability-based sampling techniques and larger samples to improve external validity.

4. Results

4.1. Respondent demographics

According to Table 1, the majority of respondents in this study had completed junior high school, totaling 150 individuals, which represents 65.2% of the sample. There were 40 respondents (17.4%) with a senior high school background, while 25 individuals (10.9%) held a diploma. Only 15 respondents (6.5%) had obtained an undergraduate degree, and none possessed a postgraduate qualification. In terms of age, most respondents fell within the 36–46 age group, totaling 174 individuals (75.6%), indicating that the business participants in this study are predominantly in a mature and productive age range. The 25–35 age group included 44 individuals (19.1%), while those over the age of 46 represented the smallest segment, with only 12 individuals (5.3%). Regarding business sectors, most respondents operated in the culinary sector, with 70 individuals (30.4%). This data was followed by grocery stores and agribusinesses, each represented

by 50 individuals (21.7%). The handicraft sector accounted for 40 respondents (17.4%), while 20 individuals (8.8%) were involved in the herbal products sector (Table 1).

Table 1: Frequency by education level, age and business sector

Characteristics	Description	Frequency	Percentage
Education level	Junior high school	150	65.2%
	High school	40	17.4%
	Diploma	25	10.9%
	Undergraduate	15	6.5%
	Postgraduate	-	-
Age	25 – 35	44	19.1%
	36 – 46	174	75.6%
	> 46	12	5.3%
Business sector	Grocery store	50	21.7%
	Culinary	70	30.4%
	Handicraft	40	17.4%
	Herbal product	20	8.8%
	Agribusiness	50	21.7%

4.2. Reliability and validity testing

We evaluate the measurement model for this Religious Knowledge Construct. This construct consists of four indicators (Reg1–Reg4) with loading values ranging from 0.706 to 0.957. The AVE for this construct is 0.800, indicating that more than 50% of the variance in the indicators is explained. Additionally, the Composite Reliability is 0.940, and Cronbach's Alpha is 0.914, both reflecting excellent internal reliability. This can be seen in Table 2.

Table 2: Factor loading, Cronbach's alpha, composite reliability, AVE

Constructs	Indicator	Factor loading	AVE	Composite reliability	Cronbach's alpha
Religious knowledge (Reg)	Reg1	0.957	0.800	0.940	0.914
	Reg2	0.935			
	Reg3	0.954			
	Reg4	0.706			
Education level (Edu)	Edu1	0.936	0.669	0.857	0.761
	Edu2	0.733			
	Edu3	0.771			
Geographical climate (Geo)	Geo1	0.863	0.822	0.933	0.891
	Geo2	0.958			
	Geo3	0.896			
Intellectual development (Hrm)	Hrm1	0.712	0.641	0.840	0.744
	Hrm2	0.939			
	Hrm3	0.739			
Social welfare (Wel)	Wel1	0.837	0.723	0.886	0.809
	Wel2	0.860			
	Wel3	0.853			

All HTMT (Heterotrait-Monotrait Ratio) values in this study are below the critical threshold of 0.90, indicating that the variables in the model are sufficiently distinct from one another and that multicollinearity is not an issue (Kline, 2016). This finding aligns with the recommendation by Henseler et al. (2015), which states that HTMT values below 0.90 indicate acceptable discriminant validity. Additionally, all indicators exhibit outer loading values above the acceptable threshold of 0.70. Discriminant validity using the Fornell–Larcker criterion, which confirmed that all constructs are valid, as each construct's square root of AVE is greater than its correlations with other constructs. This can be seen in Tables 3 and 4.

Table 3: Fornell-Larcker criterion

Constructs	Education level	Geographical climate	Intellectual development	Religion knowledge	Social welfare
Education level	0.923				
Geographical climate	-0.028	0.907			
Intellectual development	0.158	-0.488	0.803		
Religion knowledge	0.818	-0.191	0.282	0.894	
Social welfare	0.289	-0.569	0.450	0.382	0.850

Table 4: HTMT results

Construct pairs	HTMT
Geographical climate <-> education level	0.255
Intellectual development <-> education level	0.211
Intellectual development <-> geographical climate	0.483
Religion knowledge <-> education level	0.568
Religion knowledge <-> geographical climate	0.217
Religion knowledge <-> intellectual development	0.287
Social welfare <-> education level	0.331
Social welfare <-> geographical climate	0.667
Social welfare <-> intellectual development	0.472
Social welfare <-> religion knowledge	0.427

4.3. Structural model

The structural model analysis was conducted using SmartPLS, which enables structural equation modeling to evaluate the relationships among education level, intellectual development, religious knowledge, geographical climate, and social welfare.

This section presents detailed analysis results and discusses the effects of each variable on social welfare in Tangkahan, Indonesia. The study tested

10 hypotheses by examining direct effects and conducting moderation and mediation analyses, as elaborated in the following discussion. It can be seen in Table 5 and Fig. 1.

Table 5: Assessment of the structural model

Hypotheses	Variable	Path coefficient	R^2	T-statistic	P-value	Decisions
	Factors affecting intellectual development					
H1	Education level → intellectual development	0.277	0.300	1.796	0.036	Supported
H2	Religious knowledge → intellectual development	0.456		2.986	0.001	Supported
H3	Geographical climate → intellectual development	0.426		7.097	0.000	Supported
	Factors affecting social welfare					
H4	Education level → social welfare	0.148	0.423	0.995	0.160	Not supported
H5	Religion knowledge → social welfare	0.109		2.986	0.001	Supported
H6	Geographical climate → social welfare	0.456		7.609	0.000	Supported
H7	Intellectual development → social welfare	0.174		2.152	0.016	Supported
	Mediating effects of intellectual development					
H8	Education level → intellectual development → social welfare	0.053	-	1.362	0.087	No mediation
H9	Religion knowledge → intellectual development → social welfare	0.073	-	1.772	0.038	Mediation
H10	Geographical climate → intellectual development → social welfare	0.079	-	2.084	0.019	Mediation

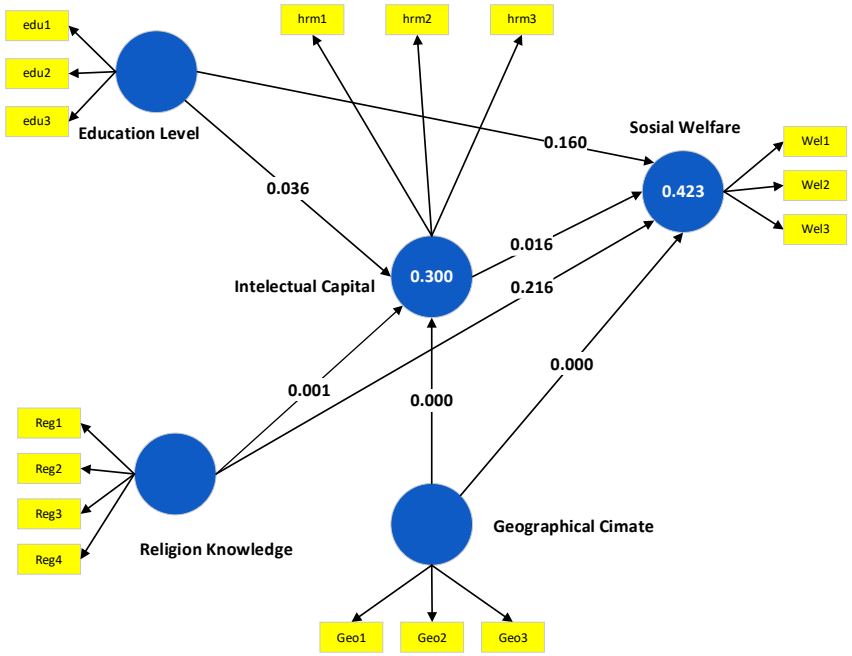


Fig. 1: Structural equation model result

5. Discussion

5.1. Direct effect

The analysis results indicate that education level has a positive and significant effect on intellectual development, with a path coefficient of 0.277 and a p-value of 0.036, which is below the 0.05 significance threshold. This finding implies that the higher an individual's educational attainment, the greater their contribution to enhancing intellectual development. Education serves as a primary means of shaping knowledge, skills, and critical thinking capacities necessary for generating intellectual value in both social and economic contexts. This result aligns with Becker (1993) human capital theory, which posits that education is an essential investment in developing human resource competencies.

Furthermore, the findings of this study are consistent with those of Oketch et al. (2014) and Parisi et al. (2012), who found that educational level is consistently associated with cognitive ability in adulthood, despite the multitude of factors influencing intellectual development. The Langkat Regency Government has implemented several programs, such as model schools, aimed at improving the quality of education among local communities and promoting vocational education to produce graduates who are job-ready and possess the skills necessary for self-reliance.

Strengthening educational levels plays a crucial role for communities in tourism areas, as it enhances their cognitive abilities to manage tourism activities and optimize its benefits for community welfare. Vocational programs should emphasize training in tourism-related skills, including foreign language proficiency, tour guiding, homestay management, and environmental conservation. Such initiatives ensure that graduates acquire skills that meet the local community's needs. Furthermore, the government should consider integrating ecotourism-related content into the curricula of primary, secondary, and higher education. This would nurture ecological awareness and foster an entrepreneurial

spirit among the younger generation. The results indicate that religious knowledge positively and significantly affects intellectual development, with a path coefficient of 0.456, a t-value of 2.986, and a p-value of 0.001, which is well below the 0.05 significance threshold. This finding suggests that a higher level of religious knowledge contributes to the development of intellectual capital. According to Hong et al. (2023), religious knowledge not only shapes an individual's spiritual values but also promotes the formation of responsible, honest, and community-oriented character traits.

This result aligns with the findings of Ritchie et al. (2014), who noted that religious understanding at certain stages of life can influence intellectual development. Tangkahan is well known for its community's commitment to environmental conservation. Strong religious values enhance public awareness of the responsibility to protect nature as a trust (amanah), fostering intellectual traits such as empathy toward the environment. This is evident in daily community practices, such as transforming river wood waste into souvenirs and managing forest honeybee colonies to produce highly sought-after forest honey for eco-tourists. The government, religious leaders, and academics need to collaborate and synergize efforts to strengthen religious values as a foundation for promoting intellectual development within the Tangkahan community.

The results indicate that geographical climate positively and significantly affects intellectual development, with a path coefficient of 0.426, a t-statistic of 7.097, and a p-value of 0.000. These findings align with the study by León and Burga-León (2015), which showed that the influence of geography on cognitive ability is dynamic and can be shaped through public policy. Understanding geographical climate beyond mere interaction with nature should be integrated into the education system, as it helps foster children's awareness of the environments in which they live and grow. Tangkahan, renowned as an ecotourism area abundant in pristine tropical forests, rivers, and biodiversity, provides a meaningful context for community-based intellectual development. The environmental issues faced in Tangkahan, such as conservation efforts, wildlife protection (e.g., elephants), and initiatives against illegal logging, present real-world challenges that enhance the community's intellectual engagement with nature.

Furthermore, local environmental features like changing weather patterns, soil texture, and the flow of the Batang Serangan River offer valuable natural learning experiences that contribute to the community's ecological intelligence. The government should consider integrating Tangkahan's environmental knowledge into programs designed to empower the local community. This integration could take the form of collaborative initiatives with universities, including training in eco-friendly product development, digital marketing for sustainable tourism, and other capacity-building activities.

The results indicate that education level does not have a significant effect on social welfare, with a path coefficient of 0.148, a t-statistic of 0.995, and a p-value of 0.160, which exceeds the 0.05 significance threshold. These findings contrast with several previous studies, such as that of He et al. (2025) who identified a strong correlation between social welfare and educational attainment which demonstrated that education and health levels play a significant role in reducing poverty and enhancing community welfare in their research in Banyumas.

The results of the present study can be explained by the arguments of Kiantoro and Dewi (2024), who asserted that although education is widely regarded as a key factor in socio-economic development, a mismatch between the fields of study pursued by the local population and the needs of the labor market may lead to an insignificant effect of education level on social welfare.

Additionally, other factors, such as limited access to capital for entrepreneurship and a lack of employment opportunities, may contribute to the non-significant effect observed in this study. Therefore, even if the people of Tangkahan achieve a reasonable level of education, if the labor market does not recognize their qualifications, they may remain socio-economically vulnerable. Thus, it is crucial to integrate local market needs with vocational education systems focused on tourism management for educational policy in this region. A well-targeted and locally relevant education system is expected to enable educated individuals to contribute effectively to the advancement of tourism in Tangkahan, thereby improving the area's social and economic welfare.

The results show that religious knowledge has a positive and significant impact on social welfare, indicated by a path coefficient of 0.109, a t-statistic of 2.986, and a p-value of 0.001. These statistics suggest that a greater understanding of religious teachings contributes meaningfully to improving social welfare. Similarly, Andersen (2009) found that individuals with strong religious awareness are more likely to allocate a portion of their wealth to humanitarian organizations aimed at helping those in need. In the context of Tangkahan, religious knowledge encompasses not only a normative understanding of religious teachings but also manifests in daily practices such as community cooperation (gotong royong) and collective participation in religious and communal activities. These practices help strengthen social bonds and promote mutual assistance among community members. To institutionalize these values, it is recommended that the Tangkahan community consider establishing a community-based organization to manage social funds contributed by the public. They can use these funds for various community welfare purposes, including disaster relief, social assistance for the elderly, healthcare, and other collective needs.

The analysis indicates that geographical climate has a positive and significant effect on social welfare,

evidenced by a path coefficient of 0.456, a t-statistic of 7.609, and a p-value of 0.000. This finding aligns with the research conducted by Olmedo et al. (2024), who identified a geographical relationship influencing the distribution and type of entrepreneurial activities in both rural and urban areas of Ireland. Similarly, Spencer and Strobl (2025) emphasized that geographical climate is closely linked to social welfare, noting that climate changes significantly impact the economic activities of communities within a region. In this study's context, areas with strong infrastructure such as good transportation access, abundant natural resources, and a safe and stable environment tend to demonstrate higher levels of social welfare. Conversely, regions with geographical limitations such as remoteness, susceptibility to natural disasters, or inadequate infrastructure often encounter greater challenges in achieving welfare. Tangkahan, recognized as an ecotourism area in Langkat Regency, North Sumatra, boasts several geographical advantages, including pristine tropical forests, clear spring-fed rivers, and high biodiversity. These natural features offer significant opportunities for developing the ecotourism and organic agriculture sectors.

The results indicate that intellectual development has a positive and significant impact on social welfare, evidenced by a path coefficient of 0.174, a t-statistic of 2.152, and a p-value of 0.016. These findings corroborate the study by Novarlia et al. (2023), which demonstrated that human development through intellectual advancement directly affects community social welfare. Additionally, a literature review by Zahruddin et al. (2023) concluded that government policies promoting intellectual development positively influence social welfare outcomes. In Tangkahan, the Reflection of intellectual development is in various non-formal education initiatives, such as English language training, digital marketing workshops, and public speaking courses related to tourism. These training programs have enhanced the local community's skills in managing tourism services and generating income, such as becoming tour guides or content creators. These skills were acquired outside the formal education system through initiatives led by non-governmental organizations and government programs. Overall, these empirical findings emphasize that investing in education and tourism-oriented skills training is a strategic approach to enhancing community welfare through the advancement of intellectual development.

5.2. Mediating effect

The analysis results indicate that the path coefficient is 0.053, with a T-statistic of 1.362 and a p-value of 0.087. Since the p-value exceeds 0.05, this hypothesis is not supported and is considered statistically insignificant. These results suggest that intellectual development does not mediate the relationship between education level and social welfare. These findings are inconsistent with previous studies conducted by Oketch et al. (2014) and Parisi et al. (2012). Despite an improvement in formal education levels among residents, education relevant to local challenges and potential, especially in tourism, remains limited. Consequently, the community's knowledge and skills related to tourism have mainly been acquired through non-formal education programs. Therefore, the government needs to take a more proactive approach to address the gaps that may hinder improvements in social welfare in Tangkahan. Suppose the root cause is the mismatch between formal education and the practical needs of the tourism sector. In that case, it is essential to collaborate with the central government and other stakeholders to provide more structured and targeted vocational education programs, beyond those currently available in informal settings.

The results indicate that intellectual development significantly mediates the relationship between religious knowledge and social welfare, with a path coefficient of 0.073, a t-statistic of 1.772, and a p-value of 0.038. This value is below the 0.05 significance threshold. The finding aligns with previous studies by Andersen (2009) and Novarlia et al. (2023), which reported interrelationships among religious knowledge, intellectual development, and social welfare in various contexts. These results suggest that religious knowledge not only directly impacts social welfare but also indirectly influences it by enhancing intellectual development.

In the context of the ecotourism community in Tangkahan, religious values extend beyond mere ritualistic practices; they are deeply embedded in the communal culture. The shared experience of religious rituals fosters a collective motivation to pursue a better quality of life. Within Tangkahan's local tradition, individuals who achieve economic success are encouraged to inspire others in the community to follow their lead. Therefore, religious values can be considered a driving force behind intellectual growth, ultimately contributing to the pursuit of social welfare.

The results indicate that intellectual development plays a significant mediating role in the relationship between geographical climate and social welfare. With a path coefficient of 0.079, a t-statistic of 2.084, and a p-value of 0.019, this hypothesis is statistically supported, as the p-value is less than 0.05. This finding suggests that the positive impact of geographical climate on social welfare occurs not only directly but also indirectly through the enhancement of intellectual development.

These results align with previous studies conducted by León and Burga-León (2015) and Park and Reisinger (2010). In the context of this study in Tangkahan, which is situated in the tropical rainforest region of Sumatra and is part of the Gunung Leuser National Park ecotourism zone, the natural environment, including rivers, forests, and rich biodiversity, holds significant potential for enhancing community welfare. This can be achieved

through various sectors such as tourism, conservation, and the sustainable use of non-timber forest products, as well as processed forest wood waste. Implementing environmental education programs, tourism management training, and digital literacy initiatives for marketing tourism products are highly relevant for harnessing Tangkahan's geographical advantages to promote local social welfare.

Although statistically significant, the practical contribution of religious knowledge to social welfare was relatively small. The positive effect of religious knowledge on social welfare was statistically significant but relatively weak (β = 0.109). This suggests that religious values contribute indirectly to welfare enhancement, while economic and environmental factors remain more dominant determinants. Although religious knowledge exhibited a statistically significant effect on social welfare (β = 0.109, $p < 0.05$), the magnitude of the relationship was relatively weak. This finding suggests that religious knowledge alone may not be sufficient to substantially improve welfare conditions among MSME actors in the Tangkahan ecotourism area. Welfare outcomes are likely influenced by a broader set of economic, institutional, and environmental factors. Therefore, religious knowledge should be viewed as a complementary rather than a primary determinant of social welfare.

The results indicate that geographical climate exerts the strongest influence on social welfare (β = 0.456), followed by intellectual development (β = 0.174) and religious knowledge (β = 0.109). These findings suggest that environmental conditions and intellectual capacity play more substantial roles in determining welfare than educational attainment alone. For policymakers, this implies that improving welfare in ecotourism communities should focus not only on formal education but also on environmental sustainability, intellectual capacity building, entrepreneurship training, and community empowerment programs.

6. Conclusion

The findings of this study highlight the importance of educational attainment, a solid foundation in religious knowledge, and the development of community intellectual capacity as essential elements for achieving social welfare, especially in ecotourism-based regions like Tangkahan. Therefore, cross-sector collaboration among government entities, educational institutions, religious leaders, and the local community is crucial for improving the quality of life for residents. Local governments and academic institutions should create curricula and vocational training programs that meet the specific needs of the ecotourism sector, including topics such as conservation, homestay management, digital literacy, and tour guiding. Additionally, promoting religious values should be supported through collaboration between religious leaders, social organizations, and community groups. This approach will help strengthen social solidarity and communal cooperation, ultimately contributing to the goal of social welfare. Furthermore, the government is encouraged to support training programs in partnership with existing informal community organizations in the region to enhance intellectual development related to tourism management.

List of abbreviations

AVE	Average variance extracted
HTMT	Heterotrait-monotrait ratio
MSME	Micro, small, and medium enterprise
PLS-SEM	Partial least squares structural equation modeling

Compliance with ethical standards

Ethical considerations

Informed consent was secured from all participants, with data handled confidentially in accordance with research guidelines. Prior to embarking on data collection, the purpose of this evaluation was thoroughly explained to all subjects. Participation remained entirely optional, with explicit informed consent acquired from everyone who completed questionnaires or underwent interviews. To protect respondent privacy, all personal details and answers were anonymized and used exclusively for scholarly research.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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