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Community Environmental Leadership and Sustainability: Building Knowledge from the Local Level

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Community Environmental Leadership and Sustainability: Building Knowledge from the Local Level

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Abstract: The objective of the study was to document an experience of training community environmental leaders in the context of sustainable development in localities surrounding the Chautengo Lagoon, Guerrero, Mexico. Specifically, we explored the epistemological, theoretical, deontological, and pedagogical-didactic components that must be considered when designing a training process for community environmental leaders in rural contexts. A mixed, descriptive, transversal approach was used to articulate scientific knowledge with local knowledge. Twelve semi-structured interviews identified potential environmental leaders, while 19 surveys assessed training needs. Subsequently, a tailored capacity-building program was designed, implemented, and evaluated, which assessed empirical knowledge of communities and sustainable practices. A total of 19 leaders with organizational and mobilization skills were trained, successfully engaging 1,500 people in an environmental cleanup campaign. The program covered key topics such as sustainable development management, environmental education for sustainability, and local governance, resulting in the formation of an environmental advocacy committee. Participants rated the program positively for its design (90%), content, materials, facilitator performance (71%), and duration (67%). This study contributes to the understanding of community environmental leadership in Latin America highlighting the value of local knowledge as a tool for environmental governance and sustainable social change. Our findings suggest that strengthening community leadership with participatory methodologies can improve environmental awareness, community resilience, and long-term ecological conservation. The program can be replicated in vulnerable communities in other contexts and positively impact local governance.

Keywords: education for sustainability; community environmental leadership; sustainable development; local knowledge; Latin American community empowerment

1. Introduction

Environmental leadership has become increasingly relevant as a tool for advocacy, mobilization, and the promotion of social and environmentally just realities. Also referred to as sustainability leadership, it addresses complex challenges by integrating political, economic, social, and environmental dimensions [**1–3**]. In this context, the construction of knowledge from the local level emerges as a key process to promote conservation strategies that respond to the specific socio-environmental realities of each territory.

One pressing issue is the degradation of natural ecosystems, particularly wetlands, which face biodiversity loss and environmental deterioration [**4–10**]. These challenges require not only the implementation of public policies, but also the strengthening of local capacities through participatory

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processes that value traditional knowledge and community experience. Rural communities, as the main guardians of their territories, possess empirical knowledge that, when combined with academic approaches, enhances sustainable environmental management.

The area that includes Chautengo Lagoon and Pico del Monte community in southern Mexico exemplifies these challenges, suffering from deforestation, overfishing, pollution, and unsustainable agricultural and tourism activities. Despite existing activism, *weak* environmental awareness among local communities has limited conservation efforts. This study explores the role of community environmental leadership as a strategy to enhance local environmental governance through collaboration among activists, rural communities, local authorities, and academia.

1.1. Leadership and Sustainability

Leadership is commonly defined as a set of qualities, behaviors, skills or processes through which individuals influence groups to achieve common goals [**11,12**]. Various leadership styles have been identified, including situational, servant, transactional, transformational, autocratic, democratic, charismatic, and distributed leadership [**13,14**]. Of relevance to environmental initiatives are transactional leadership, which focuses on power and goal-setting, and transformational leadership, which fosters commitment and long-term collaboration [**14,15**].

Liefferink and Wurzel [**16**] categorize environmental leaders into four types: structural, entrepreneurial, cognitive, and exemplary, while Liao [**17**] highlights ecological transformational leadership, sustainable and moral leadership promote sustainability va-lues, all of them are essential for fostering environmental actions. Boeske [**18**] revealed that sustainability, sustainable and environmental leadership share values, attitudes, moral and ethical beliefs.

Four key factors influence environmental leadership: culture, governance, empo-werment, and motivation. Culture shapes social consciousness and can either drive or limit environmental change [**2**]. Governance models that blend various styles can enhance sustainability and facilitate policy implementation [**19,20**]. Empowerment arises from participation and local knowledge, fostering autonomy in decision-making [**21**], while motivation, both intrinsic and extrinsic, plays a crucial role in achieving sustainability goals [**22**].

1.2. Sustainable Development and Community Leadership

The concept of sustainable development, introduced in the Brundtland Report, emphasizes meeting present needs without compromising future generations [**23**]. Sustainability is defined as the harmonization of economic, social, and environmental dimensions, requiring value-based management that respects ecological limits [**24**]. The 2030 Agenda for Sustainable Development, which includes 17 Sustainable Development Goals (SDGs), underscores the need for local action and multi-stakeholder collaboration [**25**]. This study aligns with SDG 15 (Life on Land) by promoting sustainable leadership models that integrate community participation, local governance, and academic support [**26**].

1.3. Environmental Education and Leadership Training

Training community environmental leaders is fundamental for fostering grassroots conservation efforts. Environmental education programs aim to raise awareness, build values, and develop skills for sustainable living [27,28].

Due to its importance in constructing knowledge through experience in problem-solving, this work is complemented by the theoretical foundations of Tovar Galvez [**29**] and the methodology for designing a training program by Nieto & Buendia [**30**], who propose a four-stage process for designing environmental leadership programs: (1) Contextualization, which links training to local environmental issues; (2) Structuring, which defines content and methodologies; (3) Programming, which organizes logistics and re- sources; and (4) Evaluation, which assesses learning outcomes.

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Learning models from Piaget's cognitivism, Vygotsky's socio-constructivism, and Freire's critical pedagogy suggest that experience-based learning and participatory me-thodologies are effective in shaping environmental leaders [31,32].

Environmental leadership plays an essential role in environmental preservation by developing strategies for its conservation [**33**]. Hence, it is important to strengthen its knowledge. The following studies reveal significant insights into the nature of environmental leadership in different geographical and cultural contexts (Table 1). All of them highlight the relevant role that leaders play in promoting social change and sustainability.

Table 1. Review of studies that describe the role and predominant styles of environmental leadership.

Title	Authors & Year	Methodology	Sample	Key Findings
Youth and Environmental Action [**34**]	Arnold et al. (2009)	Qualitative interviews	12 young leaders (Canada)	Formative influences on youth activism
Leadership Styles of Rural Leaders **[19]**	Springer et al. (2020)	Multifactor Leadership Questionnaire	49 community leaders (Poland)	Transactional leadership predominates
Leadership Style and Gender [**35**]	Martínez-León et al. (2020)	Multifactor Leadership Questionnaire	114 cooperatives (Spain)	No gender difference in leadership styles
Collaborative and Transformational Leadership [**36**]	Ardoin et al. (2014)	Narrative interviews	12 leaders (USA)	Collaborative and transformational leadership key
Predominant Leadership in Environmental Education [**37**]	Reyes & Rojas (2017)	Qualitative questionnaire	5 organizations (Mexico)	Transformational and collaborative styles dominate
Foundations for Training Environmental Leaders [**38**]	Tovar-Gálvez (2012a)	Literature review	Theoretical framework	Framework for leader training
Agencies, Educators, Communities, and Wildfire [**39**]	Monroe et al. (2015)	In-depth interviews	7 youth programs (USA)	Community-driven projects empower youth
Environmental Leadership School of Sumaco [**40**]	Torres (2011)	Systematized experience	75 leaders (Ecuador)	Leaders develop socio-environmental solutions
Towards a Contextualized Citizen	Tovar-Gálvez (2012b)	Literature review	Theoretical analysis	Contextualized citizen education essential

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Environmental Education [**29**]				
Impact of Green Transformational Leadership in Hotels [**41**]	Suliman et al. (2023)	Quantitative questionnaire	347 hotel employees (Egypt)	GTL enhances engagement & performance
Managers' Green Transformational Leadership in Firms [**42**]	Özgül & Zehir (2023)	Survey	315 firms (Turkey)	GTL boosts financial and green innovation
Green Transformational Leadership in SMEs [**43**]	Perez et al. (2023)	Quantitative questionnaire	SMEs (Pakistan)	GTL fosters sustainability in SMEs
Transformational Leadership and Pro-Environmental Behavior [**44**]	Ren et al. (2024)	Repeated questionnaires	350 employees (China)	ESTL promotes pro-environmental behavior
Leadership Styles in Aerospace Multinationals [**45**]	García Martín et al. (2023)	Case studies & survey	35 leaders (India & Europe)	Servant leadership for long-term sustainability
Impact of Green Servant Leadership in SMEs [**46**]	Shah et al. (2023)	Questionnaires	430 SMEs (Pakistan)	GSL strengthens pro-environmental behaviors
Transformational Leadership and ESG Performance [**47**]	Zhu & Huang (2023)	Survey	500 employees (China)	Transformational leadership drives ESG

A key challenge is integrating local knowledge into leadership development **[26].** It is also important that the training of environmental leaders generates proposals from a local perspective integrating traditional knowledge [48–51**]**. This aligns with Mexico's Environmental Education Strategy for Sustainability, which promotes the development of environmental leaders capable of addressing the country's sustainability challenges [**52**].

1.4. Research Objective

This study examines the epistemological, theoretical, and methodological foundations for training community environmental leaders within the context of sustainable development, emphasizing the construction of local knowledge as a critical component of community empowerment. It documents an initiative in communities near the Chautengo Lagoon, Guerrero, Mexico, where nineteen local leaders successfully mobilized 1,500 people for a cleanup campaign. The findings contribute to the understanding of contextualized environmental leadership training and its potential for replication in similar ecological and social settings.

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2. Materials and Methods

2.1. Area and Context of Study

The study was conducted in Chautengo Lagoon, located in the state of Guerrero, Mexico (16º 35' 39" – 16º 38' 36" N; 99º 08' 25" – 99º 02' 48" W), covering 32.5 km². Along its border, there is an area of vegetation colonized by *Rhizophora mangle*, *Avicennia nitida, Laguncularia racemosa* and *Conocarpus erectus* (red, black, white and buttonwood mangrove respectively). In addition to *Spartina alterniflora and Arecaceae* (coconut palm).

The study population comprised residents from eight communities: El Medano, Pico del Monte, Los Tamarindos, Chautengo, Llano de la Barra, Estero del Marquez, Las Peñas, and La Fortuna, totaling approximately 3,136 inhabitants (National Institute of Statistics and Geography) [**53**]. Environmental degradation, including mangrove deforestation, overfishing, and pollution, threatens local livelihoods, necessitating urgent community-led conservation initiatives. The primary economic activities in these municipalities include agriculture, livestock farming, fishing, aquaculture, commerce, and tourism. The region has a warm, sub-humid climate, characterized by summer rainfall [54–56].

2.2. Type of Research and Procedure

The methodological approach used was mixed, descriptive, and cross-sectional. The research was carried out in three phases, from November 2021 to September 2022 (Figure 1).

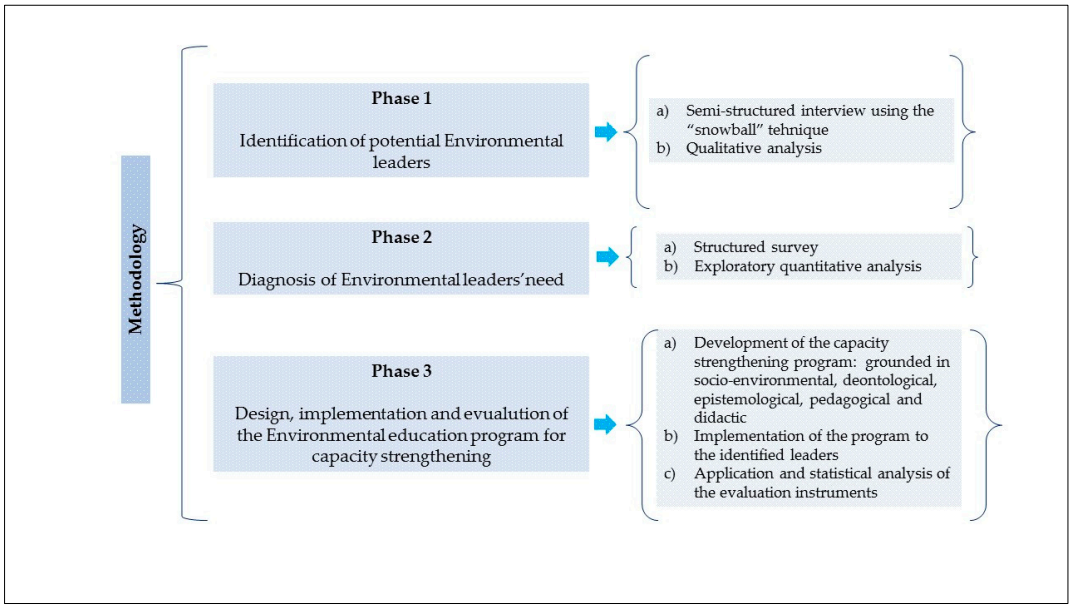

Figure 1. Methodological scheme.

2.3. Phase 1. Identification of Potential Environmental Leaders

An exhaustive documentary review was conducted to identify existing studies on environmental leadership training [1,38–40,57,58**]**. An immersion process was also conducted, consisting of five field visits to Pico del Monte. During these visits, it was possible to explore the characteristics of the place, as well as the ways and lifestyles of the population. The selection of this community was primarily based on its proximity to the Chautengo Lagoon.

During this phase, 12 semi-structured interviews were conducted, using the "snowball" technique to identify the community leaders, as well as their characteristics and the activities they were carrying out in the community and its surrounding areas. Data coding and analysis were carried out using the *Atlas ti* software program.

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After identifying the twelve environmental leaders, a community meeting was organized with fishing cooperatives and residents. During the meeting, topics such as climate change, environmental challenges, and changes in mangrove area over the years 1981, 2010 and 2020 were presented. Data from the United Nations Environment Programme (UNEP) and the National Commission for the Knowledge and Use of Biodiversity by its acronym in Spanish (CONABIO) [7,26,59–61] was used to support the discussion.

At the explicit invitation of other leaders from the region, and considering the importance of this information, it was also presented to the presidents of the fishing cooperatives from the communities of Chautengo, Llano de la Barra, La Fortuna, Las Peñas and El Medano in the Chautengo community, as well as to residents of Llano de la Barra community and the main town of the municipality of Cuautepec.

It is worth mentioning that, on the proposal of this initial group, leaders proposed a cleanup campaign, mobilizing municipal authorities and private-sector sponsors to remove solid waste from the lagoon. This provided an opportunity to observe leadership behaviors in action.

2.4. Phase 2. Diagnosis of Training Needs of Environmental Leaders

Nineteen leaders from the cleanup campaign were invited to participate in an environmental training program. Participants engaged in reflective exercises on local environmental problems and their alignment with the 2030 Agenda for Sustainable Development Goals (SDGs), identifying the specific knowledge gaps and skillsets needed to strengthen their leadership roles.

All of them expressed their agreement with the proposal. We proceeded to the application of 19 structured surveys with a Likert scale, with five intervals ranging from "sometimes" to "always," which allowed us to obtain a Training Needs Diagnosis (TND); this revealed aspects such as environmental activities they had undertaken, their level of organization, their relationship with their community, and of course, which personal areas they believed should be developed and strengthened for better environmental performance. The data obtained was processed using the SPSS software, version 25.

2.5. Phase 3. Development of the Program to Strengthen Capacities

The training program was structured based on Nieto and Buendía's framework **[30]** and tailored to the socio-cultural context of the region, fostering the co-construction of knowledge between facilitators and community leaders.

- ***Contextualization*:** Findings from Phase 1 guided the curriculum design, ensuring relevance to local leadership styles and environmental issues.
- *Structuring*: Content was aligned with training needs, incorporating the historical, economic, and ecological context **[26]**.
- *Programming*: Four four-hour training sessions were scheduled at a local public educational facility. Sessions integrated prior knowledge exploration and interactive strategies to address the climate crisis.
- *Evaluation*: After program completion, 12 surveys (adapted from Stocking et al. [**62**]) were conducted to assess: relevance of content, facilitator expertise, session duration, material effectiveness, and perceived impact on leadership skills.

3. Results

In this section, we present the results to be considered in the training of environmental leaders.

3.1. Identification of the Environmental Leaders

The interviews' results allowed us to identify people in three different occupations: fisherman (3), service provider (5), and public servant (4) who showed concern for and took action to care for the environment.

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3.2. Presentation of Environmental Problems in the Communities

The presentation of environmental issues in the communities helped raise awareness not only among the leaders and presidents of fishing cooperatives but also among the rest of the attending population. This resulted in the addition of leaders from the communities of Chautengo (4), Llano de la Barra (3), Los Tamarindos (2), El Médano (1) from the municipality of Florencio Villarreal; La Fortuna (1) and Las Peñas (2) from the municipality of Copala; and Estero del Marquéz (1), which belongs to the municipality of Cuautepec, which added to the five from the community of Pico del Monte, gave us a total of 19 people interested in strengthening themselves as *community environmental leaders.*

3.3. Cleanup Campaign

Although the cleanup campaign was not the main purpose (it will be reported in another document) of this environmental education process, it did allow us to observe how the 19 people identified as leaders organized and mobilized around 1500 people from eight communities adjacent to the Chautengo Lagoon, as well as various educational ins-titutions in the region. This campaign lasted one week. The leaders were responsible for gathering the population in public spaces (sports fields) in their respective localities; subsequently, they divided the population by gender and occupation and assigned the areas based on their complexity and accessibility (see Figure 2).

Figure 2. Chautengo Lagoon Cleanup Campaign. Source: Original creation.

3.4. Training Needs of Environmental Leaders

The results of the needs assessment showed that the leaders have organizational skills but with areas for improvement; 95% of the leaders expressed the need for training in the following environmental topics: urban solid waste management (18%), ecological conservation (10%), communication (10%), recycling (8%), organic composting (7%), and drafting official documents (5%).

These topics were grouped into three guiding themes, which enabled the establishment of the content of the capacity-building program: environmental issues, management for sustainable development, and environmental education for sustainability.

3.5. Training Program for the Development of Environmental Competencies

With the formal detection of the training needs of individuals selected as environmental leaders, a training program was developed and divided into four sessions.

3.5.1. First Session, August 27, 2022

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Description: Participants collectively reflected on global environmental issues and their local impacts. Concepts such as planetary crisis, climate change, and global warming were discussed. It was shown how to calculate the ecological and carbon footprint, along with recognizing the renewable resources available in each participating locality. Success stories from other places in Mexico and other countries were shared.

Findings: Attendees reflected their direct and indirect roles in modifying their natural environment by overexploiting fishing resources, deforesting mangroves, or undertaking actions contributing to the silting of the lagoon, resulting in fish mortality, among other problems. They also acknowledged that the population is always seeking economic support and that raising awareness will be a complex but not impossible task.

3.5.2. Second Session, September 3, 2022

Description: The session focused on urban solid waste (garbage), including the description, origin, and classification of plastics and microplastics. Emphasis was placed on the reuse of materials, especially cases involving polystyrene foam and plastic that release contaminating particles when exposed to different temperatures. Additionally, the session highlighted the risks posed to animals that mistake these materials for food. Another significant issue of concern was the socio-environmental problems associated with open-air garbage dumps and their implications for communities.

Findings: The leaders discussed actions that communities can undertake to address or mitigate these negative impacts. They proposed organizing workshops to promote waste collection and contribute to environmental change, emphasizing the slogan "It's not my trash, but it's my planet".

Finally, they expressed their interest in forming a non-profit organization aimed at fostering social and environmental change in the communities.

3.5.3. Third Session, September 10, 2022

Description: The session focused on the ecological importance of mangroves. It included discussions on the differences between reforestation and rehabilitation processes, as well as the necessary steps to carry out a safe restoration. Participants were educated about the significance of sanitation efforts and proposed assisted reforestation guided by professionals. An *on-site* practical demonstration was conducted with Californian red worms under the guidance of a professional *composter.*

Findings: The session concluded with plans to launch a mangrove reforestation campaign. Cattle manure from the region was suggested as an organic fertilizer. Additionally, participants agreed to visit Ventanilla, a town in the neighboring state of Oaxaca, to gather information and seek advice on a mangrove reforestation project recognized as a "successful" case.

3.5.4. Fourth Session, September 24, 2022

Description: The session focused on developing critical thinking and assertive communication skills, emphasizing the importance for leaders to reflect on the environmental problems affecting their communities and engaging actively with all levels of government and administrative agencies. Participants were guided on drafting various types of documents to formally request attention to their petitions, including official letters, letters, memorandums, posters, and assembly minutes. The session concluded with a reflection on the practical usefulness of the information covered during the four training sessions, as well as the perspectives on what would follow in their communities with their respective projects.

Findings: To continue with their planned actions, the leaders decided to form a committee consisting of a president, secretary, treasurer, and two members. They aim to formalize this committee as a civil association named "*Environmental Leaders for Sustainability in the Costa Chica*

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region." As their first step, they will seek legal assistance from a lawyer and guidance from a civil association called *Tlali* for advice on the formation and official registration process.

Another action agreed upon was to invite their commissioners to undertake cleanup campaigns, conduct awareness talks, and invite stakeholders engaged in environmental initiatives. To facilitate open and fluid communication, they decided to create a WhatsApp group and add all individuals interested in participating and promoting actions among all the communities involved.

3.6. Evaluation of the Environmental Leaders Training Program in the Context of Sustainable Development

The training program was evaluated by the environmental leaders who attended all four sessions (63%). They were completely satisfied with the course design (90%), the information provided during the sessions (92%), and the materials used in each activity (92%). Likewise, they expressed high satisfaction with the content of the topics covered, with (42%) indicating they were very satisfied and (58%) indicating they were completely satisfied. Regarding the facilitator´s knowledge demonstrated during the course, they were very satisfied (23%) and completely satisfied (71%). They also agreed with the amount of time dedicated to the course for the target population, with (33%) very satisfied and (67%) completely satisfied (Figure 3).

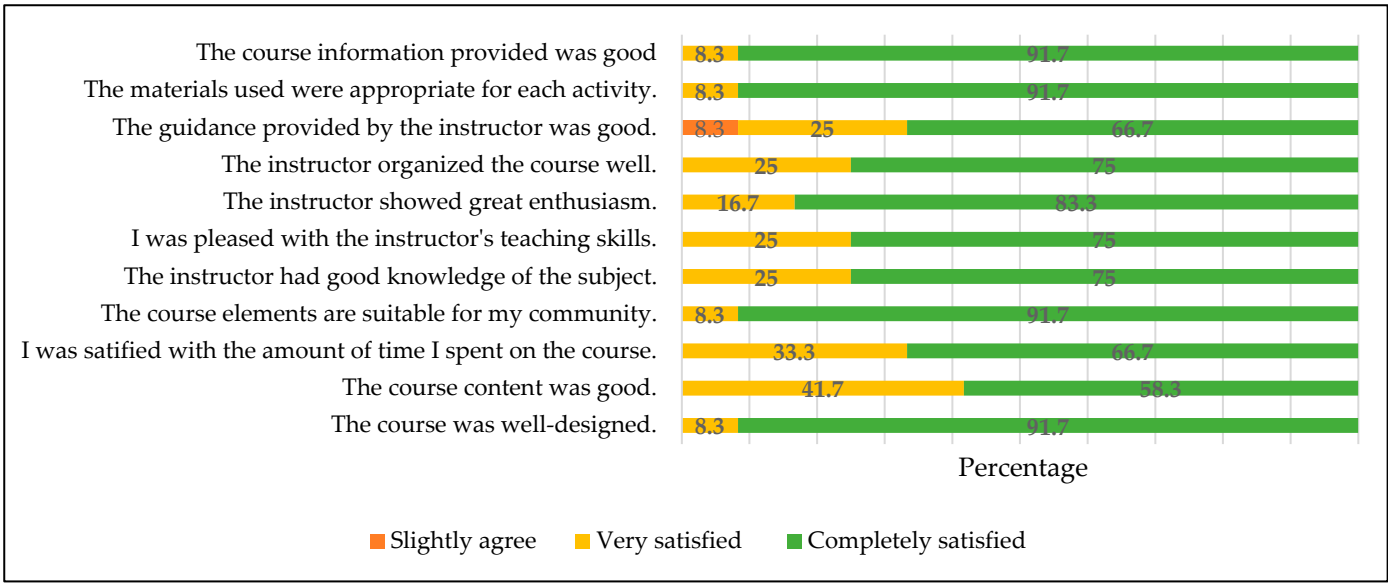

Figure 3. Evaluation of the environmental leaders' training program.

4. Discussion

The following is a description of the general findings identified during the environmental leadership training process:

Three types of environmental actors were identified based on their occupations: fishermen, service providers, and public servants. Each of them has developed their leadership by addressing different environmental issues and positioning themselves within *situational* leadership. The figure of the local fisherman, in particular, stands out for their deep concern for "their lagoon," which is the main source of livelihood for the communities. This deep-rooted connection to the land and water embodies local ecological knowledge and inspires the adoption of sustainable practices within these communities.

The public servants, through their roles, promote compliance with environmental policies, aiming to improve ecosystem health and sustainability. For their part, the participating public service providers tirelessly work on environmental education for visitors, advocating for more responsible environmental practices. They have witnessed firsthand the negative effects of *unsustainable* tourism,

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especially concerning improper waste management—highlight the importance of community-led conservation initiatives.

The study emphasizes the significance of environmental leadership and allows us to witness the transition from an initial transactional leadership to a *situational transformational* style. This evolution was grounded in the co-construction of knowledge between community members and facilitators, where local experiences and traditional practices were integrated with sustainable development principles. Unlike previous studies in Europe and Asia—such as Springer, Walkowiak, and Bernaciak **[19]** in Poland and **Xuejiao Niu et al. [22]** in Taiwan—this study **identifies both intrinsic and extrinsic motivations-** driving environmental leaders in a Latin American context.

Moreover, our findings align with Zhu and Huang [47] and **Li et al.** [64], **who demonstrated that transformational leadership in environmental settings fosters community-wide behavioral change; enhances environmental social governance and strengthens social responsibility [47]. Additionally, transformational leadership along with GTL, ESTL, SL, GSL have been shown to improve pro-environmental behaviors [41–46]. This was particularly evident during the cleanup campaign, where collective action was catalyzed by the leaders' passion and commitment, reinforcing the connection between leadership charisma and environmental motivation. This outcome also parallels the results of Hu et al.** [64]**, who found that sustainable leadership in Taiwanese manufacturing companies enhanced employees' environmental commitment.**

The study confirms the effectiveness of contextualized pedagogical interventions in fostering local environmental awareness and community engagement, as highlighted by Barreto et al. [**65**] in Bogotá and Selby et al. [**66**] in Costa Rica. By embracing participatory learning and respecting community knowledge, the training program created a collaborative space where local leaders became co-creators of environmental solutions rather than recipients of external knowledge. Similarly, the findings align with Jones et al. [**67**], who documented how environmental leadership programs in the UK's Our Bright Future initiative empowered participants to drive meaningful ecological change.

Additionally, the study supports research by Monroe et al. [**39**], which emphasizes school-community collaboration in promoting environmental action. The integration of Training Needs Diagnosis (TND) in this study aligns with Tovar-Gálvez [**29**] and Hintz and Lackey [**57**], demonstrating its value in enhancing community participation and addressing local environmental challenges.

This study contributes to the theory of environmental leadership by integrating situational, transformational, and community-based leadership approaches within a Latin American environmental context. Future research should explore: the long-term impact of environmental leadership training on policy implementation and behavioral change, and the role of gender and generational differences in shaping environmental leadership styles.

One key goal of this training process was to ensure that participants acquired a solid profile that would guarantee the continuity of their role as environmental leaders, as proposed by Torres [**40**]; he also suggests that with the acquired knowledge, participants can identify socio-environmental issues, beginning with a broad approach and subsequently prioritizing specific problems within each community.

5. Conclusions

This community-centered environmental leadership training initiative, framed within the 2030 Agenda for Sustainable Development, began with an immersion process that allowed for direct engagement with local communities and the observation of their environmental challenges and initiatives. As a result, a working group was established to enhance knowledge and skills related to sustainable practices. This initiative fostered intersectoral collaboration between local governments, civil society, and the private sector, leading to tangible actions, such as a cleanup campaign that removed one ton of plastic waste, generating economic benefits for community development.

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The subsequent phase focused on the design and implementation of a community *environmental leadership training program*, tailored to the socio-cultural and ecological characteristics of the region. This program promoted community empowerment, not only among direct participants but also within the broader population. Its implementation successfully engaged municipal governments, civil society organizations, and private sector actors, reinforcing the importance of multi-stakeholder initiatives in environmental governance. The interinstitutional commitment materialized through a cleanup campaign, where the recovered plastic waste was commercialized, generating revenue for community improvements.

A key contribution of this study is the development of a conceptual framework for community environmental leadership, which integrates training methodologies in environmental sciences and sustainability. This framework fosters action-oriented competencies and community empowerment, equipping local actors to become agents of environmental change. The establishment of a civil committee, *Environmental Leaders for Sustainability in the Costa Chica Region*, marks a critical step toward long-term environmental governance and legal representation to advocate for the region's ecological stability. By promoting a community-led model, this training initiative highlights the potential of local leadership to drive sustainability.

The evaluation process demonstrated a significant increase in awareness, leadership capacity, and mobilization among participants, highlighting the effectiveness of environmental education in fostering sustainable practices. The findings underscore the need for contextualized environmental education (EE) that integrates traditional knowledge, critical thinking, and a sense of ownership, supported by academically grounded methodologies.

We consider that a contribution was made to the literature; unlike previous research that focuses on environmental leadership in business sectors, this study focuses on community environmental leadership in a Latin American context, where factors such as local participation, traditional knowledge and sociocultural resilience play a crucial role. Likewise, the effectiveness of participatory methodologies is demonstrated, in line with proposals for contextualized environmental education. The impact of training on community mobilization is also evident; 19 trained leaders mobilized 1,500 people for tangible environmental actions (clean-up campaign and reforestation planning).

However, for future studies it will be necessary to seek greater representation of population groups. The duration of the research should also be taken with due caution; we are documenting the design and implementation of the program, but longitudinal monitoring is required in the medium and long term.

This study lays the groundwork for future research on scalable leadership training models that can be applied to other environmentally vulnerable communities. Future studies should explore the long-term impact of community-based environmental leadership programs on local governance and conservation efforts, and the integration of digital tools and technology to enhance environmental education and activism.

This study demonstrates that community-driven environmental leadership can catalyze sustainable environmental management. The model presented here serves as a replicable framework for other regions facing similar socio-environmental challenges, emphasizing the **importance of local knowledge as a driver of sustainability.**

Author Contributions: Conceptualization: Aparicio López, J.L.; methodology: Rodríguez Alviso, C.; software and validation: Castro Bello, M.; formal analysis: Villerías Salinas, S.; investigation: Rojas Casarrubias, C..; writing—original draft preparation: Aparicio López, J.L..; writing—review and editing: Rodriguez Alviso, C.; funding acquisition: Rojas Casarrubias, C; Aparicio López, J.L.; Rodríguez Alviso, C.; Castro Bello, M. and Villerías Salinas, S. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki. As part of the ethical protocol, this research process complied with the guidelines issued by the

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Bioethics Committee of the Autonomous University of Guerrero (Reference: CB-003/2021). The theoretical, epistemic, and methodological foundations were evaluated, ensuring full respect for the characteristics of the study area, its cultural traditions, and the participants´ idiosyncrasies.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The original contributions presented in the study are included in the article, further inquiries can be directed at the corresponding author.

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Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

ONU	Organización de las Naciones Unidas
GTL	Green Transformational Leadership
SMEs	Small – Medium Entrepreneurs
ESTL	Environmentally Specific Transformational Leadership
GSL	Green Servant Leadership
ESG	Environmental Social Governance
CSR	Corporate Social Responsibility
INEGI	Instituto Nacional de Estadística y Geografía (National Institute of Statistics and Geography
UNEP	United Nations Environment Program
CONABIO	Comisión Nacional para el Conocimiento y Uso de la Biodiversidad
SDGs	Sustainable Development Goals
TDN	Training Needs Diagnosis
SL	Servant Leader

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