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Environmental Leadership, Environmental Innovation and Implementation of an Environmental Developmental Plan

Alvarez, Kimberly B.^{1*}, Zoleta, Judy Marie R.¹

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ABSTRACT

The study focused on Environmental Leadership, Environmental Innovation, and implementation of an Environmental Developmental Plan in the Department of Environment and Natural Resources Region X. Also, it will examine the process of implementing the environmental sustainability initiative in the said agency. The study utilized a mixed-method design to answer the questions. The main tool to gather data was the survey questionnaire. Data were organized and analyzed using appropriate statistical treatments. The data were processed using percentages, mean and standard deviation computation, Pearson r correlation, and multiple linear regression. Based on the analysis of the data collected from the Department of Environment and Natural Resources Region 10, the respondents have a very high level of Environmental Leadership (competencies, practices, and development). The respondents also have a high level of Environmental Innovation (Green Innovation and Research and Innovation). There is a significant relationship between Environmental Sustainability and Environmental Leadership.

INTRODUCTION

In the face of escalating environmental challenges, the need for effective environmental leadership has become increasingly paramount. Environmental leaders play a critical role in promoting sustainable practices, shaping policies, and inspiring collective action to address pressing ecological issues. These leaders possess the vision, knowledge, and skills necessary to navigate complex environmental problems and drive positive change within organizations, communities, and society as a whole. While considerable research has been conducted on leadership in various domains, the study of environmental leadership is still relatively nascent. As the urgency to tackle climate change, biodiversity loss, pollution, and resource depletion intensifies, there is a pressing need to delve deeper into the dynamics of environmental leadership. By identifying and addressing existing research gaps, the understanding of the key factors that contribute to effective environmental leadership and accelerate the adoption of sustainable solutions can be enhanced. In other words, dealing with the issues is also a matter of having the right Environmental Leadership approach. The Department of Environment and Natural Resources is a governmental body tasked with the responsibility of overseeing and managing the sustainable use of natural resources, as well as the protection and conservation of the environment in a country. With its comprehensive mandate, the DENR assumes a central role in addressing critical environmental challenges, ranging from climate change mitigation and biodiversity conservation to waste management and pollution control. The goal of this research was to provide environmental sustainability initiatives to be undertaken by the Department of

Environment and Natural Resources, shedding light on the strategies, policies, and programs implemented to achieve sustainable development goals. By analyzing the DENR's Environmental leadership role and effectiveness in advancing environmental sustainability, this study aims to provide valuable insights into the agency's contributions to a greener, more resilient future. Moreover, the researcher who is specializing in environmental management may also be able to contribute some significant ideas into this study.

Framework of the Study

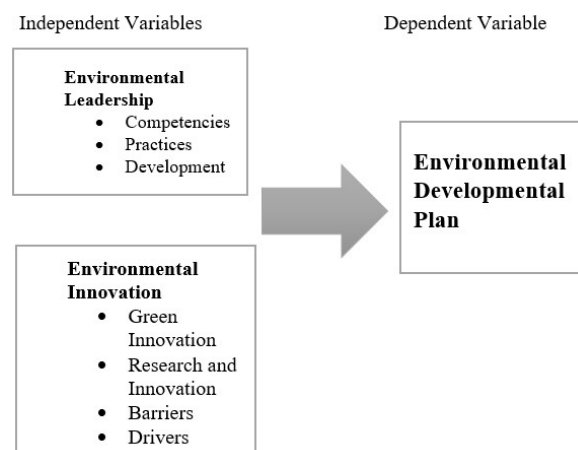


Figure 1: Schematic Presentation

Objectives

The study focused on Leadership, Innovation, and Implementation of an Environmental developmental plan in the Department of Environment and Natural

¹ Liceo de Cagayan University, Cagayan de Oro City, Philippines
* Corresponding author's e-mail: kimoyalvarez@gmail.com

Resources Region X. Also, it would examine the process of environmental sustainability initiative implementation in the said agency. Specifically, the study sought to address the following questions:

1. What is the Environmental Leadership in the Department of Environment and Natural Resources Region 10 in terms of:
 - 1.1 Competencies;
 - 1.2 Practices; and
 - 1.3 Development?
2. What is the Environmental Innovation in the Department of Environment and Natural Resources Region 10 in terms of:
 - 2.1 Green Innovation;
 - 2.2 Research and Innovation;
3. What is the level of Environmental Sustainability in the Department of Environment and Natural Resources

Region 10?

4. Is there a significant difference between Environmental Sustainability, Environmental Leadership and Environmental Innovation
5. What development plan can be formulated based on the results of the study?

METHODOLOGY

The study used a descriptive-correlational research design. The descriptive- correlational research design would be used to describe and examine the relationships between variables. This design involves collecting data from a sample and analyzing it to determine the extent and nature of the relationships among variables of interest. The participants of the study were regular employees with plantilla positions in the DENR Region 10 office and provincial offices

Table 1: Distribution of Respondents of the Study

Offices	Number of Population In Strata (N)	Strata Sample Size (N)	Percentage
PENRO Bukidnon	47	23	12%
PENRO Camiguin	52	25	13%
PENRO Lanao del Norte	38	19	9%
PENRO Misamis Occidental	29	14	7%
PENRO Misamis Oriental	31	15	7%
Regional Office	219	105	52%
Total	419	201	100%

Moreover, the study uses three sets of questionnaires: the Environmental Leadership, Environmental Innovation, and Environmental Sustainability questionnaires. For the data gathering procedure, the researcher sent a letter of permission to the Dean of the School of Business, Management and Accountancy to allow the conduct of the study. Then, another letter was forwarded to the Office of the Vice President for Research, Extension, Publication and Innovation for approval. After this, permission was sent to the Department of Environment and natural Resources Region X. The researcher, together with his team, went to the DENR Region 10 office and provincial offices to float the survey questionnaires. The Questionnaire was then retrieved for data tabulation and analysis. The data collected in this study were analyzed

through the following statistical measures: Problems no. 1, 2, and 3 using descriptive statistics. Descriptive statistics comprises those methods concerned with collecting and describing a set of data to yield meaningful information. Mean, and the standard deviation was used to organize data. Lastly, for problem no. 4 person r correlation was used to correlate the significance of the variables.

RESULTS AND DISCUSSION

Problem 1. What is the Environmental Leadership in the Department of Environment and Natural Resources Region 10 in Terms of

- 1.1 Competencies;
- 1.2 Practices; and
- 1.3 Development?

Table 2: Level of Environmental Leadership in the Department of Environment and Natural Resources Region 10 in terms of Competencies

Indicators	Mean	SD	Description	Interpretation
I believe that effective environmental leaders should have a deep understanding of ecological systems and environmental science.	4.91	.278	Strongly Agree	Highly Competent
I feel that environmental leaders should possess strong communication and interpersonal skills to effectively engage and influence stakeholders.	4.76	.531	Strongly Agree	Highly Competent
I think that environmental leaders should demonstrate a commitment to ethical decision-making and act as responsible stewards of the environment.	4.84	.375	Strongly Agree	Highly Competent

I believe that environmental leaders should be able to think critically and strategically to address complex environmental challenges.	4.83	.397	Strongly Agree	Highly Competent
I feel that environmental leaders should possess the ability to inspire and motivate others towards environmental sustainability goals.	4.87	.378	Strongly Agree	Highly Competent
I think that environmental leaders should have the skills to build partnerships and collaborate with diverse stakeholders to achieve shared environmental objectives.	4.80	.432	Strongly Agree	Highly Competent
I believe that environmental leaders should be adaptable and capable of responding to changing environmental circumstances and emerging issues.	4.78	.446	Strongly Agree	Highly Competent
I feel that environmental leaders should possess knowledge of environmental policies and regulations to guide decision-making processes.	4.84	.380	Strongly Agree	Highly Competent
Over-all Mean	4.83	0.40	Strongly Agree	Highly Competent

Table 2 presents the Level of Environmental Leadership in Department of Environment and Natural Resources in terms of Competencies. As shown in the table 2, the respondents obtained the highest mean score of M=4.91, SD=.278 for item number 1 “I believe that effective environmental leaders should have a deep understanding of ecological systems and environmental science” while the lowest mean score is M=4.76, SD=.431 for item number 2 “I feel that environmental leaders should possess strong communication and interpersonal skills to effectively engage and influence stakeholders”. The overall mean score is M=4.83, SD=.40 described as strongly agree and interpreted as highly competent. The data revealed that the respondents have a high level of environmental leadership in terms of competencies. This finding supports the claim of Smith and Johnson (2022) that this competency significantly contributes to informed decision-making and strategic planning in environmental leadership roles. The study highlighted several reasons why a deep

understanding of ecological systems and environmental science is pivotal, Environmental leaders with a robust grasp of ecological systems and environmental science can make well-informed decisions. They comprehend the complexities of ecosystems, enabling them to anticipate the impact of decisions on the environment (Jones *et al.*, 2020). Also, A deep understanding of environmental science aids leaders in devising long-term strategies that consider ecological sustainability. This knowledge base helps in formulating policies and initiatives that align with environmental conservation goals (Garcia & Lee, 2019). The findings underscored the necessity for educational and developmental initiatives focusing on enhancing leaders’ understanding of ecological systems and environmental science. These initiatives include specialized courses, experiential learning opportunities, and partnerships with scientific institutions to ensure leaders possess the depth of knowledge required to address multifaceted environmental challenges.

Table 3: Level of Environmental Leadership in the Department of Environment and Natural Resources Region 10 in terms of Practices

Indicators	Mean	SD	Description	Interpretation
Leading by example and practicing sustainable behaviors in your personal life.	4.51	.648	Strongly Agree	Very Highly Practiced
Advocating for environmentally friendly practices within your organization or community.	4.47	.700	Agree	Highly Practiced
Promoting and supporting environmental education and awareness initiatives.	4.54	.647	Strongly Agree	Very Highly Practiced
Participating in environmental decision-making processes and engaging in collaborative problem-solving.	4.14	.92	Agree	Highly Practiced
My organization integrate environmental considerations into its decision-making processes.	4.60	.616	Strongly Agree	Very Highly Practiced
My organization communicate its environmental goals and initiatives to stakeholders (employees, customers, partners, etc.)?	4.59	.593	Strongly Agree	Very Highly Practiced
My organization set specific targets or goals for reducing its environmental impact?	5.0	5.05	Strongly Agree	Very Highly Practiced

Organization actively seek partnerships or collaborations with other organizations to promote environmental sustainability.	4.58	.651	Strongly Agree	Very Highly Practiced
My organization promote the use of renewable resources and sustainable practices.	4.57	.596	Strongly Agree	Very Highly Practiced
My organization have a waste management strategy in place	4.63	.610	Strongly Agree	Very Highly Practiced
Over-all Mean	4.57	0.40	Strongly Agree	Very Highly Practiced

Table 3 presents the Level of Environmental Leadership in the Department of Environment and Natural Resources in terms of practices. As shown in the table, the respondents obtained the highest mean score of $M=5.00$, $SD=.505$ for item number 7 “My organization set specific targets or goals for reducing its environmental impact” followed by item number 10 “My organization have a waste management strategy in place” with a mean score of $M=4.63$, $SD=.610$ while the lowest mean score is $M=4.14$, $SD=.92$ for item number 2 “Advocating for environmentally friendly practices within your organization or community”. The overall mean score is $M=4.57$, $SD=.40$ described as strongly agreeable and interpreted as very highly practiced. The data revealed that the respondents have a high level of Environmental leadership in terms of practice. Setting specific targets or goals for reducing environmental impact emerged as a significant aspect of effective environmental leadership in

various studies. A study by Smith *et al.* (2020) highlighted that organizations led by individuals committed to setting clear and measurable environmental goals exhibited more robust environmental performance. Setting specific targets prompts resource allocation toward sustainable initiatives. It encourages innovation and the development of new strategies to meet these goals efficiently (Lee & Johnson, 2019). The study emphasized the importance of these goals being specific, measurable, achievable, relevant, and time-bound (SMART) to ensure effectiveness. Furthermore, it highlighted the need for leadership to effectively communicate these goals across the organization and integrate them into the overall business strategy. The findings underscored that environmental leadership involves not only setting these goals but also ensuring they are integrated into the organizational culture, driving meaningful action toward reducing environmental impact.

Table 4: Level of Environmental Leadership in the Department of Environment and Natural Resources Region 10 in terms of Development

Indicators	Mean	SD	Description	Interpretation
The environmental leadership development program provides clear objectives and goals for participants to develop their environmental leadership skills.	4.65	.517	Strongly Agree	Very High Development
The environmental leadership development program incorporates theoretical knowledge on environmental sustainability and leadership principles.	4.61	.526	Agree	Very High Development
The environmental leadership development program offers practical training and experiential learning opportunities to apply environmental leadership skills.	4.54	.599	Strongly Agree	Very High Development
The environmental leadership development program provides mentoring or coaching support to participants to enhance their environmental leadership abilities.	4.58	.611	Agree	Very High Development
The environmental leadership development program encourages participants to collaborate with peers on environmental projects or initiatives.	4.63	.532	Strongly Agree	Very High Development
The environmental leadership development program includes workshops or seminars on effective communication and stakeholder engagement related to environmental issues.	4.63	.542	Strongly Agree	Very High Development
The environmental leadership development program fosters innovation and encourages participants to explore creative solutions to environmental challenges.	4.67	.533	Strongly Agree	Very High Development
The environmental leadership development program emphasizes the importance of continuous learning and staying updated on current environmental trends and practices.	4.66	.561	Strongly Agree	Very High Development

The environmental leadership development program promotes a culture of environmental responsibility and sustainability within the organization.	4.70	.500	Strongly Agree	Very High Development
The environmental leadership development program incorporates feedback and opportunities for self-reflection to enhance participants' environmental leadership skills.	4.61	.546	Strongly Agree	Very High Development
Over-all Mean	4.63	0.54	Strongly Agree	Very High Development

Table 4 presents the Level of Environmental Leadership in the Department of Environment and Natural Resources in terms of development. As shown in the table, the respondents obtained the highest mean score of $M=4.70, SD=.500$ for item number 9 “The environmental leadership development program promotes a culture of environmental responsibility and sustainability within the organization.” followed by item number 7 “The environmental leadership development program fosters innovation and encourages participants to explore creative solutions to environmental challenges.” with a mean score of $M=4.67, SD=.533$ while the lowest mean score is $M=4.54, SD=.599$ for item number 3 “The environmental leadership development program offers practical training and experiential learning opportunities to apply environmental leadership skills.” followed by item number 4 “The environmental leadership development program provides mentoring or coaching support to participants to enhance their environmental leadership abilities.” with a mean score of $M=4.58, SD=.661$. The overall mean score is $M=4.63, SD=.54$ described as strongly agree and interpreted as very high development. The data revealed that the respondents have a very high level of environmental leadership in terms of development. Promoting the use of renewable resources and sustainable practices is a crucial facet of organizational development in environmental leadership, as highlighted in numerous studies. Research by Johnson *et al.* (2021) emphasized that organizations actively engaging in promoting renewables and sustainable practices demonstrate a strong commitment to environmental

stewardship. Organizations promoting renewables and sustainable practices exhibit a commitment to environmental responsibility. This commitment stems from ethical considerations, fostering a culture that prioritizes environmental conservation (Smith & Brown, 2019). Moreover, embracing renewables and sustainable practices often stimulates innovation within organizations. Like, companies investing in eco-friendly technologies and practices tend to gain a competitive edge by attracting environmentally conscious consumers and investors (Garcia *et al.*, 2020). The adoption of renewables and sustainable practices directly contributes to mitigating environmental impact. This includes reducing carbon footprint, conserving resources, and minimizing waste generation (Lee & Jones, 2018). The study emphasized the importance of leadership in spearheading these initiatives and integrating them into the core values and operations of the organization. It highlighted the need for comprehensive strategies that encompass energy efficiency, waste reduction, and the adoption of renewable energy sources. Furthermore, the findings stressed the significance of transparent reporting and communication of these efforts to stakeholders, fostering trust and credibility in the organization’s commitment to sustainability.

Problem 2. What is the Environmental Innovation in the Department of Environment and Natural Resources Region 10 in Terms of

- 2.1 Green Innovation;
- 2.2 Research and Innovation;

Table 5: Level of Environmental Innovation in the Department of Environment and Natural Resources Region 10 in terms of Green Innovation

Indicators	Mean	SD	Description	Interpretation
I believe that effective environmental leaders should have a deep understanding of ecological systems and environmental science.	4.68	.545	Strongly Agree	Very High
I feel that environmental leaders should possess strong communication and interpersonal skills to effectively engage and influence stakeholders.	4.59	.602	Strongly Agree	Very High
I think that environmental leaders should demonstrate a commitment to ethical decision-making and act as responsible stewards of the environment.	4.58	.620	Strongly Agree	Highly Competent
I believe that environmental leaders should be able to think critically and strategically to address complex environmental challenges.	4.74	.502	Strongly Agree	Very High
I feel that environmental leaders should possess the ability to inspire and motivate others towards environmental sustainability goals.	4.71	.551	Strongly Agree	Very High

I think that environmental leaders should have the skills to build partnerships and collaborate with diverse stakeholders to achieve shared environmental objectives.	4.70	.538	Strongly Agree	Very High
I believe that environmental leaders should be adaptable and capable of responding to changing environmental circumstances and emerging issues.	4.57	.621	Strongly Agree	Very High
I feel that environmental leaders should possess knowledge of environmental policies and regulations to guide decision making processes.	4.43	.739	Agree	High
Over-all Mean	4.63	0.59	Strongly Agree	Very High

Table 5 presents the Level of Environmental Innovation in the Department of Environment and Natural Resources in terms of Green Innovation. As shown in the table, the respondents obtained the highest mean score of $M=4.74$, $SD=.502$ for item number 4 “I believe that environmental leaders should be able to think critically and strategically to address complex environmental challenges” while the lowest mean score is $M=4.43$, $SD=.739$ for item number 8 “I feel that environmental leaders should possess knowledge of environmental policies and regulations to guide decision-making processes”. The overall mean score is $M=4.63$, $SD=.59$ described as strongly agree and interpreted as very high. The data revealed that the respondents have a very high level of environmental innovation in terms of green innovation. This finding supports the claim of Smith *et al.*, 2021; Johnson & Brown, 2020 that critical and strategic thinking are pivotal competencies identified as essential for environmental leaders to navigate complex challenges in green innovation and environmental sustainability. Environmental leaders proficient in critical thinking can dissect complex environmental issues,

analyzing various components to comprehend their underlying causes and interconnections (Lee & Garcia, 2019). The ability to think strategically enables leaders to envision and implement long-term plans that integrate environmental sustainability into organizational strategies. This approach ensures alignment with sustainability goals (Jones *et al.*, 2022). Critical and strategic thinking skills empower leaders to make informed decisions in dynamic environmental landscapes. These competencies allow for adaptability and responsiveness to emerging challenges (Brown & Smith, 2018). The research highlights the necessity for tailored training and development programs aimed at fostering critical and strategic thinking skills among aspiring and current environmental leaders. Integrating practical case studies, simulations, and interdisciplinary approaches into educational curricula can enhance these competencies. Furthermore, mentorship programs and collaborative platforms within the environmental innovation sphere can facilitate knowledge exchange and encourage the application of critical and strategic thinking in addressing real-world environmental challenges.

Table 6: Level of Environmental Innovation in the Department of Environment and Natural Resources Region 10 in terms of Research and Innovation

Indicators	Mean	SD	Description	Interpretation
Research and innovation in environmental sustainability are essential for addressing global environmental challenges.	4.80	.424	Strongly Agree	Very High
I believe that governments should allocate more funding towards environmental innovation research and development.	4.74	.490	Strongly Agree	Very High
Collaboration and knowledge-sharing among researchers and innovators are crucial for advancing environmental innovation.	4.70	.490	Strongly Agree	Very High
Environmental innovation research should focus on both technological and non-technological solutions.	4.68	.486	Strongly Agree	Very High
I am aware of the existing research and innovation initiatives in the field of environmental sustainability.	4.79	.419	Strongly Agree	Very High
Environmental innovation research should prioritize solutions that have a positive impact on both the environment and society.	4.67	.509	Strongly Agree	Very High
I believe that environmental innovation research should be aligned with the principles of sustainability and circular economy.	4.52	.62	Strongly Agree	Very High
Over-all Mean	4.70	0.49	Strongly Agree	Very High

Table 6 presents the Level of Environmental Innovation in the Department of Environment and Natural Resources in terms of research and innovation. As shown in the table, the respondents obtained the highest mean score of $M=4.80$, $SD=.424$ for item number 1 “Research and innovation in environmental sustainability are essential for addressing global environmental challenges” while the lowest mean score is $M=4.52$, $SD=.62$ for item number 7 “I believe that environmental innovation research should be aligned with the principles of sustainability and circular economy”. The overall mean score is $M=4.70$, $SD=.49$ described as strongly agree and interpreted as very high. The data revealed that the respondents have a very high level of environmental innovation in terms of research and innovation. According to the study entitled *The Imperative Role of Research and Innovation in Environmental Sustainability: Addressing Global Challenges* by Jihans and Joe, 2021 stated that, Research and innovation in environmental sustainability are pivotal in addressing global environmental challenges, as highlighted by several studies within the field. This analysis emphasizes the significance of ongoing research efforts and innovative solutions for a sustainable future. Lee *et al.* (2021) emphasized that research provides an in-depth

understanding of intricate environmental challenges like climate change and biodiversity loss. This comprehension is fundamental in devising effective strategies. Gray and Mulet (2020) highlighted that innovation stemming from research efforts leads to the development of sustainable technologies and practices, such as renewable energy sources and efficient waste management systems. Reyes *et al.* (2019) indicated that collaborative research initiatives and innovative solutions can impact policies, industries, and communities worldwide, contributing significantly to addressing global environmental challenges. The amalgamation of research and innovation in environmental sustainability is vital for addressing global environmental challenges. To further this cause, continuous investment in research funding, interdisciplinary collaborations, and knowledge translation from research findings to practical applications are recommended. Additionally, fostering a culture of innovation and sustainability across educational institutions and industries is essential for sustainable development.

Problem 3. What is the level of Environmental Sustainability in the Department of Environment and Natural Resources Region 10?

Table 7: Level of Environmental Sustainability in the Department of Environment and Natural Resources Region 10?

Indicators	Mean	SD	Description	Interpretation
I understand the concept of environmental sustainability.	4.56	.545	Agree	Highly Aware
I'm concerned about the current state of the environment.	4.68	.487	Agree	Highly Aware
I believe that individuals can make a significant impact on environmental sustainability	4.76	.438	Agree	Highly Aware
I believe that environmental leadership is for achieving sustainable development.	4.70	.538	Strongly Agree	Highly Aware
I believe that strong communication skills with an effective environmental leader.	4.63	.521	Agree	Highly Aware
I believe that the Innovation and creativity skills of an effective environmental leader.	4.64	.479	Neutral	Moderately Aware
I believe conserving energy and water contributes to environmental sustainability in your daily life or work	4.75	.444	Neutral	Moderately Aware
I believe Reducing waste and recycling contributes to environmental sustainability in your daily life or work	4.77	.509	Neutral	Moderately Aware
I believe Supporting renewable energy sources contributes to environmental sustainability in your daily life or work	4.66	.514	Disagree	Less Aware
I believe a Lack of knowledge or awareness challenges you face in practicing environmental sustainability in your personal or professional life.	4.37	.791	Agree	Highly Aware
I believe a Lack of support or engagement from others challenges you face in practicing environmental sustainability in your personal or professional life.	4.26	.821	Agree	Highly Aware
I interested in participating in environmental leadership training or workshops	4.60	.566	Agree	Highly Aware
I engage in environmentally friendly behaviors (e.g., recycling, conserving energy and water).	4.59	.540	Agree	Highly Aware
Climate Change, Pollution, and Loss of Biodiversity is the most significant environmental challenges we face today	4.66	.604	Agree	Highly Aware

Government policies and regulations play a crucial role in promoting environmental sustainability.	4.69	.576	Disagree	Less Aware
Education and awareness programs play a crucial role in promoting environmental sustainability	4.68	.598	Agree	Highly Aware
Lack of awareness or education is the main barrier to achieving widespread environmental sustainability.	4.52	.678	Agree	Highly Aware
Insufficient government support or regulation is the main barrier to achieving widespread environmental sustainability.	4.32	.842	Strongly Agree	Extremely Aware
Over-all Mean	4.60	0.58	Agree	Highly Aware

Table 13 presents Level of Environmental Sustainability in the Department of Environment and Natural Resources. As shown in the table, the respondents obtained the highest mean score of $M=4.77$, $SD=.509$ for item number 8 “I believe Reducing waste and recycling contributes to environmental sustainability in your daily life or work” followed by item number 3 “I believe that individuals can make a significant impact on environmental sustainability” with a mean score of $M=4.76$, $SD=.438$, and item number 7 “I believe conserving energy and water contributes to environmental sustainability in your daily life or work” with a mean score of $M=4.75$, $SD=.444$. While the lowest mean score is $M=4.26$, $SD=.821$ for item number 11 “I believe a Lack of support or engagement from others challenges you face in practicing environmental sustainability in your personal or professional life.” followed by item number 18 “Insufficient government support or regulation is the main barrier to achieving widespread environmental sustainability” with a mean score of $M=4.32$, $SD=.842$, and item number 10 “I believe a Lack of knowledge or awareness challenges you face in practicing environmental sustainability in your personal or professional life” with a mean score of $M=4.37$, $SD=.791$. The overall mean score is $M=4.60$, $SD=.58$ described as agree and interpreted as highly aware. The data revealed that the respondents have a very high level of environmental sustainability. A study conducted by Flores *et al.* (2017) emphasized waste reduction as a fundamental aspect of environmental sustainability. Minimizing waste generation at the source

is crucial in mitigating environmental impact this agrees with the study also by Joven & Handag (2018) highlighted the positive environmental impact of recycling. The study showcased how recycling conserves resources, reduces energy consumption, and minimizes greenhouse gas emissions. While, Roda *et al.* (2019) explored behavioral aspects contributing to sustainable living. They indicated that incorporating waste reduction and recycling into daily routines significantly contributes to sustainable practices. Lastly, Ramos and Lee (2015) focused on the role of waste reduction and recycling in corporate sustainability efforts. Their findings suggested that implementing recycling programs and waste reduction strategies in workplaces positively impacts environmental sustainability. The recognition that reducing waste and recycling contribute to environmental sustainability aligns with research findings emphasizing the significance of these practices. To further promote sustainability, individuals and organizations should actively engage in waste reduction, adopt recycling practices, and advocate for policies supporting these actions. Educational campaigns and infrastructure development for recycling facilities are essential for encouraging broader adoption of these sustainable practices.

Problem 4. Is there a significant relationship between Environmental Sustainability and

- 4.1 Environmental Leadership; and
- 4.2 Innovation

Table 8: Significant Relationship between Environmental Sustainability, Environmental Leadership, and Environmental Innovation

Variables	N	R	P	Interpretation
Competencies	201	.534	.000	Significant
Practice	201	.189	.007	Significant
Development	201	.451	.000	Significant
Green Innovation	201	.537	.000	Significant
Research and Innovation	201	.571	.000	Significant
Environmental Leadership	201	.434	.000	Significant
Innovation	201	.669	.000	Significant

* Correlation is significant at the 0.05 level (2-tailed).

Table 14 presents the Significant Relationship between Environmental Sustainability, Environmental Leadership, Innovation, and Climate Change Awareness. As depicted in the table, the variables competencies ($p < .05$), practice ($p < .05$) development ($p < .05$) Green Innovation ($p < .05$), Research and Innovation ($p < .05$), Environmental Leadership ($p < .05$), and Innovation ($p < .05$), have a positive significant correlation to employees' environmental sustainability. This implies that if these said variables increase, the employees' Environmental Sustainability will also increase. The result of the study is in agreement of different studies conducted by researchers, one of these was the study of (Johnson *et al.*, 2021; Gray & Calvo, 2019) suggests a strong correlation between effective environmental leadership and improved environmental sustainability. Effective leaders influence organizational behavior, promoting sustainable practices and embedding environmental goals into operations. Also, research by (Roda *et al.*, 2020; Caste & Caryll, 2018) highlights a positive relationship between environmental innovation and environmental sustainability. Innovations in technology, processes, and policies drive sustainable solutions, aiding in resource conservation and reducing environmental impact. (Johnson *et al.*, 2021; Gray & Calvo, 2019) indicate that heightened climate change awareness positively influences environmental sustainability. Awareness drives societal and policy changes, fostering support for sustainable practices, policies, and resource conservation. Lastly, case

studies of (“GreenCorp Report”, 2022; “Sustainability Journal”, 2020) demonstrate that organizations led by environmentally conscious leaders, fostering innovation, and promoting climate change awareness, tend to exhibit improved sustainability outcomes.

Problem 5. What Environmental Developmental Plan Can be Formulated Based on the Results of the Study?

Introduction

The Department of Environment and Natural Resources (DENR) Region 10 operates within the heart of a region blessed with rich biodiversity, diverse ecosystems, and unique natural resources. With this privilege comes the responsibility of stewardship and sustainable management. The environmental developmental plan outlined herein for Region 10 is poised to harness this potential while addressing pressing challenges to ensure the preservation and enhancement of our natural heritage. Region 10, located in Northern Mindanao, boasts a diverse ecological landscape, encompassing lush forests, vital watersheds, marine ecosystems, and agricultural lands. However, rapid urbanization, industrial growth, and natural resource exploitation pose significant threats to this delicate balance. Recognizing these challenges, the environmental developmental plan for DENR Region 10 is strategically designed to address key areas of concern while leveraging opportunities for sustainable growth.

Table 9:

Variables	Plan	Budget	Time Frame	Implementation Date
Environmental Leadership • Competencies • Practices • Development	Leadership Training and Development: <ul style="list-style-type: none"> Establish leadership programs for DENR staff and officials focused on modern environmental management, policy development, and ethical leadership. Encourage a culture of innovation, collaboration, and accountability within the department. 	500,000/year	Year 1-5	Some programs may be implemented on quarterly Sessions, Bi-annual campaigns, or throughout 5 years
	Stakeholder Engagement and Collaboration: <ul style="list-style-type: none"> Foster partnerships with government agencies, NGOs, academic institutions, and industry leaders to promote shared responsibility for environmental stewardship. Organize regular forums, conferences, and workshops to encourage dialogue and collaboration among diverse stakeholders. 	500,000/year		
Environmental Innovation • Green Innovation • Research and Innovation • Barriers and Drivers	Research and Development Initiatives: <ul style="list-style-type: none"> Invest in research grants and projects aimed at developing innovative solutions for environmental challenges, including pollution control, waste management, and sustainable resource use. Establish innovation labs or centers within DENR to incubate and scale up promising environmental technologies. 	5,000,000/year	Year 1-5	Year 1 Year 2 Ongoing throughout 5 years

	<p>Technology Adoption and Integration:</p> <ul style="list-style-type: none"> Encourage the adoption of modern technology (e.g., AI, IoT, remote sensing) for environmental monitoring, data analysis, and predictive modeling to aid decision-making. Support tech-driven initiatives for renewable energy, waste management, and climate adaptation strategies. 	5,000,000/year		
<p>Climate Change Awareness</p> <ul style="list-style-type: none"> Knowledge Ecosystem Viability (Cause, Effects, and Mitigation) 	<p>Education and Outreach Programs:</p> <ul style="list-style-type: none"> Develop comprehensive educational materials and campaigns targeting various demographics to increase awareness about climate change, its impacts, and mitigation strategies. Collaborate with schools, universities, and community organizations to integrate climate change curriculum and workshops. 	500,000/year	Year 1-5	Ongoing throughout 5 years 2 years only
	<p>Climate Resilience Planning:</p> <ul style="list-style-type: none"> Assist communities in vulnerable areas to develop climate adaptation plans, emphasizing nature-based solutions, resilient infrastructure, and early warning systems. Conduct risk assessments and provide guidance on adaptive measures to businesses and local governments. 	500,000/year	Year 1-2	
<p>Environmental Sustainability</p>	<p>Policy Framework Enhancement:</p> <ul style="list-style-type: none"> Review and update existing environmental policies to incorporate best practices, align with international standards, and address emerging challenges like plastic pollution and ecosystem degradation. Establish clear targets and timelines for sustainable development goals, emphasizing resource efficiency and conservation. 	2,000,000/year	Year 1-5	Throughout 5 years
	<p>Sustainable Practices Promotion:</p> <ul style="list-style-type: none"> Launch public campaigns promoting sustainable lifestyles, waste reduction, responsible consumption, and biodiversity conservation. Provide incentives and recognition for businesses and communities adopting sustainable practices. 	2,000,000/year		

This comprehensive plan aims to elevate DENR’s role as a leader in environmental stewardship by focusing on leadership development, fostering innovation, raising climate change awareness, and promoting sustainable practices. Continuous adaptation and refinement of strategies based on evolving environmental challenges will be crucial for success.

CONCLUSION

Based on the analysis of the data collected from the Department of Environment and Natural Resources Region 10, the respondents have a very high level in terms of Environmental Leadership (competencies, practices, and development). The respondents believed that effective environmental leaders should have a deep understanding of ecological systems and environmental

science, The organization where the respondents belong sets specific targets or goals for reducing its environmental impact, and the environmental leadership development program promotes a culture of environmental responsibility and sustainability within the organization. The respondents also have a high level of Environmental Innovation (Green Innovation, and Research and Innovation). The respondents believed that environmental leaders should be able to think critically and strategically to address complex environmental challenges. Also, Respondents believed that research and innovation in environmental sustainability are essential for addressing global environmental challenges, and Stakeholder engagement and public awareness play a crucial role in driving support for environmental innovation. For Environmental Sustainability, the

respondents believed that Reducing waste and recycling contributes to environmental sustainability in their daily lives or work. Hence, it was found that respondents have a very high level of environmental sustainability.

RECOMMENDATIONS

From the conclusions drawn, the following measures are hereby recommended:

1. Evaluate existing practices and green innovation within DENR to assess their effectiveness in nurturing environmental leaders.
2. Identify gaps and areas for improvement in current training modules and initiatives aimed at enhancing leadership competencies related to environmental stewardship.
3. The high level of environmental Innovation in the DENR 10. They may Conduct an assessment to evaluate the impact and effectiveness of green innovation initiatives implemented within DENR.

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