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Artikel Review

Integration Of Ecological Spirituality And Youth Participation In Reforestation Program: Laudato Si' Movement Timor Leste

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Abstract: Deforestation in Timor-Leste continues at a rate of 10,000-12,000 hectares per year. Nevertheless, existing reforestation research remains theoretically fragmented, prioritizing biophysical and technical dimensions while neglecting the spiritual and attitudinal values that drive participatory environmental behavior among youth-led movement. This study examines the causal pathways through which ecological spirituality, operationalized through the three dimensions of *Laudato Si'* (spiritual, lifestyle, and societal), drives environmental attitudes, mediates youth participation in reforestation, and ultimately produces ecological and social outcomes. The research method used is a qualitative approach complemented by a basic ecological assessment (mixed-method light). This study engaged 23 purposively selected informants through in-depth interviews and thematic analysis, complemented by field ecological measurements including land suitability assessment and plant survival rate at two reforestation sites in Díli, Timor-Leste. This study reveals that the three dimensions of Laudato Si' ecological spirituality function as interconnected psychological mechanisms of values internalization that progressively transform individual moral awareness into collective environmental action; however, despite strong spiritual motivation, youth participation remained predominantly consultative (Arnstein's tokenism level) due to centralized decision-making and limited resource autonomy, while field assessment classified both reforestation sites as marginally suitable (S3), with plant survival rates of 50%-80% with drought-tolerant neem (*Azadirachta indica*) achieving the highest survival rate (80%). This study contributes the ESYPESO Framework as a novel integrated analytical model that, empirically maps causal pathways among ecological spirituality, environmental attitudes, participatory behavior, and ecological and social outcomes within a youth movement.

Keywords: ecological spirituality, environmental sustainability, ESYPESO framework, reforestation, youth participation

1 INTRODUCTION

The report by the United Nations Environment Program (UNEP) through its Global Environment Outlook series Year 2019 emphasizes that environmental pressures such as rapid urbanisation, climate change, deforestation and poor resource management require a cross-country and cross-sectoral approach (UNEP 2019). The 2022 report on the United Nations in Timor-Leste showed that environmental damage from disasters, such as Cyclone Seroja in April 2021, has had a significant impact on infrastructure and people's lives. One of the main challenges facing Timor-Leste is deforestation and land degradation (*United Nations Timor-Leste* 2022). The Global Forest Watch report on Timor-Leste (2001–2024) shows that 90% of tree cover loss was concentrated in areas influenced by the main drivers of deforestation. This is due to changes in tree cover

Table 1. Literature Mapping Matrix

Author (Year)	Focus / Theme	Ecol. Spirituality	Env. Attitude	Youth Participation	Ecological and Social Outcome	Context	Gap / Limitation
McKay et al. (2014)	Faith-based conservation & community participation	✓	–	–	–	General	No empirical outcome; no participation model
Erbaugh et al. (2020)	Reforestation: biophysical & technical focus	–	–	✓	✓	Global	No spirituality; no values integration
Gozum et al. (2023)	*Laudato Si'* ethics & individual awareness	✓	–	–	–	Philippines	No participation; no ecological outcome
Couceiro et al. (2023)	Youth environmental stewardship	–	✓	✓	–	Europe	No spirituality; no ecological outcome
Ewane (2024)	Community participation in reforestation	–	–	✓	✓	Africa	No spirituality; no attitudes variable
Maru et al. (2024)	Ecological conversion & environmental responsibility	✓	✓	–	–	General	No participation; no ecological outcome
Sayuti et al. (2025)	Faith-based approaches & ecological awareness	✓	–	–	–	Indonesia	No participation model; no outcome measurement
Tomizuka & Yamaura (2025)	Attitudes & environmental action in students	–	✓	✓	–	Japan	No spirituality variable; no ecological outcome
Wekesa et al. (2026)	Youth barriers in forest governance	–	–	✓	–	Kenya	No spirituality; no attitudes; no outcome
Billet & Baimel (2026)	Ecospirituality & pro-environmental attitudes	✓	✓	–	–	Cross-cultural	No participation; no ecological outcome
This study	Ecological spirituality → environmental attitude → youth participation → ecological and social outcome	✓	✓	✓	✓	Timor-Leste	Integrated ESYPESO Framework; all four variables

Source: Authors' synthesis (2026)

resulting from permanent land-use changes, such as the expansion of agricultural land, rather than temporary disturbances (Global Forest Watch, n.d.). According to a study conducted by a team from the Ministry of Agriculture and Fisheries' (MAP) forest conservation program in collaboration with the Japan International Cooperation Agency (JICA), Timor-Leste loses

10,000–12,000 hectares of dense forest each year (Barros Soares and Moniz 2022).

The younger generation holds significant potential to drive environmentally friendly innovation, as acknowledged in the National Action Plan for Youth 2023–2027, which emphasizes aligning youth policies with the national development agenda (Government of Timor-Leste 2022). Timor-Leste is a predominantly Catholic nation, with 97.5% of its population identifying as Catholic according to the 2022 Population and Housing Census (INETL

(Instituto Nacional de Estatística de Timor-Leste) 2022).

Recent studies have explored youth engagement in environmental management across different context. Ewane (2024) highlights the importance of community participation in forest reforestation. Wekesa et al. (2026) identify structural and knowledge barriers affecting youth engagement in forest governance. Couceiro et al. (2023) demonstrate how environmental stewardship among youth is shaped by local ecological and social contexts. Tomizuka and Yamaura (2025) analyze how attitudes influence environmental action among students. Previous studies indicate that faith-based approaches can enhance community participation in environmental conservation and foster sustainable ecological awareness (McKay et al. 2014; Sayuti et al. 2025). Ecological spirituality can serve as a foundation for environmental conservation campaigns and can reinforce pro-environmental behavior (Omoyajowo et al. 2023). Religious environmental teachings contribute to increased ecological awareness and conservation efforts in various communities (Palos Rey and Diez Bosch 2024). Reflections on spiritual values in environmental conservation are essential for emphasizing the protection of diverse ecosystems and strengthening the moral relationship between humans and nature (Mohammed Nur 2025).

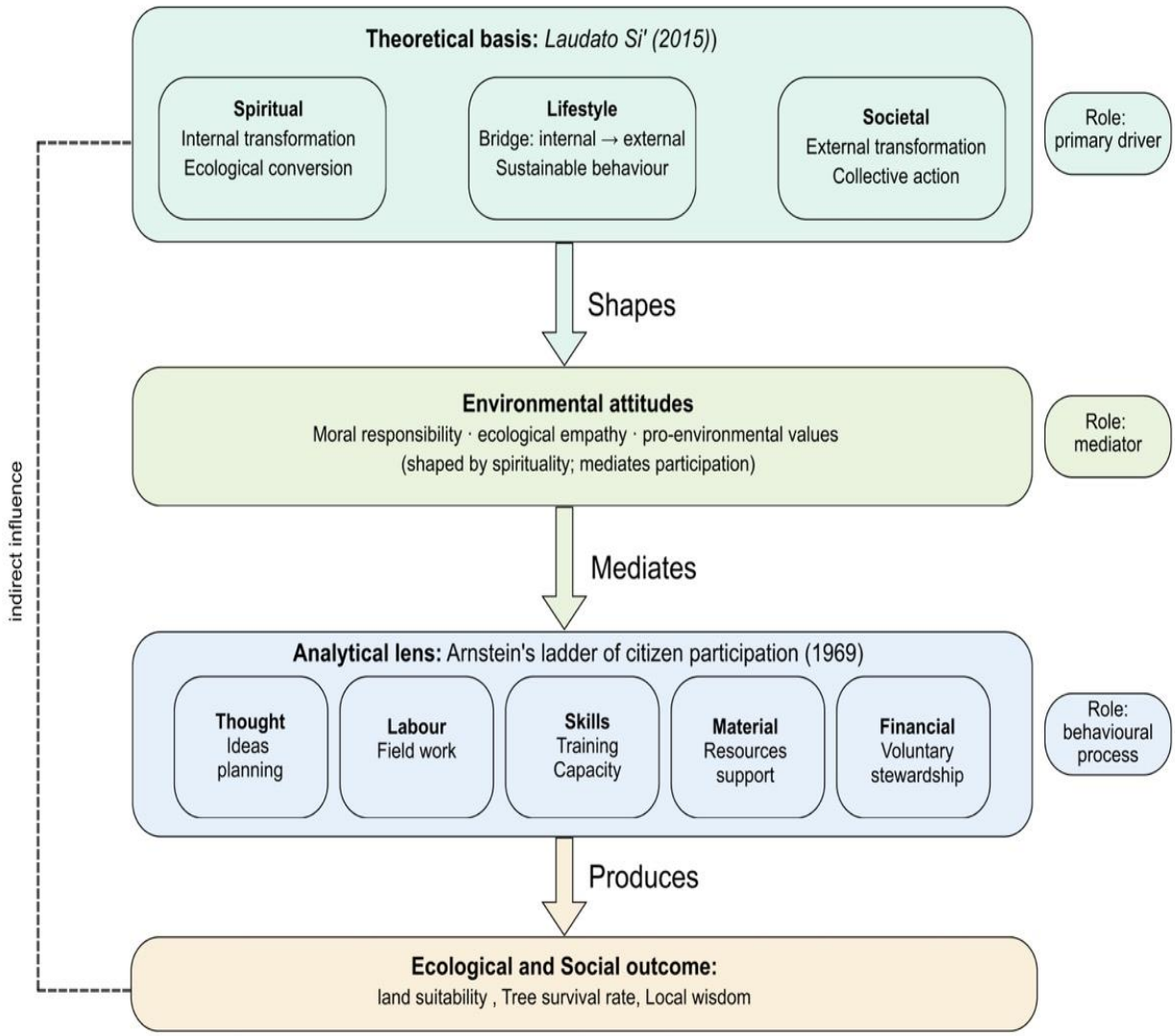
The tendency toward fragmentation in the literature on reforestation research, which tends to focus on biophysical and technical aspects, as well as general community participation, without integrating the underlying values and spirituality that drive such behavior (Erbaugh et al. 2020). Studies on ecological spirituality, including those inspired by *Laudato Si'*, place more emphasis on the transformation of individual ethics and awareness, but have not yet been empirically linked to measurable ecological impacts in the field (Gozum et al. 2023). Literature Mapping Matrix is presented in Table 1.

Table 1 presents a synthesis matrix of key studies related to the three core constructs examined in this research: ecological spirituality, environmental attitudes, youth participation, and ecological and social outcomes. As shown in the table, existing studies tend to examine these constructs in isolation. Studies on ecological spirituality, including those inspired by *Laudato Si'*, focus primarily on individual ethical transformation without linking spirituality to measurable ecological outcomes (Gozum et al. 2023; McKay et al. 2014). Studies on youth participation in reforestation emphasize structural and technical dimensions without integrating the spiritual or attitudinal values that motivate behavior (Erbaugh et al. 2020; Ewane 2024; Wekesa et al. 2026). No previous study has proposed a formal relational model integrating all four constructs within a single analytical framework, particularly in the context of youth environmental movements in Timor-Leste.

In this study, ecological spirituality is examined as a key primary driver in shaping environmental attitudes among youth, while environmental attitudes mediate youth participation in reforestation program as a Behavioural process. This participatory process subsequently contributes to and produces ecological and social outcomes, such as land suitability Tree survival rate, environmental awareness and landscape restoration. Accordingly, the study proposes an integrated relational framework in which ecological spirituality indirectly influences ecological and social outcomes through environmental attitudes and participatory action. The Conceptual Framework is shown in Figure 1.

The primary theoretical contribution of this study is the development of the Ecological Spirituality → Youth Participation → Ecological and Social Outcome (ESYPESO) Framework, a formal relational model that proposes ecological spirituality as a primary driver shaping environmental attitudes, which in turn mediate youth participatory behavior as a behavioral process, ultimately producing ecological and social outcomes. Within this framework, *Laudato Si'* operationalizes the ecological spirituality construct across three dimensions (spiritual, lifestyle, and societal), while Arnstein's ladder of citizen participation (1969) operationalizes the participation construct across five forms (thought, labour, skills, material, and financial). This integration resolves the theoretical fragmentation identified in the literature, where spirituality and participation have been treated as parallel, disconnected constructs.

The novelty of this study lies in three specific contributions. First, it develops an integrated analytical framework the ESYPESO Framework that explicitly maps the causal pathways among ecological spirituality, environmental attitudes, youth participation, and ecological and social outcomes in community-based reforestation. Second, it empirically demonstrates how Laudato Si'-inspired ecological spirituality shapes youth engagement in reforestation activities within the specific socio-cultural context of Timor-Leste Third, it contributes to theoretical discussions on spiritual



Gambar 1. ESYPESO Framework Source: Developed by the Authors (2026)

ecology by explaining the relational pathways among spiritual values, environmental attitudes, participatory behavior, and ecological restoration outcomes moving beyond descriptive case studies toward a theoretically integrated explanatory model. Therefore, this study has three main objectives. (1) analyzes the concept of ecological spirituality in Laudato Si' and its role as a primary driver of environmental attitudes among members. (2) examines forms of youth participation in reforestation using Arnstein's Theory. (3) analyzes the ecological and social outcomes of the reforestation program carried out by the Laudato Si' Movement Timor-Leste.

2 RESEARCH METHOD

This research was carried out in Dili, Timor-Leste, focusing on the headquarters of Laudato Si' Movement Timor-Leste (LSM-TL) youth organization. The site was selected for its strategic role in supporting reforestation program and fostering *Laudato Si'* ecological spirituality among young people. The research location map is shown in Figure 2.

Figure 2. Research Location Map
Source: Authors' Mapping (2026)

Table 2. Profile of Research Informants

No	Category	Role / Position	Number	Age Range	Gender	Data Collected
1	Youth Member	Founder	1	30	Female	Spiritual motivation, organizational history, ecological spirituality
2	Youth Member	Executive President	1	28	Female	Leadership, program planning, spiritual values
3	Youth Member	Active Youth Member	15	18–28	M/F	Participation forms, spiritual awareness, reforestation involvement
	Youth Sub-total		**17**			
4	Religious Figure	Priest / Nun	3	35–60	M/F	Spiritual guidance, ecological teachings, Laudato Si' values
5	Local Community	Resident near reforestation site	3	25–55	M/F	Community perception, land use, local wisdom
Total	**Non-Youth Sub-total**		**6**			
	TOTAL		**23**			

Source: Primary Data of Interviews (2026)

This research was conducted over a period of 6 months, from October 2025 to April 2026. The study began with the planning phase, research preparation, the collection of primary and secondary data, analysis, and the reporting of research results. Primary data collection was conducted through direct field analysis over a one-month period in February 2026, involving in-depth interviews with official members and field observations at reforestation sites in the Díli area of Timor-Leste.

This study employed a qualitative approach complemented by a basic ecological assessment, (mixed-method light). The qualitative component was used to explore youth participation, motivations, and the role of ecological spirituality in the reforestation program, while ecological assessment was conducted to evaluate planting outcomes through survival rates. The sample in this research consists of active members of the Laudato Si' Movement Timor-Leste youth organization who are directly involved in the reforestation program, serving as respondents. The total number of interview informants consisted of 23 respondents selected through purposive sampling based on their involvement in the reforestation program. Of these, 17 participants were categorized as youth members actively engaged in the Laudato Si' Movement Timor-Leste, including the founder, the executive president, and active youth members. To enrich the analysis, the study also included non-youth informants. These consisted of religious figures (priests and nuns) who provide spiritual guidance within the movement. Additionally, local community residents living near the reforestation sites were included, as they are directly affected by and involved in the program. The remaining 6 non-youth informants consisted of 3 religious figures (priests and nuns) and 3 local community residents living near the reforestation sites. The detailed profile of research informants is presented in Table 2.

All youth informants were selected from the Laudato Si' Movement Timor-Leste (LSM-TL). Non-youth informants were included to enrich the analysis through broader perspectives on spiritual guidance and community impact. This study focuses on two main reforestation program sites in the Dili area: Kruz Tolu Golgota Hill and Papa João Paulo II Statue Hill, which were selected as study sites to analyze the implementation and impact of reforestation program.

The sampling technique used purposive sampling, which is a method of selecting a sample based on specific criteria (Sugiyono 2019). All youth informants were selected from a single organization, the Laudato Si' Movement Timor-Leste (LSM-TL), rather than from multiple youth organizations, as this study specifically examines the ecological spirituality embedded within LSM-TL’s organizational framework and reforestation program. Primary data were collected through in-depth interviews, direct field observation, and ecological measurement. Secondary data were obtained literature review, reports, and relevant documents. To enhance data validity, this study

applied triangulation, including source triangulation (comparing information from youth members, religious leader, and local communities) and method triangulation (interviews, observation and ecological data). To further ensure the credibility of qualitative data, member checking was conducted by sharing key findings with selected informants to verify the accuracy of interpretations. Transferability was addressed through thick description of the research context, while dependability was maintained through an audit trail of data collection and analysis procedures.

For the ecological assessment, plant survival rate was measured to evaluate the effectiveness of the reforestation program. Survival rate was calculated using the following formula:

$$\text{Survival Rate } (\%) = \frac{\text{Number of surviving plants}}{\text{Total number of planted seedlings}} \times 100$$

Field measurements were conducted using plot sampling techniques. Observation plots were established at each site, and all planted seedlings within the plots were counted and monitored. The number of surviving plants was recorded after a certain monitoring period, and the total number of initial plantings was used as a baseline. The plant sample size in each plot followed the actual number of seedlings planted within the designated observation area.

Qualitative data were analyzed manually using a thematic analysis approach, without the assistance of qualitative data analysis software, given the manageable scale of the dataset (23 respondents). Interview data were transcribed, coded, and categorized into key themes related to youth participation, spiritual motivation, and environmental impact. The analysis followed three main steps: (1) open coding to identify initial concepts, (2) categorization into broader themes, and (3) interpretation to connect findings with research objectives. This process allowed for a systematic understanding of how ecological spirituality serves as a driver to influences youth involvement in reforestation program. The data collection techniques are presented in Table 3.

In this research, data were collected through in-depth interviews, observations, and documentation. The collected data were then analyzed using data analysis techniques based on the model proposed by Miles and Huberman (1984). The stages of this data analysis included data reduction, data display, and drawing conclusions.

Land Suitability Assessment (Based on Limiting Factors)

The land suitability assessment in this study was conducted using a classification approach based on limiting factors, in accordance with the land suitability evaluation guidelines from the

Table 3. Data Collection Methods

Variables	Data Collection Technique	Data Collected (Indicator)	Data Type	Data Source
Dimension of Ecological Spirituality *Laudato Si'*	In-depth interviews	• Spiritual Dimension • Lifestyle Dimension • Societal Dimension	Primary	*LSM-TL Official member*
		• Member's Environmental Attitudes		
Forms of Youth Participation (Arnstein's Theory)	In-depth interview	• Participation of Thought • Participation of Labor • Participation of Skills • Participation of Material • Participation of Financial	Primary	*LSM-TL Official member*
Outcome of Reforestation Program	Observation	Ecological: • Land Suitability Assessment • Tree Survival Rate (%)	Primary	Field
	Documentation	Ecological: • List of Tree Species	Secondary	*LSM-TL Report*
	Observation & interview	Social: • Tree Locality and Local Wisdom	Primary	Field
Source: Authors' Analysis (2026)				

Center for International Forestry Research and the World Agroforestry Centre (CIFOR-ICRAF).

Table 4. Land Suitability Assessment

Class	General Criteria
S1 (Highly Suitable)	No significant constraints
S2 (Moderately Suitable)	Mild to moderate constraints
S3 (Marginally Suitable)	Significant constraints
N (Unsuitable)	Severe constraints
Source: CIFOR-ICRAF (2007)	

Land suitability classifications are divided into four classes S1 (Highly Suitable) indicates no or only minor limiting factors. S2 (Moderately Suitable) indicates moderate limiting factors. S3 (Marginally Suitable) indicates fairly severe limiting factors. N (Unsuitable) indicates very severe limiting factors that make the land unsuitable for specific uses (Ritung et al. 2007). The Land Suitability Assessment is presented in Table 4.

3 RESULT AND DISCUSSION

Figure 3 shows the study's integrative result model, based on the ESYPESO Framework, showing the relationships among ecological spirituality, environmental attitudes, youth participation, and ecological social outcomes.

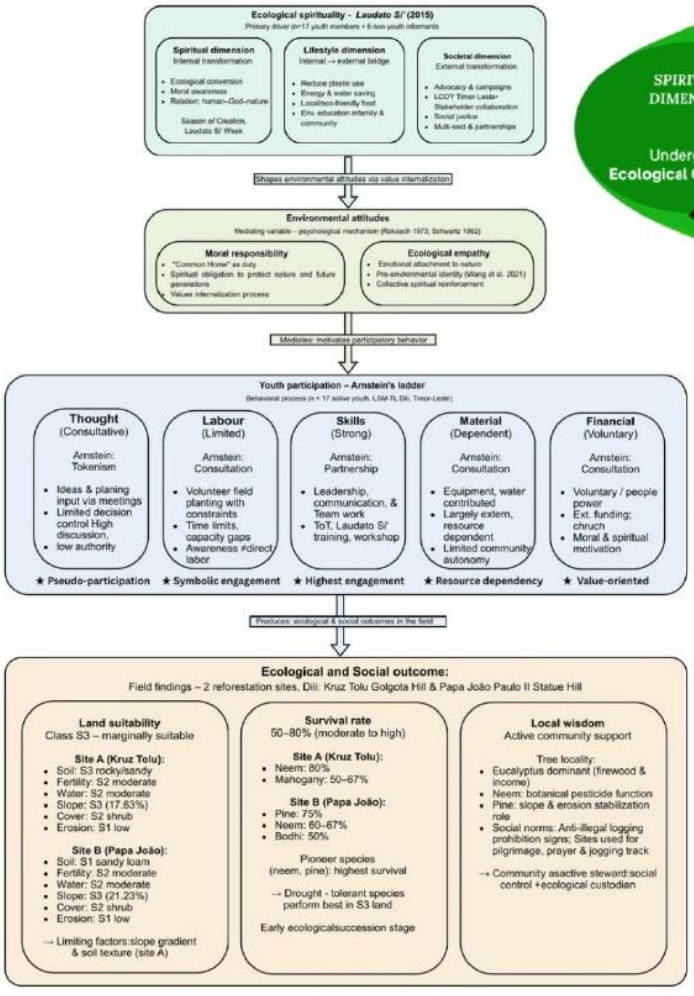


Figure 3. ESYPESO integrative result model
Source: Researchers' analysis based on interview data and field observations (2026)

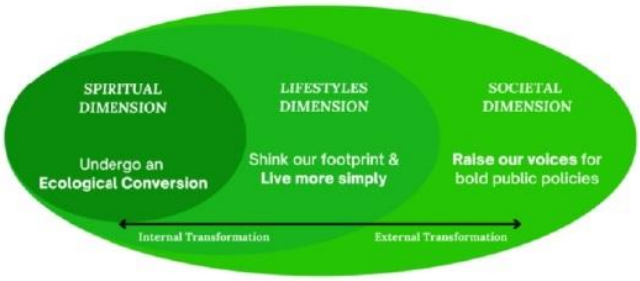


Figure 4. Dimensions of *Laudato Si'*
Source: Laudato Si' Global Movement (Pope Francis, 2015)

3.1 Theoretical basis: Dimensions of Ecological Spirituality *Laudato Si'*

The Laudato Si' Movement Timor-Leste was founded as the national branch of the Global Laudato Si' Movement network. It draws inspiration from Pope Francis's 2015 encyclical *Laudato Si'*, which emphasizes caring for our common home and advancing climate and ecological justice. The organization was formally inaugurated on March 14, 2023, although its activities had already begun in October 2020 under the name "Laudato Si' Animators Timor-Leste" (Laudato Si' Movement Timor-Leste, n.d.). Within the Laudato Si' Movement Timor-Leste, there are two main requirements for becoming a *Laudato Si' Animator*: We "*live Laudato Si'*" and We animate others to "*live Laudato Si'*".

According to interviews with active members of the Laudato Si' Movement Timor-Leste, it was stated that to practice the ecological spirituality of "*We live Laudato Si'*," there are three dimensions, as illustrated in Figure 4.

Spiritual Dimension - Internal Transformation

Interview findings revealed that the spiritual dimension in *Laudato Si'* serves as the starting point for environmental engagement among youth and members of LSM-TL. Informants explained that ecological conversion became the foundation for environmental action because it encouraged an internal transformation that shaped awareness of the relationship between humans, God, and nature. Informants explained that ecological conversion became the foundation for environmental action because it encouraged an internal transformation that shaped awareness of the relationship between humans, God, and nature. As one active youth member stated: *'Before joining LSM-TL, I never thought about nature as something sacred. But after learning Laudato Si', I realized that destroying the forest is like destroying God's creation.'* (Informant 5, Active Youth Member, February 2026). Participants emphasized that nature is an integral part of creation that must be respected and protected. The interviews further showed that the strengthening of ecological spirituality was reflected in various collective activities routinely organized by LSM-TL. Informants mentioned annual programs such as the Season of Creation, *Laudato Si' Week*, prayer groups, and reflective activities involving communities and youth in Timor-Leste.

The findings indicate that ecological conversion functions as a spiritual transformation grounded in moral awareness and environmental concern, which may progressively shape pro-environmental behavioral orientations among members over time. This finding is consistent with Maru et al., (2024), who argued that ecological conversion represents a fundamental shift in attitudes and actions that shapes environmental responsibility. This finding further aligns with Messias (2024), who demonstrated that ecological spirituality rooted in Laudato Si' particularly through the concept of ecological conversion strengthens ethical responsibility toward environmental sustainability by fostering a deeper sense of moral duty toward creation. This occurs because ecological conversion does not operate as a single cognitive event but as a gradual psychological process: repeated exposure to spiritual teachings reshapes one's moral identity, making environmental protection feel not like an external obligation but an intrinsic personal responsibility. This explains why members who undergo deeper spiritual formation within LSM-TL tend to show stronger and more sustained environmental engagement. In this study, ecological spirituality influenced how youth interpreted environmental issues, transforming environmental protection from a purely technical activity into a moral and spiritual obligation. The findings also align with studies emphasizing that collective religious practices play an important role in sustaining environmental participation (Muralidharan et al. 2024). Activities such as the Season of Creation and *Laudato Si'* Week function not only as spiritual expressions but also as social mechanisms that strengthen ecological values, solidarity, and long-term environmental commitment among youth. Theoretically, this finding contributes to spiritual ecology literature by empirically demonstrating that the spiritual dimension of *Laudato Si'* operates as the foundational mechanism of values internalization, the upstream driver from which environmental attitudes and participatory behavior subsequently emerge. In practice, youth organization should design structured spiritual formation programs, such as ecological retreats, reflective prayer groups, and communal environmental activities as intentional, measurable mechanisms for building long-term environmental commitment.

Lifestyle Dimension - Bridge from the Internal to the External

Interview findings revealed that the lifestyle dimension of *Laudato Si'* serves as a bridge between spiritual awareness and concrete environmental action among LSM-TL members. After experiencing ecological and spiritual transformation, participants explained that they

began applying these values in their daily lives through changes in lifestyle and consumption patterns. Informants described efforts to reduce their carbon footprint by living more simply, minimizing excessive consumption, and using resources more wisely. The interviews further showed that ecological awareness was reflected in practical behaviors, such as conserving energy and water, reducing single-use plastic use, and choosing local or environmentally friendly food products. Informants also emphasized that LSM-TL members strengthened this dimension through environmental education activities conducted within families and communities.

The findings indicate that the lifestyle dimension of *Laudato Si'* plays a role in translating ecological spirituality into observable environmental behavior. Spiritual awareness alone was not sufficient; it became meaningful when expressed through sustainable daily practices and responsible consumption patterns. This finding demonstrates how ecological values can move from the level of internal belief into concrete forms of environmental action embedded in everyday life. The study also aligns with Solekah et al. (2022), who found that pro-environmental behaviors such as energy conservation, water conservation, and reduced plastic consumption are important indicators of ecological awareness and environmental responsibility. This finding is further consistent with Qiu (2025), who demonstrated that social norms and collective efficacy significantly strengthen pro-environmental behavioral consistency among community members particularly when individual moral commitments are reinforced by shared group norms and communal participation. In contrast to studies focusing solely on individual behavior change, this study demonstrates that collective lifestyle practices function as social reinforcement mechanisms extending pro-environmental behavior beyond the individual into the communal sphere (Zheng et al. 2019). This occurs because spiritual awareness alone creates motivation but not necessarily habit. The lifestyle dimension bridges this gap by embedding ecological values into daily routines and social practices, making pro-environmental behavior structurally easier to sustain and explains why members who actively engage in lifestyle-based activities show more consistent environmental behavior. Furthermore, the findings suggest that environmental education and collective ecological practices function as mechanisms that may support more consistent environmental action among youth. Theoretically, this finding supports the values-action gap literature by showing that spiritual values must be reinforced through concrete behavioral practices and community norms to produce consistent environmental action. In practice, LSM-TL should develop structured lifestyle programs that translate spiritual awareness into measurable behavioral indicators, such as household carbon footprint tracking and community waste reduction targets.

Societal Dimension - External Transformation

Interview findings revealed that the societal dimension of *Laudato Si'* represents a broader form of external transformation in which individual ecological awareness develops into collective environmental action. Informants explained that environmental conservation efforts within LSM-TL require the active involvement of most members and cannot be addressed individually. Members stated that environmental responsibility should be understood as a shared social obligation involving communities, institutions, and policymakers. The interviews further showed that ecological awareness among LSM-TL members was expressed through participation in environmental movements, reforestation program, and collaboration with various stakeholders, including government institutions, schools, and community organizations. Informants highlighted the important role of youth in environmental education, advocacy, and collective action. Participation in forums such as the Local Conference of Youth (LCOY) in Timor-Leste was described as a strategic opportunity for young people to contribute to environmental discussions and influence policy-related processes. In addition, participants explained that public dialogue and environmental campaigns were used to raise awareness and encourage collective solutions to environmental problems. Several informants also emphasized that environmental protection should be closely linked to social justice. Participants stated that vulnerable groups, including poor communities and marginalized populations, are often the most affected by environmental degradation and climate change.

The findings indicate that the societal dimension of Laudato Si' transforms ecological concern from individual practice into collective social engagement. Ecological awareness among members of LSM-TL extended beyond personal lifestyle changes and developed into participation in environmental movements, advocacy activities, and collaborative actions involving multiple stakeholders. The study also supports the concept of integral ecology emphasized in *Laudato Si'*,

which highlights the interconnected relationship between environmental protection, social participation, and shared responsibility. Furthermore, the findings demonstrate the strategic role of youth in promoting environmental sustainability through education, advocacy, and participation in policy-related forums such as LCOY. This finding is consistent with Susan (2025), who argued that environmental issues cannot be separated from broader social structures and collective social action. This finding further aligns with Wekesa et al. (2026), who identified youth engagement in governance structures as a critical but often underutilized pathway for environmental sustainability in developing country contexts. The strategic role of youth in advocacy forums such as LCOY demonstrates how individual spiritual transformation can scale into collective environmental governance consistent with the integral ecology framework emphasized in Laudato Si'. This transition from individual to collective action occurs because the societal dimension of Laudato Si' explicitly frames environmental responsibility as a shared social obligation not merely a personal practice. By institutionalizing this framing through advocacy, campaigns, and inter-institutional collaboration, LSM-TL creates social structures that sustain collective ecological commitment beyond individual motivation, explaining why members who engage in societal-level activities demonstrate broader and more sustained environmental action than those who remain at the individual spiritual or lifestyle level. Furthermore, the findings suggest that environmental sustainability is closely linked to issues of social justice, particularly the unequal impacts of environmental degradation on vulnerable communities. Theoretically, this finding contributes to integral ecology scholarship by empirically demonstrating that the societal dimension of Laudato Si' represents a measurable transition from individual spiritual transformation to collective environmental governance. Practically, youth environmental organizations should create formal institutional pathways for members to engage in policy advocacy forums such as LCOY, thereby elevating participation from community action toward structural environmental governance.

We animate others to live Laudato Si'

We animate others to live. Laudato Si' emphasizes that the call to live out the values of *Laudato Si'* does not stop at personal awareness but must be realized in efforts to mobilize and inspire others collectively. This suggests that ecological transformation may be more effective within a community, as sustainable change is difficult to achieve individually. The Laudato Si' Movement Timor-Leste (LSM-TL) serves as a space for shared learning and for extending the impact of ecological values within social life. Therefore, every individual is called to adopt an environmentally friendly lifestyle, also to become an active agent of change, proclaiming the message of *Laudato Si'* to the wider community to strengthen our shared commitment to caring for the earth as our common home.

Ecological Spirituality *Laudato Si'* as Driver for Environmental Attitude

Interviews were conducted with LSM-TL members who have been actively involved for more than two years. Informants explained that the teachings of *Laudato Si'* foster an understanding that humans have a moral and spiritual responsibility to protect the “Common Home” as part of the relationship between humans, nature, and God. The members also revealed that ecological spirituality indicates transforming the attitudes and behaviors of its adherents in their daily lives. The interviews stated that spiritual values related to care for creation increase empathy toward environmental damage and strengthen collective awareness to engage in environmental conservation activities. The findings further showed that environmental awareness among members is reflected in active participation in various environmental restoration activities, including tree planting, environmental awareness campaigns, monitoring activities, and collaboration with communities and institutions involved in environmental conservation. Informants emphasized that their involvement in reforestation program was motivated by spiritual values that encouraged a deeper connection between humans and nature. Informants explained that their participation in reforestation was driven by spiritual values that fostered a deeper connection between humans and nature.

The findings indicate that the ecological spirituality dimension of *Laudato Si'* is a major factor shaping environmental awareness among members of LSM-TL. The findings of this study indicate that ecological spirituality plays a significant role in shaping environmental awareness and encouraging pro-environmental behavior among members of the Laudato Si' Movement in Timor-Leste. This process can be understood through the psychological mechanism of values internalization, in which repeated engagement with spiritual teachings and collective

religious practices gradually reshapes an individual’s cognitive and moral framework. This finding is consistent with Rokeach (1973), who argued that deeply internalized values serve as internal reference points that individuals use to formulate attitudes and guide behavior consistently across contexts. Similarly, Schwartz (1992) demonstrated that values function as motivational structures shaping behavioral priorities and environmental responsibility. In this study, ecological conversion promoted a reorientation in the relationship between humans and nature, shifting environmental perceptions from viewing nature as a passive resource to understanding it as a sacred moral responsibility. This finding also aligns with Wang et al. (2021) found that biospheric values and environmental identity whether held individually or collectively significantly influence pro-environmental behavior. This internal transformation operates through three psychological pathways: (1) affective engagement, whereby spiritual reflection cultivates emotional attachment and empathy toward environmental degradation; (2) moral obligation, whereby ecological values become embedded in one’s sense of identity and duty toward creation; and (3) social reinforcement, whereby collective spiritual activities such as the Season of Creation and Laudato Si' Week strengthen individual ecological commitments through shared norms and communal accountability. Together, these pathways explain why and how ecological spirituality translates into measurable environmental attitudes and active participation in reforestation programs among LSM-TL members. Furthermore, ecological spirituality encouraged active, sustainable participation in environmental restoration activities, such as tree planting, environmental campaigns, and collaboration with communities and institutions. This finding is consistent with Maulana et al., (2026), who demonstrated that spiritual intelligence and connection to nature positively influence pro-environmental behavior among youth. Theoretically, this study contributes to the literature on ecological spirituality by demonstrating that the spiritual, lifestyle, and societal dimensions of *Laudato Si'* function as interconnected mechanisms shaping environmental awareness, pro-environmental behavior, and youth participation in environmental action. The findings strengthen the understanding that ecological spirituality operates not only as a theological concept, but also as a psychological, social, and behavioral foundation influencing collective environmental engagement within youth movement in Timor-Leste. Practically, the study suggests that environmental programs should integrate spiritual reflection, sustainable lifestyle practices, environmental education, and collaborative social action to strengthen long-term environmental commitment among youth and communities. Activities such as ecological campaigns, reforestation initiatives, environmental education, and community participation may support sustainable environmental behavior and collective ecological responsibility. Future research should further examine the influence of ecological spirituality on environmental behavior and participatory action across different socio-cultural contexts.

3.2 Forms of Youth Participation in Reforestation

Young people affiliated with the Laudato Si' Movement Timor-Leste are actively involved in environmental conservation efforts through reforestation programs. Their participation extends beyond tree-planting activities to include planning, implementation, and environmental monitoring.

For many members, reforestation is consistent with the values promoted in *Laudato Si'*. Spiritual motivation strengthens their sense of responsibility, solidarity, and commitment to environmental stewardship. The beginning of this participation can be traced to the ecological spirituality dimension of *Laudato Si'*, which became a driving force shaping youth environmental attitudes and mediating them to engage in reforestation program in various forms of participation used. This spiritual understanding encourages youth to perceive environmental action as a moral and faith-based responsibility rather than merely a technical conservation activity. The following are examples of youth forms participation in the reforestation program carried out by the Laudato Si' Movement Timor-Leste, along with an analysis using Arnstein’s theory ladder of citizen participation. The forms of youth participation are presented in Table 5.

Table 5. Forms of Youth Participation

Forms of Youth Participation	Description of Participation
Participation of Thought	LSM-TL serves as a learning space and platform for young people to develop leadership skills and express their ideas. Members participate through meetings and discussions, both online and offline, where they contribute suggestions, ideas, and feedback, including in the planning of reforestation programs and the selection of planting locations. This participation is motivated by organizational engagement also by the belief that caring for nature is part of their spiritual and moral responsibility.
Participation of Labor	Member participation has not yet reached its full potential due to limited technical knowledge, time constraints, and varying levels of commitment. Nevertheless, several members demonstrate strong motivation by actively volunteering in reforestation program. Their involvement is often encouraged by ecological values promoted through *Laudato Si'*, which frames environmental care as a form of service and solidarity with creation. Local communities have also observed and supported these tree-planting activities.
Participation of Skills	Members of LSM-TL possess diverse backgrounds and skills that contribute to addressing climate change and environmental issues. They generally participate in leadership, communication, coordination, and teamwork. To strengthen members' capacities, the organization provides Training of Trainers (ToT), *Laudato Si'* training, workshops, and environmental programs. These activities not only improve technical and organizational competencies but also deepen ecological awareness and spiritual commitment toward environmental stewardship.
Participation of Material	Members contribute material support, such as equipment, water, food, and other necessities, for reforestation program. The organization communicates supply needs openly to encourage collective responsibility and solidarity among members. Although the organization or partner institutions provide some materials, contributions from members reflect a shared commitment to supporting environmental action as a communal and faith-inspired effort.
Participation of Financial	Organizational activities are carried out voluntarily and rely heavily on collaboration or "people power." Support for reforestation programs is obtained through partnerships with external stakeholders, including the Ministry of Forestry and the church. Since activities are funded collectively through institutional support, members are generally not required to provide direct financial contributions. Nevertheless, their willingness to participate voluntarily reflects values of service, stewardship, and collective responsibility emphasized in ecological spirituality.

Source: Primary Data of Interviews (2026)

1. Participation of Thought

The findings indicate that participation of thought in the reforestation program organized by LSM-TL demonstrates a relatively high level of engagement in terms of ideas, discussions, and involvement in planning processes. Members actively contributed opinions and participated in discussions during the planning, implementation, and post-implementation stages of the program. However, the dominance of participation at the discussion level rather than direct involvement in implementation suggests that participation remains largely consultative. Although members were given opportunities to express their views and concerns, their influence on decision-making and program execution remained limited. This finding is consistent with Sherry Arnstein (1969) through the Ladder of Citizen Participation theory, particularly at the level of consultation, where communities are allowed to voice opinions without possessing substantial control over decisions and resources. Based on Arnstein's framework, this pattern can be categorized as pseudo-participation or tokenism because participation mainly functions as a mechanism for communication rather than shared authority. This finding is consistent with Uppalapati et al. (2025), who emphasized that participation frequently becomes symbolic when communities function primarily as consultees rather than active decision-makers. Similarly,

Restrepo-Mieth et al. (2023) found that participation in environmental programs tends to remain superficial when engagement is confined to discussion without substantial involvement in implementation processes. This occurs because decision-making authority within LSM-TL remains centralized within organizational leadership, structurally limiting members’ ability to translate their ideas into actionable program changes. The gap between thought participation and implementation participation, therefore, reflects not a lack of motivation or awareness, but an organizational power structure that has not yet devolved sufficient authority to youth members. The findings suggest that participation in the reforestation program has not yet reached the level of partnership or citizen control. The limited role of members in implementation and decision-making may be influenced by unequal power-sharing mechanisms, limited technical capacity, and organizational structures that still centralize authority within specific actors. Although participatory discussions may strengthen communication, awareness, and community engagement, they do not automatically ensure equal influence in determining program direction and implementation. The findings, therefore, highlight the importance of strengthening participatory mechanisms that enable members to move beyond consultative roles toward more collaborative, decision-oriented forms of participation. Theoretically, this finding validates Arnstein’s tokenism category for youth environmental movements, extending its analytical relevance beyond urban planning and governance contexts. In practice, LSM-TL should establish youth-led decision-making committees with genuine authority over program design and site selection, enabling members to move from consultation toward partnership, the fifth rung of Arnstein’s ladder. Members Discussion can seen in Figure 5.

Figure 5. Members’ Discussion
Source: LSM-TL Documentations (2025)

2. Participation of Labor

The findings indicate that labor participation in the reforestation program organized by LSM-TL remains relatively limited despite members’ strong ecological awareness. Although participants demonstrated high levels of understanding and concern regarding environmental issues, this awareness was not always translated into direct involvement in field-based reforestation program. Constraints related to time availability, technical capacity, and long-term commitment became important factors limiting members’ participation in practical implementation activities. This finding suggests a gap between environmental knowledge and concrete environmental action. Participation tends to remain focused on discussion and moral support rather than on direct physical involvement in reforestation program. The results are consistent with the argument of Restrepo-Mieth et al. (2023), who emphasize that participation in environmental programs may become superficial or symbolic when communities are involved primarily in consultation and discussion, without substantial engagement in implementation processes. This finding is further consistent with Ewane (2024), who demonstrated that community participation in reforestation programs is often constrained by practical limitations including time availability, technical capacity, and organizational support, even when ecological awareness and motivation are high. In contrast to studies reporting strong labor participation in community reforestation, the present findings suggest that spiritual motivation alone, without structural organizational support, is insufficient to sustain direct field engagement (Herbohn et al. 2023). This gap between ecological awareness and labor participation exists because participation in physically demanding field activities requires not only motivation but also practical enabling conditions: time, technical knowledge, logistical support, and organizational coordination. When these structural conditions are absent or insufficient, even highly motivated members default to lower-cost forms of participation such as discussion and moral support explaining why labor participation remains the weakest form despite members’ strong spiritual commitment.

The results also suggest that environmental participation is influenced not only by individual awareness and motivation but also by institutional capacity, organizational support, and access to resources that enable active involvement. In this context, members possessed ecological concern and moral commitment, yet practical limitations reduced their ability to sustain direct labor participation in environmental restoration

programs. These findings highlight that meaningful participation requires both cognitive awareness and supportive structural conditions that facilitate active engagement in environmental action. Theoretically, this finding suggests that spiritual motivation is a necessary but insufficient condition for sustained labor participation. In practice, LSM-TL should establish regular, scheduled field-participation calendars with well-defined defined working groups, transportation support, and flexible time commitments to enable more members to translate ecological awareness into direct reforestation action. Reforestation Program can be seen in Figure 6.

Figure 6. Reforestation Program
Source: LSM-TL Documentations (2025)

3. Participation of Skills

The findings indicate that skills-based participation in the reforestation program organized by LSM-TL demonstrates strong potential to expand members' engagement in environmental activities and decision-making processes. Members' abilities in leadership, communication, and teamwork reflect significant social capital that can support more active and meaningful participation within the organization. Informants stated that capacity-building initiatives such as training programs, Training of Trainers (ToT) workshops, and *Laudato Si'* formation activities functioned as important mechanisms for transforming passive consultation into active engagement. This finding is consistent with the study Suryana et al. (2022) highlighted that capacity building significantly improves the quality of participation and promotes more equitable engagement in community-based environmental programs. This finding further aligns with Arnstein's (1969) framework, which emphasizes that strengthening individual and collective capacity is a prerequisite for shifting participation from tokenistic consultation toward partnership and shared decision-making. In contrast to Abdurrahim et al. (2022), who found that strong local leadership enabled independent community mobilization. The present findings indicate that LSM-TL members still rely on organizational facilitation and structured guidance suggesting that capacity development within the organization has not yet reached the level of self-directed participatory agency. This dependency on organizational facilitation stems from skill development within LSM-TL being primarily driven top-down through formal training programs rather than bottom-up through peer-led initiatives. As a result, when organizational support is absent or reduced, members' ability to independently coordinate and implement reforestation activities is limited, which explains why skills-based participation shows strong potential but has not yet translated into autonomous environmental leadership. Theoretically, this finding extends the capacity-building literature by demonstrating that skill development in youth organizations operates through both technical and spiritual dimensions. Practically, LSM-TL should transition from trainer-dependent capacity building toward peer mentoring systems, where experienced members lead skill development for newer members, to build more autonomous and sustainable participatory capacity. Laudato Si' Training can seen in Figure 7.

Figure 7. *Laudato Si'* Training
Source: LSM-TL Documentations (2024

4. Participation of Material

The findings indicate that material-based participation in the reforestation program conducted by LSM-TL remains relatively limited and highly dependent on external resources and institutional support. Although several members from their own homes, most logistical and material needs for reforestation program were met through external organizations and partner institutions. In this study, dependence on external support may strengthen program implementation in the short term, but it can also reduce community autonomy and limit members' influence over program sustainability and decision-making processes. The findings also align with Swapan et al. (2022), who emphasized that access to resources and institutional support significantly influence the level and effectiveness of community participation

in development and environmental programs. This finding is consistent with Arnstein (1969), who argued that limited control over resources constrains the transition to higher levels of participation particularly partnership and citizen control because resource access is a fundamental component of community empowerment. In contrast to Pratama (2024), who documented strong community self-reliance through locally managed environmental initiatives. The present findings indicate that material participation within LSM-TL remains highly externally dependent. This external dependency occurs because LSM-TL, as a relatively young organization (formally established in 2023), has not yet developed sufficient internal resource mobilization mechanisms relying on institutional partnerships for logistical support, which limits members’ sense of ownership and constrains participation from evolving toward higher autonomy. Theoretically, this finding reinforces Arnstein’s resource-power nexus by demonstrating that material dependency on external institutions structurally limits participatory agency regardless of spiritual motivation. Practically, LSM-TL should develop community resource mobilization strategies such as internal environmental funds and material co-investment systems to gradually reduce external dependency and strengthen members’ sense of program ownership.

5. Participation of Financial

The findings indicate that financial participation in the reforestation program conducted by LSM-TL is not compulsory and is primarily grounded in voluntarism, solidarity, and collaborative principles often described by members as “people power.” Interviews revealed that the organization prioritizes voluntarism, solidarity, and collaborative principles, often described by members as “people power”. Interview participants revealed that this voluntary approach strengthened intrinsic motivation because participation was driven by moral commitment and ecological awareness rather than financial obligation. This finding suggests that environmental participation within the organization is strongly value-oriented, where moral and spiritual commitment become the primary driving forces for collective environmental action. However, from the perspective of Sherry Arnstein (1969), the absence of direct financial contributions may also indicate that members do not yet possess full ownership or control over the program. Consequently, limited financial participation may constrain the transition toward higher levels of participation, such as delegated power or citizen control, because communities remain dependent on external funding structures and institutional support. This finding is consistent with the argument of Rodríguez Bolívar et al. (2016), who emphasized that financial contributions to natural resource management can strengthen long-term participation, accountability, and program sustainability. Theoretically, this finding reveals a paradox in youth environmental movements: voluntary, spiritually driven participation produces strong intrinsic motivation, yet simultaneously constrains the transition toward higher levels of participatory agency, because resource dependency on external institutions limits members’ ownership and decision-making authority structurally positioning participation at the tokenism level rather than delegated power or citizen control. Practically, LSM-TL should establish an internal environmental solidarity fund to gradually build resource autonomy while preserving the moral character of voluntary participation. Additionally, the organization should negotiate co-management agreements with institutional partners that explicitly delegate decision-making authority to youth members ensuring external financial support does not come at the cost of participatory agency.

3.3 Ecological and social Outcome of the Reforestation Program

The ecological and social outcomes of the LSM-TL reforestation program reflect the interconnectedness of two key elements. The first is the ecological spirituality dimension of Laudato Si', which aims to shape the youth’s environmental attitudes. The second is that youth environmental attitudes mediate various forms of youth participation in reforestation programs to produce ecological and social outcomes within the context of the Laudato Si' Movement in Timor-Leste. Therefore, the ecological and social outcomes such as:

A. Land Suitability Assessment

Land suitability assessment is a fundamental factor in determining the success of reforestation programs because it directly influences plant growth rates and survival. In the context of the reforestation program implemented by the Laudato Si' Movement Timor-Leste, land suitability analysis is crucial to ensure that the vegetation species planted align with local biophysical conditions such as soil type, water availability, and slope gradient. The Results of Land Suitability Assessment in Table 6.

Table 6. Results of Land Suitability Assessment

Factors	Field Condition Criteria Results (A)	Field Condition Criteria Results (B)	Class	
			A	B
Soil Type (Texture)	**Rocky and sandy** (Coarse texture with many rock fragments; low water-holding capacity and nutrient content)	**Sandy loam** (The soil texture is suitable for plant growth and has moderate water-holding and nutrient-holding capacity)	S3	S1
Soil Fertility	**Moderate** (Nutrient levels are sufficient for plant growth with proper management)	**Moderate** (Nutrient levels are sufficient to support plant growth, but management is still required)	S2	S2
Water Availability/Drainage	**Moderate** (Adequate water availability, flooding is rare; adequate water availability, flooding is rare)	**Moderate** (Drainage is fairly good; water availability is sufficient for plant growth)	S2	S2
Slope Gradient (%)	**17,63%** (Including slopes (15–25%), prone to erosion)	**21,226%** (Includes slopes (15–25%), which are prone to erosion and therefore require soil conservation)	S3	S3
Current Land Cover	**Shrub** (Natural vegetation consisting of shrubs that can still be rehabilitated)	**Shrub** (Natural vegetation consisting of shrubs that can still be restored through rehabilitation or planting)	S2	S2
Erosion Risk	**Low** (No significant erosion channels found on the soil surface)	**Low** (No signs of significant erosion, such as erosion gullies or exposed soil)	S1	S1
Final Land Suitability Assessment Class			**S3 (Marginally Suitable)**	**S3 (Marginally Suitable)**

Source: Field Research Findings (2026)

1. Soil Type (Texture)

Field observations revealed differences in soil texture between the two study locations, which may influence the suitability of the sites for plant growth and reforestation activities. Location A was characterized by a stony and sandy soil texture classified as Class S3, whereas Location B had a sandy loam texture classified as Class S1. The findings showed that Location B possessed more favorable physical conditions for plant growth

compared to Location A. Observations further indicated that the sandy loam soil in Location B had better moisture retention and supported denser vegetation growth, while the stony and sandy soil in Location A appeared drier and less capable of maintaining soil moisture under similar environmental conditions.

The findings indicate that soil texture plays an important role in determining land suitability for plant growth and reforestation programs. Location B, which was dominated by sandy loam soil classified as Class S1, demonstrated more favorable conditions for vegetation growth than Location A, which was characterized by stony and sandy soil classified as Class S3. Sandy loam soil generally provides better water retention, aeration, and nutrient availability, which support root development and improve vegetation productivity. In contrast, stony and sandy soils tend to have lower water-holding capacity and limited nutrient retention, making them less suitable for sustaining plant growth, particularly under dry environmental conditions. This finding is consistent with Alghamdi et al. (2023), who explained that sandy soils commonly experience rapid water infiltration and low nutrient retention, thereby reducing their suitability for agricultural and reforestation productivity. In contrast, Daraei et al. (2024) demonstrated that sandy loam soil possesses better physical and chemical properties for retaining soil moisture and nutrients, contributing positively to root growth and crop productivity.

2. Soil Fertility

Field observations and soil analysis revealed that soil fertility conditions at both study locations were classified within the moderate suitability category (Class S2). The findings showed that the soils at both locations still contained essential nutrients capable of supporting plant growth and reforestation activities. However, the observations also indicated that soil quality and nutrient availability had not yet reached optimal levels for maximum vegetation productivity. Several areas demonstrated moderate vegetation growth, suggesting that plant development was possible under existing conditions, although long-term growth performance appeared to vary depending on local soil characteristics and environmental management practices.

The findings indicate that soil fertility conditions at both study locations fall within the moderate suitability category (Class S2), suggesting that the soils can support plant growth but have not yet reached optimal fertility levels for maximum productivity. Moderate soil fertility reflects the presence of essential nutrients required for vegetation growth; however, nutrient availability and overall soil quality may still be insufficient to sustain high levels of plant productivity without additional management interventions. In the context of reforestation, these conditions imply that plant growth can occur relatively well, although long-term productivity and survival rates may depend on appropriate soil management practices. This finding is consistent with Tang (2024), who explained that soil fertility is closely related to the soil’s capacity to provide essential nutrients necessary for plant growth and productivity. The study further emphasized that soils with moderate fertility generally require additional management strategies such as fertilization, organic matter enrichment, and sustainable soil conservation practices to improve nutrient availability and optimize vegetation growth.

3. Water Availability/Drainage

Field observations and environmental assessments revealed that water availability at both study locations was classified within the moderate suitability category (Class S2). The findings showed that groundwater and soil moisture conditions at both locations were still sufficient to support plant growth and survival. However, observations also indicated that water accessibility had not yet reached optimal conditions for maximum vegetation productivity. Several areas experienced relatively dry soil conditions during periods of limited rainfall, suggesting that water availability fluctuated depending on seasonal environmental conditions. Despite these limitations, vegetation at both locations was still able to grow under existing moisture conditions, although growth performance varied across sites.

The findings indicate that water availability at both study locations falls within the moderate suitability category (Class S2), suggesting that groundwater and soil moisture conditions are still capable of supporting plant growth but are not yet optimal for maximum vegetation productivity. Moderate water availability means that plants can still obtain sufficient moisture for growth and survival; however, limitations in water accessibility may reduce plant performance, particularly during dry periods or seasons with limited rainfall. In reforestation programs, water availability is an important ecological factor because it directly influences root development, nutrient uptake, and long-term plant survival. This finding is consistent with De Jong Van Lier (2025), who explained that soil moisture conditions and

water accessibility within the root zone strongly influence plant water availability and vegetation productivity. The study further emphasized that soils with moderate water availability may still support plant growth, although additional water management practices and soil conservation measures are often required to maintain stable moisture conditions and improve long-term productivity.

4. Slope Gradient (%)

Field observations and topographic measurements revealed that the slope gradients at both study locations ranged between 15–25% and were classified within the steep slope category (Class S3). The findings showed that both areas possessed uneven land surfaces with relatively steep inclinations that may influence land stability and vegetation growth. Observations further indicated signs of surface runoff and soil displacement in several sections of the sites, particularly during periods of rainfall. These conditions suggest that both locations are environmentally vulnerable and may experience limitations for sustainable land use and reforestation activities if proper land management practices are not implemented.

The findings indicate that the slope gradients at both study locations fall within the steep category (15–25%) and are classified as S3, suggesting that these areas are vulnerable to erosion and may pose limitations to sustainable land use and reforestation programs. Steep slopes generally increase the velocity of surface runoff, reduce water infiltration, and accelerate the removal of topsoil, thereby decreasing soil stability and nutrient availability required for vegetation growth. In the context of reforestation, these environmental conditions may negatively affect seedling establishment, root stability, and long-term plant survival if erosion control measures are not properly implemented. This finding is consistent with Alghamdi et al. (2023), who explained that sandy and rocky soils exhibit rapid water infiltration and low nutrient retention, thereby reducing reforestation productivity. The steep slope gradients (15–25%) align with Bai et al. (2024), who found that slopes within this range carry moderate to severe erosion risk, making them important limiting factors in land management and environmental restoration programs. These limiting conditions exist because both sites are located on hillslopes with naturally poor edaphic characteristics, a rocky substrate at Location A, and steep gradients at both locations, which structurally reduce water retention, nutrient availability, and root stability. This explains why even with active youth participation in planting and maintenance, ecological outcomes remain constrained by biophysical factors beyond organizational control. Theoretically, this finding demonstrates that ecological outcomes in youth movement reforestation are jointly determined by biophysical land conditions and participatory effort an important qualification for the ESYPESO Framework. Practically, future reforestation programs should conduct land suitability assessments before site selection, prioritizing S1 or S2 classified areas, or implementing soil improvement measures before planting in S3 classified sites.

5. Current Land Cover

Field observations revealed that land cover at both study locations was dominated by shrub vegetation and classified within the moderate suitability category (Class S2). The findings showed that both areas still retained natural vegetation cover despite indications of environmental degradation in several sections of the sites. Observations further indicated that shrub vegetation was distributed across large portions of the study areas and contributed to partial soil protection and vegetation growth. In several locations, the presence of shrubs appeared to support the emergence of smaller plant species and reduced visible soil exposure, suggesting ongoing natural ecological recovery processes.

The findings indicate that land cover at both study locations is dominated by shrub vegetation and classified as moderate suitability (Class S2), suggesting that the areas still retain natural vegetation and possess considerable potential for ecological rehabilitation and reforestation. The presence of shrub vegetation reflects an early stage of natural ecological succession, which can contribute positively to ecosystem recovery by protecting soil surfaces, reducing erosion, and supporting the gradual establishment of more complex vegetation communities. In degraded landscapes, shrub cover may function as an important transitional vegetation type that facilitates environmental restoration and ecological stabilization. This finding is consistent with Guo et al. (2025), who found that shrub vegetation can improve vegetation diversity while enhancing soil physical and chemical properties. Shrub-dominated land cover may also contribute to increased soil organic matter, improved moisture retention, and greater ecological stability, thereby creating more favorable conditions for plant growth and ecosystem recovery. Similarly, Yang et al. (2025) emphasized that the presence of natural vegetation plays a crucial role in controlling land

degradation and supporting vegetation restoration efforts.

6. Erosion Risk

Field observations and environmental assessments revealed that the erosion risk at both study locations was classified as low (Class S1). The findings showed that soil conditions at both locations remained relatively stable and had not yet experienced significant soil erosion or severe land degradation. Observations further indicated that vegetation cover was still sufficiently maintained across large portions of the study areas, contributing to reduced visible soil loss and improved soil surface protection. Although several sections of the sites possessed steep slope characteristics, signs of major erosion such as deep gullies or extensive topsoil removal were not prominently observed during field assessments.

The findings indicate that the erosion risk at both study locations is classified as low (Class S1), suggesting that current land conditions have not yet experienced significant soil erosion or severe land degradation. Low erosion risk generally reflects relatively stable soil conditions, adequate vegetation cover, and limited rates of soil loss, which support the sustainability of vegetation growth and land rehabilitation efforts. In the context of reforestation, these conditions provide favorable initial conditions for plant establishment and ecosystem recovery because soil stability remains relatively well maintained. This finding is consistent with Siswanto et al. (2023), who explained that areas with mild erosion typically experience relatively low soil loss rates and have not yet suffered serious impacts on land quality and ecosystem function.

Based on the overall evaluation of land characteristics, both study locations fall within the S3 land suitability class (marginal suitability). This classification suggests that the land can still be utilized for reforestation and vegetation growth; however, several significant limiting factors may reduce productivity and increase management challenges. The primary limiting factors identified in the study include unfavorable soil texture conditions at Location A and steep slope gradients at both locations. These factors may influence water retention, nutrient availability, root development, and erosion vulnerability, thereby affecting the effectiveness and sustainability of reforestation efforts. Theoretically, this study contributes to the literature on land suitability and ecological restoration by demonstrating that soil texture, soil fertility, water availability, slope gradient, land cover, and erosion risk are interconnected ecological factors influencing the effectiveness of reforestation programs. The findings strengthen the understanding that land suitability assessment plays an important role in determining vegetation growth, ecosystem recovery, and long-term restoration sustainability within marginal environments. The findings suggest that reforestation programs in Timor-Leste should prioritize site-specific land management strategies, including soil conservation, erosion control, water management, and the selection of adaptive vegetation species suited to local environmental conditions. Strengthening ecological monitoring and sustainable land management practices may improve vegetation survival and support long-term environmental rehabilitation in degraded landscapes.

B. Tree Species and Survival Rate (%)

Field observations were conducted at two reforestation sites in the Comoro area of Dili: Kruz Tolu Golgota Hill and Papa João Paulo II Statue Hill. These reforestation sites were implemented across different planting years (2021, 2024, and 2025). Field data showed variations in tree species composition and survival rates across both locations. The dominant tree species identified included neem (*Azadirachta indica*), mahogany (*Swietenia mahagoni*), casuarina (*Casuarinaceae*), mango (*Mangifera indica*), pine, and bodhi (*Ficus religiosa*). Based on field observations, plant survival rates generally ranged from moderate to high, between 50% and 80%. Field data further showed that at Kruz Tolu Golgota Hill, neem trees demonstrated the highest survival rate (80%), while mahogany trees showed lower survival rates ranging from 50% to 66.67%. Meanwhile, at Papa João Paulo II Statue Hill, pine trees showed the highest survival rate (75%), followed by neem trees (60–66.67%), whereas bodhi trees showed the lowest survival rate (50%). In areas such as Kruz Tolu Hill Golgota and the Statue of Papa João Paulo II, which have hilly topography, the risk of erosion and groundwater loss is relatively higher, thereby affecting the soil's ability to support young plants. In addition, intense sunlight and high temperatures also increase evaporation rates, which can cause water stress in plants. The vegetation at the reforestation site can be seen in Figure 8.

The findings indicate that the reforestation sites remain within the early stages of ecological succession, where species with higher tolerance to environmental stress dominate restoration areas before gradually being replaced by more environmentally sensitive species. Survival rates ranging from 50% to 80% suggest moderate to high restoration success during the initial stages of

ecosystem recovery, although the ecosystem has not yet reached a fully stable ecological condition. The high survival rate of neem (*Azadirachta indica*) reflects the adaptive characteristics of pioneer species capable of tolerating drought stress, poor soil conditions, and semi-arid environmental conditions. In contrast, species such as mahogany (*Swietenia mahagoni*) and bodhi (*Ficus religiosa*) demonstrated lower survival rates because they generally require more stable soil moisture conditions, higher organic matter content, and more fertile soils for successful establishment. This finding is consistent with Hernandez et al. (2024) and Zuhri et al. (2026), who emphasized that species selection based on drought tolerance and adaptive functional traits is a key factor determining restoration success in dry tropical ecosystems. In contrast, the lower survival rates of *Swietenia mahagoni* and *Ficus religiosa* align with Daraei et al. (2024), who found that species requiring stable moisture and nutrients perform poorly in soils with limited water-holding capacity. This species-specific variation in survival rates occurs because different tree species possess fundamentally different physiological adaptations to water stress and soil nutrient limitations. Neem's high drought tolerance including water-use efficiency and resistance to water deficits enables it to thrive under marginal S3 conditions, while mahogany and bodhi require more stable edaphic conditions that neither site currently provides Neem trees possess high drought tolerance, efficient water-use mechanisms, and strong adaptability to degraded environmental conditions, which likely contributed to their higher survival performance at the study sites. Similarly, the findings reinforce ecological succession theory by demonstrating that early restoration stages are commonly dominated by pioneer species capable of surviving under stressful environmental conditions before ecological stabilization allows more sensitive vegetation to establish. Theoretically, these findings qualify the ESYPESO Framework by demonstrating that ecological outcomes are not solely determined by participatory effort but are significantly mediated by species-environment fit. Practically, future reforestation programs should prioritize drought-tolerant pioneer species in early planting phases, while introducing more sensitive species only after soil conditions have been improved through erosion control and organic matter enrichment.

Figure 8. Vegetation at Reforestation Site
Source: Authors' Documentations (2026)

The findings also demonstrated that biophysical land conditions strongly influence reforestation outcomes. Factors such as sandy and stony soil texture, steep slope gradients, limited soil organic matter, and moderate water availability reduced root development and increased environmental stress on planted seedlings. This observation aligns with Bretreger et al. (2022) and the Intergovernmental Panel on Climate Change (2023), which highlighted that high temperatures, prolonged drought, and increased evapotranspiration rates significantly affect vegetation survival and ecological restoration efforts in climate-vulnerable landscapes. The current study suggests that environmental limitations combined with insufficient post-planting maintenance may reduce long-term restoration success despite strong community participation and ecological commitment.

Informants explained that reforestation activities implemented by Laudato Si' Movement Timor-Leste involved youth volunteers, local communities, church representatives, and environmental activists who participated in planning, planting, and monitoring activities. Interviews revealed that planting activities were generally conducted collectively during the rainy season to improve soil moisture availability and seedling survival. Participants were divided into working groups responsible for land preparation, seedling transportation, planting, watering, and monitoring activities. Furthermore, the findings indicate that post-planting management and community involvement are essential components influencing reforestation sustainability. Monitoring activities, seedling replacement, irrigation during dry periods, and collaborative maintenance efforts contributed positively to plant survival and ecosystem recovery. However,

challenges such as livestock grazing, limited irrigation access, insufficient fertilization, and constrained maintenance capacity continued to affect restoration effectiveness. These findings reinforce previous studies emphasizing that long-term ecological restoration success depends not only on planting activities but also on continuous management, monitoring, and adaptive restoration strategies. The community's livestock can be seen in Figure 9.

Figure 9. Community Livestock
Source: Authors' Documentations (2026)

Field observations and interviews with local communities revealed that neem trees were recognized for their function as natural botanical pesticides, while pine trees were valued for their role in reducing erosion and stabilizing slopes through their extensive root systems. The neem tree can be seen in Figure 10.

Figure 10. Neem Tree (*Azadirachta indica)*
Source: Authors' Documentation (2026)

The findings also highlight the multifunctional ecological benefits of restoration species perceived by local communities. Neem trees were recognized for their role as environmentally friendly botanical pesticides, supporting sustainable agricultural practices and reducing dependence on chemical inputs. This finding is consistent with previous studies showing that neem contains bioactive compounds functioning as natural biocontrol agents while contributing positively to soil quality improvement, whereas pine species possess adaptive root systems that enhance water absorption efficiency and support slope stabilization and erosion control in restoration landscapes (Wahjono et al. 2024; Fang et al. 2026). These ecological functions strengthen the value of reforestation programs not only for ecosystem restoration but also for supporting local environmental resilience and sustainable land management. Theoretically, this study contributes to the literature on ecological restoration and succession by demonstrating that tree survival and restoration success in reforestation areas are strongly influenced by species adaptability, environmental conditions, and post-planting management. The findings strengthen the understanding that pioneer species with high drought tolerance, such as neem and pine, play an important role in the early stages of ecosystem recovery within degraded and semi-arid landscapes. In practice, the findings suggest that reforestation programs should prioritize adaptive species selection, continuous monitoring, irrigation management, and community participation to improve long-term restoration success. Integrating local ecological knowledge and sustainable maintenance practices may further strengthen ecosystem recovery, erosion control, and environmental resilience in restoration areas. However, it should be noted that this study does not employ a longitudinal or before-and-after design. The findings reflect members' perceptions and ecological conditions at the time of data collection and do not capture temporal changes in behavior or vegetation outcomes over time. Future research should adopt a longitudinal approach to more rigorously assess behavioral and ecological change.

C. Tree Locality and Local Wisdom

Field observations conducted at Bukit Kruz Tolu Golgota and Bukit Patung Papa João Paulo II in Dili revealed that aspects of locality and local wisdom play an important role in supporting reforestation and environmental conservation activities. Both locations demonstrated a high degree of vegetation suitability to local biophysical conditions, characterized by the dominance of local species such as eucalyptus. Interviews with local communities surrounding the reforestation sites further revealed that eucalyptus trees are commonly utilized for basic household needs, including firewood collection and small-scale resale to support household income. Informants explained that the utilization of *eucalyptus* trees

had not yet been optimized because community knowledge regarding the plant's broader economic and health-related benefits remained limited. The whitewood tree can be seen in Figure 11.

Figure 11. Whitewood (*Eucalyptus*)
Source: Authors' Documentations (2026)

The findings indicate that locality and local wisdom play an important role in supporting community-based reforestation and environmental sustainability within the study areas. The dominance of local vegetation species such as eucalyptus demonstrates a high level of ecological adaptation to local biophysical conditions and highlights the importance of using locally suitable species within restoration programs. The findings also suggest that local communities maintain a practical relationship with surrounding natural resources, where eucalyptus trees continue to provide economic support through firewood collection and small-scale household income generation. However, the utilization of eucalyptus resources remains relatively limited because community understanding of the plant's broader economic and health benefits has not yet been fully developed.

Field observations and interviews also showed that local wisdom functioned as an important social mechanism supporting environmental protection at both locations. Community members described the existence of social norms prohibiting illegal logging and activities that damage vegetation within the reforestation areas. Informants explained that these customary practices strengthened collective environmental awareness and encouraged local communities to participate in protecting the rehabilitated environment. In addition, the findings showed that reforestation areas were utilized not only for ecological restoration but also for social and spiritual activities. Communities used the sites as areas for pilgrimage, prayer, jogging, and limited collection of dry firewood without damaging living vegetation. The interviews further indicated strong community support for conservation activities and active participation in protecting and sustainably utilizing the rehabilitated areas. The "Prohibition" sign can be seen in Figure 12.

Figure 12. Prohibition Sign
Source: Authors' Documentations (2026)

The findings also demonstrate that local wisdom functions as an effective social control mechanism supporting environmental conservation. Social norms prohibiting illegal logging and destructive environmental practices strengthened collective ecological responsibility and encouraged sustainable management of reforested areas. This observation is consistent with Munafi et al. (2022), who demonstrated that local wisdom and customary rules function as effective social control mechanisms in forest conservation and the prevention of forest degradation. The integration of sacred site functions pilgrimage, prayer, and recreation with reforestation areas further aligns with research showing that multi-functional landscape management strengthens community attachment and long-term conservation commitment. Local wisdom functions as an effective conservation mechanism because social norms prohibiting illegal logging carry community-enforced moral authority, making compliance more robust than externally imposed regulations. When communities perceive reforestation areas as culturally and spiritually significant spaces, they develop a sense of collective stewardship that extends beyond formal organizational membership, explaining the high level of community support observed at both sites. Theoretically, this finding contributes to the community-based natural resource management literature by demonstrating that integrating local wisdom and spiritual significance into reforestation programs strengthens social control mechanisms and promotes long-term ecological sustainability. In practice, LSM-TL should formally document

and incorporate local ecological knowledge into program design, including the identification of culturally appropriate species and community-sanctioned land-use norms, to strengthen community ownership of reforestation outcomes.

Theoretically, this study contributes to the literature on local wisdom and community-based environmental conservation by demonstrating that local ecological knowledge, customary norms, and the use of adaptive local species are important for supporting sustainable reforestation and environmental protection. The findings strengthen the understanding that local wisdom functions not only as a cultural value system but also as a social mechanism that shapes collective environmental responsibility and sustainable resource management. The findings suggest that reforestation programs should integrate local species, community knowledge, and customary conservation practices to strengthen ecological sustainability and community participation. Strengthening environmental education and sustainable utilization of local resources may further improve environmental awareness, local livelihoods, and long-term conservation effectiveness within community-based restoration areas.

4 CONCLUSION

The central question driving this study was whether and how ecological spirituality within a youth organization could meaningfully shape environmental attitudes, participatory behavior, and ecological outcomes in a context of deforestation threat, such as Timor-Leste. Three core findings, scientific contributions, and differentiated implications are presented below.

The three dimensions of Laudato Si' ecological spirituality; spiritual, lifestyle, and societal operate as interconnected psychological mechanisms of values internalization that progressively transform individual moral awareness into collective environmental action. This sequential transformation explains why LSM-TL members engage in reforestation as a spiritually grounded obligation rather than a technical activity. However, despite strong spiritual motivation, youth participation remained predominantly consultative (Arnstein’s tokenism level), constrained by centralized decision-making and limited resource autonomy revealing that spiritual motivation alone is insufficient without supportive organizational structures. Ecologically, both reforestation sites were classified as marginally suitable (S3), with survival rates of 50%–80%, where pioneer species such as neem outperformed environmentally sensitive species under marginal biophysical conditions.

This study makes three contributions. First, the ESYPESO Framework proposes an integrated causal model linking ecological spirituality, environmental attitudes, participatory behavior, and ecological outcomes resolving theoretical fragmentation across prior studies. Second, it empirically demonstrates how Laudato Si'-inspired spiritual values function as a psychological mechanism that reshapes environmental identity and drives pro-environmental behavior among youth. Third, it contributes to ecological succession theory by showing that restoration success under marginal conditions depends on the interaction among species adaptability, biophysical conditions, and post-planting community management.

For academic researchers, future studies should adopt longitudinal designs, apply the ESYPESO Framework comparatively across multiple youth movement contexts, and quantitatively test causal relationships using structural equation modeling. For policymakers in Timor-Leste, youth environmental association such as LSM-TL should be formally recognized as strategic partners in national reforestation programs, with governments providing participatory decision-making authority and mechanisms for resource sharing. For practitioners, reforestation programs should integrate spiritual formation, adaptive species selection, and community-based maintenance structures to improve long-term restoration outcomes. The findings are drawn from a small-scale sample of 23 informants from a single organization (LSM-TL) across two reforestation sites in Dili, Timor-Leste. The result should be interpreted with caution, as they are not intended to be generalized beyond this specific context.

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