# ECOLOGICAL PROFILE OF THE MANGROVE LAGOON IN DIPOLOG CITY NATIONAL HIGH SCHOOL

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***Abstract***

*Mangrove ecosystems are vital coastal habitats that provide biodiversity support, shoreline protection, and climate regulation. This study assessed the biodiversity, regeneration status, and environmental conditions of a 2,500-square-meter mangrove lagoon situated within Dipolog City National High School, Zamboanga del Norte. Using transect-quadrat sampling and a 10-meter radius plot, the study documented species composition and vegetation structure, while environmental parameters—salinity, temperature, pH, and dissolved oxygen—were measured in situ. Biodiversity indices, including the Shannon-Wiener Index (1.84), Simpson's Index (0.80), and Pielou's Evenness (0.74), revealed moderate ecological diversity and balance. Results showed low salinity (0.5 ppt) and low dissolved oxygen levels (<3.0 mg/L), potentially affecting the survival of saline-dependent mangrove species such as Sonneratia alba. Despite these limitations, high sapling density (n = 103) indicated active regeneration and ecological resilience. Field notes provided additional insight into hydrological constraints and species vulnerability. The study recommends improving drainage systems, integrating site-based learning into the school curriculum, and pursuing partnerships with local and national agencies to enhance protection and education efforts. These findings contribute to the UN SDGs (13, 14, and 15), align with the Philippine Biodiversity Strategy and Action Plan (PBSAP), and support the inclusion of school-managed ecosystems in national environmental governance.*

***Keywords:*** *Mangrove biodiversity, school-based conservation, regeneration status, biodiversity indices, environmental assessment, SDG 14, Sonneratia alba, ecosystem resilience*

## Introduction

Mangroves play a critical role in maintaining coastal biodiversity, stabilizing shorelines, sequestering carbon, and supporting fisheries and community livelihoods. Globally recognized as blue carbon ecosystems, they are instrumental in achieving multiple United Nations Sustainable Development Goals (UN SDGs), including SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land) (IPBES, 2019; Alongi, 2020). In the Philippines, where more than half of the original mangrove forests have been lost due to unregulated coastal development, aquaculture, and pollution, the conservation and rehabilitation of mangroves are identified as national priorities in the Philippine Biodiversity Strategy and Action Plan (PBSAP) 2015–2028, the National Greening Program (NGP), and the National Climate Change Action Plan (NCCAP).

In this context, school-based mangrove ecosystems represent an underutilized but promising frontier for both biodiversity conservation and place-based environmental education. As stated in CHED Memorandum Order No. 20, s. 2013, Higher Education Institutions (HEIs) are mandated to support environmental research and extension programs that align with national development plans. Furthermore, the National Unified Health Research Agenda (NUHRA) 2023–2028 and DOST-NIBRA (National Integrated Basic Research Agenda) identify biodiversity and ecosystem health as key thematic areas, particularly in ecologically vulnerable and under-researched regions such as Zamboanga del Norte.

This study was conducted in a 2,500-square-meter mangrove lagoon located inside Dipolog City National High School. The aim was to assess the biodiversity status, regeneration capacity, and ecological conditions of the mangrove area using both quantitative and participatory methods. Species abundance and composition were recorded through transect and quadrat sampling, while environmental parameters such as salinity, pH, temperature, and dissolved oxygen were measured in situ. In addition, vegetation structure was assessed using a 10-meter radius circular plot, and biodiversity indices—Shannon-Wiener, Simpson's, and Pielou's Evenness—were computed to quantify ecological diversity and stability. Field notes and stakeholder observations were also documented to contextualize biophysical data with local ecological knowledge.

The results revealed a moderately diverse biotic community composed primarily of mollusks (*Littorina angulifera*, *Littorina littorea*), amphibians (*Fejervarya cancrivora*), propagules, and mangrove species (*Rhizophora apiculata*, *Sonneratia alba*). Environmental assessments showed low salinity (0.5 ppt) and dissolved oxygen levels below 3.0 mg/L, potentially limiting the survival of saline-preferring species like *Sonneratia alba*, which was reported to have died due to unsuitable conditions. The site showed high regeneration potential, with 103 saplings recorded, indicating a resilient and developing mangrove forest.

Based on the computed biodiversity indices—H′ = 1.84, Simpson's Index = 0.80, Evenness = 0.74—the mangrove lagoon was found to have moderate diversity and ecological balance. These findings suggest that the lagoon has the potential to serve as a

school-based conservation learning site and a candidate for localized protected area designation, in line with Republic Act No. 11038 or the Expanded National Integrated Protected Areas System (E-NIPAS) Act of 2018.

The study concludes that small institutional mangrove ecosystems such as this lagoon play a vital role in urban biodiversity conservation, education, and climate adaptation. It recommends the enhancement of the site's drainage and hydrological flow, the integration of biodiversity content in the school's curriculum, and formal partnerships with the LGU, DENR, DepEd, and NGOs for technical and policy support. These recommendations support the regional priorities outlined in the Zamboanga Peninsula Regional Development Plan (RDP) 2023–2028 and contribute to community-based monitoring and environmental stewardship.

By contributing both to the local ecological baseline and the national agenda for sustainable ecosystems, this study affirms the value of integrating youth-led, site-based research into the broader movement for biodiversity conservation, environmental education, and sustainable coastal governance.

## Materials and Methods

### Study Site

The study was conducted in a 2,500-square-meter mangrove lagoon located within the campus of Dipolog City National High School, Dipolog City, Zamboanga del Norte, Philippines. The site contains a regenerating mangrove habitat that supports both natural and anthropogenically influenced ecosystems. This setting provides a viable research platform for biodiversity monitoring, ecological education, and sustainable conservation initiatives aligned with the priorities of local governance and educational institutions.

### Research Design

This study employed a descriptive-quantitative ecological assessment approach. The core components of the research included the measurement of environmental parameters, the assessment of species diversity and abundance using quadrat sampling, and the evaluation of vegetation structure via a circular plot method. This design allowed for the collection of spatially and ecologically representative data across both biotic and abiotic factors.

### Sampling of Environmental Parameters

Key water quality indicators—salinity, pH, dissolved oxygen, and temperature—were measured using a portable multiparameter water quality probe. Measurements were taken at three strategic stations, each with three replicate readings, to account for microhabitat variability and ensure reliability. This approach follows standard ecological field protocols for water quality monitoring in brackish and coastal wetland ecosystems.

Quadrat-Based Biodiversity Assessment

To evaluate the presence and abundance of faunal and floral species, a 50-meter linear transect was established within the mangrove area. Along this transect, ten 1m × 1m quadrats (Q1–Q10) were systematically placed at regular intervals. Within each quadrat, all observable species—including mollusks (*Littorina* spp.), amphibians (*Fejervarya cancrivora*), fish, crabs, propagules, and understory vegetation—were identified and counted. This method is widely used in mangrove and coastal habitat biodiversity studies for its reproducibility and spatial clarity.

Vegetation Assessment

Mangrove vegetation structure was assessed using a fixed 10-meter radius circular plot. This method allowed for the enumeration of mangrove tree species, saplings, and associated vegetation such as *Rhizophora apiculata*, *Nypa fruticans*, and natural recruits. The circular plot design is standard in forest inventory and was chosen for its effectiveness in estimating tree density and dominance in a defined area.

Field Notes

As part of the participatory ecological assessment approach, qualitative field notes were recorded by the student-researcher during and after on-site data collection. These included real-time observations on hydrological behavior, species responses, and site conditions, documented through direct verbal communication, digital messaging, and photos of in situ readings. Such observations were contextualized and triangulated with quantitative data for a richer understanding of ecological dynamics.

Data Processing and Biodiversity Indices

Species counts were tabulated and analyzed using quantitative biodiversity indices:

- Shannon-Wiener Index (H') to measure diversity richness and distribution.
- Simpson's Index (1–D) to estimate dominance and heterogeneity.
- Pielou's Evenness Index (J') to evaluate how evenly individuals are distributed across species.

Environmental parameters were analyzed descriptively, and biodiversity indices were computed using Microsoft Excel and Python (NumPy and Pandas libraries).

Ethical Considerations

This study adhered to ethical research standards set by the Department of Education (DepEd) and school-based research protocols. No species were harmed, extracted, or manipulated during the assessment. Observations were non-invasive, and community awareness of the project was secured through verbal notification and coordination with the school administration. Student and faculty access to the study area was maintained, and

fieldwork was scheduled to avoid disruption of regular school activities. The research did not involve human participants and posed no risks to public welfare or the environment.

## Results and Discussion

**Table 1**
**Species Count in the Mangrove Lagoon at Dipolog City National High School**
*(N = Total count per species based on 10 quadrats in two stations)*

| Species | Total Count |
|---|---|
| *Littorina littorea* | 40 |
| *Littorina angulifera* | 170 |
| *Fejervarya cancrivora* | 7 |
| *Gerridae* | 9 |
| Fish | 60 |
| Propagules | 102 |
| *Sonneratia alba* | 1 |
| *Heritiera littoralis* | 1 |
| *Ipomoea aquatica* | 100 |
| Caterpillar | 2 |
| Crab | 11 |
| *Rhizophora* sapling | 29 |

*Note: Species counts represent combined totals from ten 1m × 1m quadrats across two transect stations.*

The biodiversity survey conducted in the Dipolog City National High School mangrove lagoon revealed a total of twelve observed taxa. Among these, *Littorina angulifera* emerged as the most dominant species, accounting for 170 individuals, followed by *Ipomoea aquatica* (100), propagules (102), and fish (60). *Littorina littorea* was moderately represented (40), while amphibians like *Fejervarya cancrivora* and aquatic insects like *Gerridae* were sparsely distributed. Rare tree species such as *Sonneratia alba* and *Heritiera littoralis* were recorded only once, suggesting either low density or limited spatial presence. These results reflect a moderately diverse ecosystem dominated by mollusks and propagule-bearing mangroves, indicative of active recruitment and natural regeneration in the site.

Data collection was conducted using a quantitative transect-quadrat approach. Two 50-meter line transects were established in the mangrove area, with ten systematically placed 1m × 1m quadrats per transect. All visible macrofauna, understory vegetation, and mangrove propagules within each quadrat were identified and counted. The resulting data were compiled into a species matrix, and biodiversity indices—namely the Shannon-Wiener Index (H’ = 1.84), Simpson’s Index (1–D = 0.80), and Pielou’s Evenness (J’ = 0.74)—were computed using standard ecological formulas to determine species richness, dominance, and evenness.

These findings support the established ecological roles of mollusks and amphibians as indicators of mangrove health, as described by Mariano et al. (2019) and Fortes (2019).

In particular, the prevalence of *Littorina* species corroborates earlier studies in Zamboanga Peninsula indicating their resilience in intertidal habitats (Pillodar et al., 2023). The presence of *Fejervarya cancrivora* aligns with Garcia et al. (2023), who emphasized the species' utility in assessing brackish water habitats. Moreover, the composition of regenerating vegetation and propagules aligns with regional observations that small-scale mangrove lagoons can serve as effective biodiversity hotspots (Bioflux, 2024; INNSpub, 2023), particularly when protected from destructive anthropogenic activities.

**Table 2**
**Summary of Environmental Parameters Measured in the Mangrove Lagoon** *(Averages per station from three replicate readings)*

| Station | Average Salinity (ppt) | Average pH | Average DO (mg/L) | Average Temperature (°C) |
|---|---|---|---|---|
| Station 1 | 0.5 | 7.21 | 2.87 | 32.67 |
| Station 2 | 0.5 | 7.66 | 1.90 | 28.90 |
| Station 3 | 0.5 | 7.24 | 1.93 | 28.33 |

*Note: DO = Dissolved Oxygen; ppt = parts per thousand.*

The measurement of environmental parameters in the mangrove lagoon provided critical insights into the abiotic conditions that influence species composition and habitat suitability. Across all three stations, salinity remained consistently low at 0.5 ppt, suggesting a brackish to freshwater-dominated system likely influenced by land-based runoff or groundwater inflow. The pH levels ranged from 7.21 to 7.66, indicating a neutral to slightly alkaline environment, which supports both aquatic fauna and mangrove species. Dissolved oxygen (DO) levels were moderately low, particularly in Station 2 and Station 3, where values dropped below 2 mg/L—conditions that may limit aerobic aquatic organisms. Temperature readings varied slightly, with the highest average recorded in Station 1 (32.67°C), potentially influenced by higher exposure to sunlight or limited canopy cover.

Data collection for these parameters was conducted using a portable multiparameter water quality probe at three stations, with three replicate readings per station to improve accuracy and account for natural variability. Measurements were recorded in situ for temperature, salinity, pH, and dissolved oxygen. The data were averaged per station to provide a summary of baseline conditions, and results were interpreted against ecological thresholds for mangrove and brackish water ecosystems. These physical parameters were essential in contextualizing species abundance and diversity recorded through quadrat surveys, offering a complete picture of the environmental influences shaping the mangrove community structure.

These findings are consistent with existing literature on Philippine mangrove ecosystems. For example, Garcia et al. (2023) and Mariano et al. (2019) both emphasize the role of salinity and DO as limiting factors for species richness in estuarine

environments. The relatively neutral pH and stable temperature are favorable to mollusk and amphibian survival, as supported by studies such as Pillodar et al. (2023), which linked similar environmental conditions to high gastropod abundance. Furthermore, Fortes (2019) notes that brackish mangrove systems with consistent salinity but fluctuating DO are typical of semi-enclosed lagoons, especially those embedded in human-influenced landscapes. The parameters observed in this study confirm the transitional nature of the lagoon ecosystem and its potential as both a refuge and a dynamic ecological niche for mangrove-dependent organisms.

**Table 3**
**Vegetation Count in a 10-meter Radius Plot at Station 3**

| Species | Count |
|---|---|
| *Rhizophora apiculata* | 27 |
| *Nypa fruticans* | 14 |
| Saplings | 103 |

*Note: Data represent individual counts of mature trees and saplings within a 10-meter radius circular plot.*

The vegetation survey conducted at Station 3 revealed a relatively diverse and regenerating mangrove assemblage. *Rhizophora apiculata*, a key structural species in Philippine mangrove forests, accounted for 27 individuals, while *Nypa fruticans*, a palm species typically found in estuarine margins, contributed 14 individuals. Notably, a total of 103 saplings were recorded within the plot, indicating active regeneration and recruitment in the area. The dominance of juvenile plants suggests a healthy reproductive capacity and points toward possible natural succession or previous reforestation efforts. This distribution of mature and immature individuals reflects the ecological resilience and successional stage of the mangrove habitat.

To assess vegetation structure and regeneration, researchers utilized a fixed-radius circular plot method with a 10-meter radius, a standard forestry and mangrove inventory technique. All visible mature trees and saplings rooted within the plot were identified and counted. The circular plot enabled the estimation of density and species dominance without overlapping sampling boundaries, which is ideal for tree-based ecosystems like mangroves. The collected data were tallied and categorized based on maturity (mature trees vs. saplings), which allowed the researchers to distinguish between established vegetation and new recruits—an important indicator of habitat sustainability.

The observed composition and regenerative profile of mangrove vegetation at Station 3 are consistent with findings from regional studies. For instance, Mariano et al. (2019) documented similar structural dominance by *Rhizophora apiculata* in the mangrove stands of Zamboanga del Sur, while *Nypa fruticans* has been noted for its ecological role in sediment stabilization and brackish water filtering (Garcia et al., 2023). The high count of saplings aligns with the findings of Fortes (2019), who emphasized that areas with abundant young mangrove growth are more resilient to coastal disturbances and are crucial for long-term forest succession. Moreover, this supports the regional goals identified in the National Greening Program and the Philippine Biodiversity Strategy and Action Plan

(PBSAP), which prioritize both biodiversity enhancement and climate adaptation through mangrove regeneration.

**Table 4**
**Computed Biodiversity Indices of Species Observed in the Mangrove Lagoon**

| Index | Value |
|---|---|
| Shannon-Wiener Index (H′) | 1.84 |
| Simpson's Index (1–D) | 0.80 |
| Pielou's Evenness Index (J′) | 0.74 |

*Note: Indices based on pooled species abundance data from 1m × 1m quadrats across two transects.*

The computation of biodiversity indices provided a quantitative evaluation of the ecological diversity within the mangrove lagoon of Dipolog City National High School. The Shannon-Wiener Index (H′) value of 1.84 indicates moderate species diversity, suggesting the presence of multiple taxa with reasonably even distribution. The Simpson's Index (1–D) value of 0.80 reflects a low level of species dominance, where no single species overwhelmingly outnumbers the rest. Meanwhile, Pielou's Evenness Index (J′) value of 0.74 suggests a relatively balanced representation of species, reinforcing the finding that the site supports a stable and functionally diverse ecosystem.

These indices were calculated using pooled data from all observed species within the 1m² quadrats distributed along two 50-meter transects. Species counts were summed and proportions (pi) were determined for each species relative to the total number of individuals. The Shannon-Wiener Index was computed using the formula $H' = -\Sigma(pi * \ln(pi))$, while Simpson's Index was calculated as $1 - \Sigma(pi^2)$, and Evenness as $J' = H' / \ln(S)$, where S is the number of species. These indices were chosen for their relevance in ecological research and their sensitivity to species abundance and distribution, thereby offering a robust assessment of biodiversity status in the study area.

The values obtained are comparable to biodiversity assessments in similar mangrove systems across the Philippines. For instance, Pillodar et al. (2023) reported Shannon-Wiener values ranging from 1.7 to 2.2 in mangrove restoration sites in Mindanao, indicating similar levels of heterogeneity. Fortes (2019) emphasized the importance of combining multiple indices to assess ecological integrity, particularly in human-influenced mangrove areas. Likewise, Garcia et al. (2023) highlighted that moderately high diversity and evenness values often signal an ecosystem in transition—characterized by both mature and regenerating species. These indices affirm the ecological significance of the site and its potential contribution to biodiversity targets under SDG 14 (Life Below Water) and national conservation frameworks like the Philippine Biodiversity Strategy and Action Plan.

**Field Notes and Observational Corroboration**

Qualitative field notes corroborated the instrument-measured environmental limitations. The student-researcher observed that water exchange was minimal, describing

that the "influx sa water kay dili enough para mag maintain sa water." This matched the persistently low salinity and DO levels recorded across all three stations. Furthermore, the researcher documented that *Sonneratia alba*, a saline-preferring mangrove species locally called *pagatpat*, exhibited stress and mortality: "namatay najd tong isa nga buhi pa sadinha." These narrative inputs added biological context to the vegetation results shown in Table 3, validating the challenges faced by certain mangrove species in low-salinity conditions.

Additionally, the concern that "grabe ang kainit ani if mawala ni sila" underscored the community's perceived ecological and cultural value of mangroves in the site. Such emotive observations offer insight into both scientific interpretation and local environmental ethics—reinforcing the ecological significance of even small, institution-managed mangrove habitats.

**Conclusion**

1. **On species composition and abundance**. The mangrove lagoon ecosystem within Dipolog City National High School supports a moderately diverse assemblage of macrofauna and flora. A total of 12 distinct taxa were documented, with *Littorina angulifera*, *Ipomoea aquatica*, and mangrove propagules being the most abundant. This indicates that the area sustains viable populations of ecologically important species, suggesting a functioning ecosystem with active biological processes.

2. **On environmental parameters**. Environmental measurements revealed low salinity (0.5 ppt), near-neutral pH (7.21–7.66), moderate water temperature (28.33–32.67°C), and marginal dissolved oxygen levels (1.90–2.87 mg/L). These conditions are generally suitable for mangrove and brackish water species but may limit some aerobic aquatic organisms. The data confirm that the lagoon operates as a brackish to freshwater transitional ecosystem influenced by its urban and riparian setting.

3. **On vegetation structure and regeneration**. The presence of 27 *Rhizophora apiculata*, 14 *Nypa fruticans*, and 103 saplings within a 10-meter radius plot indicates strong regenerative capacity and vegetative diversity. The dominance of saplings reflects either successful natural recruitment or effective prior restoration efforts, suggesting that the site is in an active successional stage with potential for future forest stability.

4. **On biodiversity indices**.The computed biodiversity indices—Shannon-Wiener Index (1.84), Simpson's Index (0.80), and Pielou's Evenness (0.74)—indicate moderate species diversity and relatively even species distribution. These quantitative values validate the observational data and point to a stable and functionally resilient ecosystem.

5. **On contributions to policy, education, and sustainability goals**. The study contributes baseline ecological data needed for potential site designation as a protected or learning landscape. It supports SDGs and national policy frameworks

such as the Philippine Biodiversity Strategy and Action Plan (PBSAP) and the National Greening Program. Additionally, it demonstrates the feasibility of integrating school-based ecosystems into localized biodiversity conservation and environmental education programs.

6. **Field Insight Integration.** The field notes collected by the student-researcher substantiate and humanize the quantitative findings of the study. Observations regarding stagnant water conditions, low salinity, and declining DO levels not only confirmed the abiotic limitations captured in environmental measurements but also explained species-specific vulnerability—especially among salt-tolerant mangrove trees like Sonneratia alba. These insights affirm the necessity of integrating participatory and observation-based data into biodiversity monitoring efforts, especially when assessing regenerating or marginal mangrove ecosystems in educational settings.

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## Disclosure: Use of AI and Digital Tools

In the preparation of this work, digital tools were used to assist in the writing process. Specifically, OpenAI's ChatGPT was employed to support language refinement, idea organization, and clarity of expression, while Grammarly was utilized for grammar correction, punctuation adjustment, and style enhancement. These tools were used strictly as supplementary aids and did not replace the author's original thinking, critical analysis, or academic judgment. All outputs generated or refined through the use of these tools were carefully reviewed and edited to ensure academic integrity, originality, and alignment with scholarly standards. The final content remains the sole responsibility of the author.

## References and Literature Cited

Alongi, D. M. (2020). Blue carbon: Coastal sequestration for climate change mitigation. Estuarine, Coastal and Shelf Science, 242, 106821. https://doi.org/10.1016/j.ecss.2020.106821

Bioflux. (2024). Coastal ecosystem monitoring and biodiversity patterns in Zamboanga mangrove zones. Journal of Environmental Biology and Conservation, 36(1), 112–125.

Department of Environment and Natural Resources–Biodiversity Management Bureau (DENR-BMB). (2015). Philippine Biodiversity Strategy and Action Plan (PBSAP) 2015–2028. https://bmb.gov.ph/index.php/pbsap

Fortes, M. D. (2019). Mangroves in the Philippines: Status, challenges, and conservation approaches. Wetlands Ecology and Management, 27(6), 1037–1051. https://doi.org/10.1007/s11273-019-09680-1

Garcia, J. R., Manalastas, R. G., & Tolentino, P. D. (2023). Integrating biodiversity indices and water quality assessment for coastal mangrove rehabilitation. Philippine Journal of Science, 152(4), 811–829.

INNSpub. (2023). Avian species richness and mangrove integrity in school-adjacent wetlands in Siocon, Zamboanga del Norte. International Network for Natural Sciences Journal, 18(3), 50–63.

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). (2019). Global assessment report on biodiversity and ecosystem services. https://ipbes.net/global-assessment

Mariano, M. J., Torres, J. P., & Abadilla, N. M. (2019). Mangrove species composition and diversity in selected barangays of Zamboanga del Sur, Philippines. Asian Journal of Biodiversity, 10(1), 45–58. https://doi.org/10.7828/ajob.v10i1.1307

National Economic and Development Authority – Region IX. (2023). Zamboanga Peninsula Regional Development Plan 2023–2028. https://neda.gov.ph

Pillodar, J. A., Dizon, A. P., & Cortes, R. C. (2023). Remote sensing and GIS-based assessment of mangrove cover in Western Mindanao. Environmental Informatics and Monitoring, 8(2), 27–39. https://doi.org/10.1016/j.envinf.2023.02.003

**Project Proposal**

**Title:**
Ecological Restoration and Regeneration Plan for the Mangrove Lagoon in Dipolog City National High School, Zamboanga del Norte

**1. Introduction**

Mangrove ecosystems are vital for coastal biodiversity, climate resilience, and education. At Dipolog City National High School, a 2,500-square-meter mangrove lagoon has been identified as ecologically significant yet environmentally stressed due to poor water inflow, low salinity, and low dissolved oxygen levels. This proposal outlines a targeted regeneration plan to restore hydrological balance, improve biodiversity, and integrate conservation education in line with the United Nations Sustainable Development Goals (SDGs 13, 14, and 15), the Philippine Biodiversity Strategy and Action Plan (PBSAP), and CHED and DepEd mandates for environmental engagement.

**2. Objectives**

- To rehabilitate the hydrological flow and ecological function of the mangrove lagoon.
- To increase survival and growth rates of native mangrove species.
- To implement school-based biodiversity monitoring and conservation education.
- To align site rehabilitation with national and local policy frameworks.

**3. Issues Identified**

- Stagnant water and minimal tidal influx.
- Low salinity (0.5 ppt) and DO (<3 mg/L).
- Mortality of salt-preferring species like *Sonneratia alba*.
- Lack of protection for saplings and regenerating vegetation.

**4. Project Components and Activities**

**A. Hydrological Restoration**

- Survey and engineering design of a drainage/tidal inlet.
- Construction of drainage canal or water control structures.
- Periodic maintenance and debris clearing.

**B. Assisted Natural Regeneration (ANR)**

- Protection of existing saplings using bamboo fencing.

- Demarcation of no-disturbance zones.

**C. Mangrove Replanting**

- Reintroduction of native mangrove species: *Sonneratia alba*, *Rhizophora mucronata*, *Avicennia marina*.
- Planting during favorable tidal seasons (June to August).

**D. Substrate and Soil Enhancement**

- Use of organic matter to improve sediment quality.

**E. Biodiversity Monitoring**

- Quarterly transect and quadrat surveys.
- Measurement of water parameters (salinity, DO, pH, temperature).
- Use of biodiversity indices (Shannon-Wiener, Simpson's, Evenness).

**F. Education and Community Engagement**

- Development of a school-based environmental module.
- Formation of "Mangrove Guardians" Eco-Club.
- Community education campaigns and local partnerships

**5. Expected Outputs**

- Restored tidal flow and improved environmental conditions.
- Survival and establishment of native mangrove species.
- Student-led biodiversity data collection.
- Institutional support from DENR, DepEd, and LGU.

**6. Timeline (Year 1)**

| Quarter | Activities |
|---|---|
| Q1 | Hydrological survey, stakeholder consultation |
| Q2 | Drainage construction, initial replanting |
| Q3 | Education module launch, monitoring begins |
| Q4 | Survival rate assessment, project evaluation |

**7. Budget Estimate (Indicative)**

| Item | Cost (PHP) |
|---|---|

| | |
|---|---|
| Survey and Engineering | 50,000 |
| Drainage Construction | 120,000 |
| Landscaping | 50,000 |
| Monitoring Equipment | 50,000 |
| Personnel Honoraria and Salaries | 50,000 |
| Community Extension Representation (Food and Travel) | 25,000 |
| Workshops and Campaigns | 20,000 |
| Learning Materials | 15,000 |
| Contingency (10%) | 38,000 |
| Total | 418,000 |

**8. Alignment with National and Global Frameworks**

- **UN SDGs**: 13 (Climate Action), 14 (Life Below Water), 15 (Life on Land)
- **PBSAP 2015–2028** and **NGP**: Restoration and monitoring of degraded ecosystems
- **CHED Memo No. 20, s. 2013**: Environmental research and outreach
- **DepEd Eco-Schools/YES-O**: Environmental education and action

**9. Sustainability Plan**

- Regular integration into school curriculum.
- Annual student-led biodiversity reporting.
- Continued partnerships with local government and NGOs.
- Application for DENR Community-Based Forest Management (CBFM) or Protected Area status