UNIVERSIDAD PARA LA COOPERACION INTERNACIONAL
(UCI)

PROJECT MANAGEMENT PLAN FOR THE ESTABLISHMENT OF A PUBLIC HEALTH ENTOMOLOGY LABORATORY IN SAN IGNACIO TOWN, BELIZE

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DEDICATION

This thesis is dedicated to you all, who have been my constant source of love and support. To my parents, thank you for instilling in me the values of hard work and perseverance. Your sacrifices have not gone unnoticed and have been the foundation upon which I built my aspirations.

To my wife, Melva, whose patience and understanding allowed me to pursue my goals without reservations. Your encouragement was a beacon of light during the most challenging times.

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ABSTRACT

This document aims to develop a project management plan for establishing a public health entomology laboratory in Belize based on the Project Management Institute (PMI) principles and best practices. The Project Management Unit (PMU) oversees every dimension of project management to guarantee that projects align with the Ministry's mission and vision. Within the PMU, there is a critical need to adopt industry standards and best practices, including project management documentation and templates. This Final Graduation Project (FGP) aims to deliver documents as a technical reference, facilitating their application in subsequent projects.

The product of this FGP is a project management plan with all the subsidiary plans, including incorporating the principles of sustainable and regenerative development. This will facilitate the Ministry's Project Management Unit by providing clear guidance on the project scope, objectives, budget, resources, risks, stakeholder management, and communication to assure quality standards and organizational success. The analytical and mixed research methods are utilized in the development of this FGP.

The lack of a public health entomology laboratory to support vector surveillance and guide interventions backed by scientific evidence has placed the Ministry at a disadvantage. This project contributes to the Ministry's commitment to address an essential public health problem in Latin America and the Caribbean. It aligns with efforts to safeguard public health against the escalating threats of vector-borne diseases across the region and with international commitments, specifically sustainable development goal 3.3, which seeks to fight communicable diseases, including malaria, neglected tropical diseases, and other communicable diseases (World Health Organization, 2024).

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ABBREVIATIONS AND ACRONYMS

AC	Actual Cost
BVEC	Belize Vector and Ecology Center
CV	Cost Variance
CPI	Cost Performance Index
CPM	Critical Path Method
EV	Earned Value
EVM	Earned Value Management
FGP	Final Graduation Project
GPM	Green Project Management
ISO	International Organization for Standardization
NGO	Non-governmental organization
KPI's	Key Performance Indicators
P5IA	People, Planet, Prosperity, Process and Products Impact Analysis
PAHO	Pan American Health Organization
PDCA	Plan-Do-Check-Act
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PMIS	Project Management Information System
PMO	Project Management Office
PMU	Project Management Unit
PPPMU	Policy Analysis Planning Project Management Unit
PV	Planned Value

QMP	Quality Management Plan
RACI	Responsible, Accountable, Consulted, and Informed Matrix
RBS	Risk Breakdown Structure
RFP	Request for Proposal
RFQ	Request for Quotation
SDG'S	Sustainable Development Goals
SLA's	Service Level Agreements
SPI	Schedule Performance Index
SV	Schedule Variance
SWOT	Strengths, Weaknesses, Opportunities, Threats
WBS	Work Breakdown Structure
WBS Dictionary	Work Breakdown Structure Dictionary
WHO	World Health Organization
USD	United States Dollars

EXECUTIVE SUMMARY

The escalating prevalence of vector-borne diseases such as dengue and malaria across the Americas and the Caribbean presents an existential public health crisis with a particularly severe impact on marginalized communities. These communities often exist under socioeconomic conditions conducive to the propagation of these diseases. In response to this crisis, the Ministry of Health and Wellness in Belize spearheads initiatives to safeguard against dengue and other significant vector-borne diseases through its Vector Control Program. However, a critical barrier to these efforts is the persistent shortage of entomologists and a general lack of entomological expertise, which hampers effective vector control across the region (Pan American Health Organization, 2019, p. V). This shortage underscores the urgent need to bolster entomological capabilities cost-effectively and sustainably to enhance the fight against vector-borne diseases significantly.

The Final Graduation Project's general objective is to develop a project management plan to establish a public health entomology laboratory to support the Ministry of Health and Wellness Vector Control Program in tailoring public health interventions to reduce the transmission of vector-borne diseases. The specific objectives are to develop a project charter in order to guide the development of the project management plan; to develop a scope management plan to ensure that the project meets its objectives; to create a schedule management plan to ensure the project remains on schedule; to create a cost management plan to list the costs that are most likely to be incurred and a timeframe for expenditure; to create a quality plan to ensure quality requirements are met; to create a resource plan to identify and assure the availability of resources required for implementation of various tasks; to create a communications plan to define the protocols for communication and dissemination of information to respective stakeholders in timely manner; to create a risk plan to identify project risks that exist or may arise and to plan for the management of those risks; to create a procurement plan to define the process for the acquisition of goods and services required; to create a stakeholder plan to identify and describe the requirements of stakeholders that may have either positive or negative impact on the project.

The development of this FGP is based on the Project Management Institute (PMI) standards and best practices. The Project Management Body of Knowledge (PMBOK) 6th and 7th Editions were utilized to guide the development of the various subsidiary management plans. These management plans are integrated into the entire life cycle of the project. The project management plan follows project management knowledge areas, techniques, and tools to clearly understand the project's scope, objectives, budget, and resource and stakeholder management, allowing for a greater chance of success in the project's execution.

An analytical project research methodology was utilized for this research, using qualitative data gathered, primarily from the Project Management Body of Knowledge (PMBOK) 6th and 7th Editions. Other secondary information sources came from interviews with subject matter experts, guidelines, and various internet sources. The information was analyzed to develop the various subsidiary plans that comprise the project management plan.

The Ministry's project to establish a public health entomology laboratory contributes towards achieving Sustainable Development Goal 3.3, which focuses on combating communicable diseases (World Health Organization, 2024). By adopting the Sustainable Development Goals (SDGs) within impoverished communities, the project aims to foster improved socioeconomic conditions, ultimately mitigating the prevalence of vector-borne and infectious diseases (Fernandez & Funes, 2023, p. 1).

The PMU, functioning as a project management office (PMO), is pivotal in overseeing this and similar initiatives. As the PMU evolves with each project, the development and implementation of this project management plan, guided by PMBOK®, are critical to ensuring successful outcomes. The plan advocates for active engagement in communication, cost, and schedule management activities and emphasizes the importance of periodically reviewing and updating subsidiary plans to reflect new insights or requirements. Moreover, it recommends that the PMU adhere to ethical and sustainable project management practices, aligning with regenerative development principles and the broader objectives of the Sustainable Development Goals. By improving living standards and health outcomes through enhancements in housing, urban environments, and sanitation, the project aims to reduce vector-borne and infectious diseases, benefiting both human and animal populations within marginalized communities (Fernandez & Funes, 2023, p. 1).

The conclusions drawn from this comprehensive project management plan outline critical aspects of the various subsidiary plans that must be adhered for successful project execution. Each component, from integration to sustainability, has been carefully tailored to ensure cohesive and efficient management, adherence to quality standards, and proactive risk mitigation. By leveraging best practices in scope, schedule, cost, resource, communication, and stakeholder management, the project is well-positioned to achieve its objectives.

The successful establishment of the Public Health Entomology Laboratory in Belize hinges on the careful execution of this project management plan. By adhering to the outlined recommendations, the PMU will ensure the effective implementation of integration, scope, schedule, cost, quality, resource, communication, risk, procurement, stakeholder, and sustainable development plans. Each plan is designed to promote transparency, accountability, and efficiency, aligning with international standards and best practices. The project manager's proactive engagement with stakeholders, regular monitoring, and utilization of project management tools will be critical in driving the project's success. Through collaborative efforts and a strong governance structure, the Ministry’s Project Management Unit, guided by this robust plan, is equipped to ensure the project achieve its objectives.

1 INTRODUCTION

1.1. Background

The global incidence of Dengue continues to increase, and in 2019, a record was set for the highest number of cases on record, with 3.18 million cases. The year 2023 saw the global 2019 record (3,181,384) for most dengue cases broken. In 2023, the region of the Americas and the Caribbean saw a total of 4.4 million cases of dengue, breaking the record set in 2019. The region of the Americas tends to experience outbreaks of dengue every 3 to 5 years (World Health Organization, 2023).

Since the introduction of Dengue in Belize in 1978, the disease has evolved from an urban disease to now affecting many rural communities annually during the rainy season from June to November (Ministry of Health and Wellness, 2020, p. 6). Over recent years, with a change in climatic stability, the weather patterns have been erratic, and we have seen very early rainy seasons in some years and prolonged drought in others, resulting in a high density of mosquito populations. In Belize, the Vector Control Program within the Ministry of Health and Wellness is tasked with implementing surveillance, prevention, and control interventions aimed at safeguarding the population against vector-borne diseases, including Malaria, Dengue, Chikungunya, and Zika, among others (Ministry of Health & Wellness, 2022). Establishing a public health entomology laboratory will facilitate disease surveillance, research into vector biology, and the effectiveness of control methods, as well as aid in supporting the development of strategies to combat these diseases.

Establishing a public health entomology laboratory requires careful development of a robust project management plan, including documents the project management team will utilize throughout the execution, monitoring, controlling, and closing stages. These documents are

essential for guiding the team in managing and overseeing the project throughout its lifecycle. This final graduation project (FGP) will facilitate the Project Management Unit (PMU) of the Ministry of Health and Wellness with a project management plan for this urgently needed public health project. Likewise, the associated templates, aligned with the Project Management Institute (PMI) and industry standards and best practices, can be adopted for future projects managed by the PMU.

1.2. Statement of the problem

The existential public health concern, due to dengue, continues to grow annually throughout the Americas and the Caribbean. The disease continues to affect marginalized populations affected by socioeconomic conditions that create an environment conducive to sustained dengue transmission. Through its Vector Control Program, the Ministry of Health and Wellness in Belize is primarily responsible for leading the response against dengue and other vector-borne diseases of public health importance.

The lack of a public health entomology laboratory to evaluate the effectiveness of interventions and monitor vector populations places the Ministry at a disadvantage. And it puts the population at risk. This situation is not unique to Belize and is a weakness throughout the region, with the Pan American Health Organization emphasizing its importance and encouraging member states to build capacity to guide their response (Pan American Health Organization, 2019, p. V). Over the years, the Ministry has been coordinating with local researchers to fill some of the void in this regard, particularly with the Belize Vector and Ecology Center.

To this end, the Ministry of Health and Wellness seeks to establish a public health entomology lab to strengthen its response to vector-borne diseases. This endeavour aligns with international obligations, specifically sustainable development goal 3.3, which seeks to fight

communicable diseases, including malaria, neglected tropical diseases, and other communicable diseases (World Health Organization, 2024). Endeavours, such as these, are overseen by the Ministry's Project Management Unit (PMU), which functions as a project management office (PMO). The PMU is developing and maturing with each subsequent project, and this undertaking, which will see the development of a project management plan developed through the guidance of the Project Management Book of Knowledge (PMBOK®), will guide implementation throughout the project lifecycle and assure a successful outcome.

1.3. Purpose

Expertise in entomology is crucial for devising optimal strategies and techniques to control vectors effectively. Nevertheless, the ongoing shortage of entomologists and subsequent lack of entomological proficiency across the region pose consistent obstacles to combating various vector-borne diseases. Therefore, it is imperative to enhance entomological capabilities within countries in a cost-effective and sustainable manner, thereby significantly improving overall vector-borne disease control efforts.

As a solution for the Ministry’s project management unit endeavour, this FGP will devise a project management plan to establish a public health entomology laboratory, including all subsidiary plans and templates to guide all critical aspects of the project’s life cycle to ensure a successful outcome. The project management plan will serve as a blueprint, directing all project phases. Other expected benefits of the project include:

- Ensuring that all team members are aligned with the project's objectives, scope, timeline, and budget.
- Enhanced coordination to facilitate better coordination among team members and departments, leading to more efficient task execution.

- Improved risk management through identifying potential risks early on, allowing for the development of mitigation strategies to avoid or minimize their impact.
- Optimization of resources to enable efficient allocation and utilization of resources, reducing wastage and ensuring that project milestones are met within budget constraints.
- Guided cost management to provide a framework for monitoring and controlling project costs, helping to ensure the project is completed within the approved budget.
- Timely delivery through tracking project progress against the plan, allowing for adjustments to keep the project on schedule.
- Improved communication through clear communication channels and protocols, ensuring all stakeholders are informed and engaged throughout the project lifecycle.
- Incorporated quality assurance measures to maintain high standards for project deliverables, ensuring they meet or exceed stakeholder expectations.
- Stakeholder satisfaction: Ensuring project goals are met efficiently and effectively increases the likelihood of fulfilling stakeholders' expectations, leading to higher satisfaction levels.

1.4. General objective

To develop a project management plan based on the Project Management Institute (PMI) project management principles and best practices to improve the ability to manage a project to establish a public health entomology laboratory in Belize.

1.5. Specific objectives

The specific objectives of the FGP are:

1. To create an integration management plan to harmonize all project elements and allow for any possible change control that may be required.
2. To create a scope management plan detailing what is included and excluded from the project.
3. To create a schedule management plan that divides the project into scheduled tasks with well-defined start and finish dates and corresponding budgets.
4. To create a cost management plan that lists the costs that are most likely to be incurred and a timeframe for expenditure.
5. To create a quality management plan to meet stakeholders' expectations by identifying requirements.
6. To create a resource management plan to identify the physical resources required to complete the project.
7. To create a communications management plan to ensure that information is managed and disseminated in a timely manner to appropriate stakeholders.
8. To create a risk management plan to identify and monitor predicted project risks and to plan appropriate actions to manage them.
9. To create a procurement management plan to purchase or acquire products and services required from outside the project team.
10. To create a stakeholder management plan that systematically identifies, analyses, and engages with relevant stakeholders, ensuring that their expectations are understood and

addressed to promote positive relationships and contribute to the overall success of the project.

11. To create a sustainable development plan that integrates sustainable practices, restores biodiversity, and creates a regenerative ecosystem that not only mitigates environmental impacts but also fosters community resilience and well-being through innovative and inclusive initiatives.

2 THEORETICAL FRAMEWORK

2.1 Company/Enterprise framework

2.1.1 Company/Enterprise background

The Ministry of Health and Wellness in Belize is the principal governmental body responsible for guiding the nation's public health policy, healthcare services, and wellness initiatives (Ministry of Health & Wellness, 2023). It is tasked with ensuring the provision of quality healthcare, promoting public health, and implementing disease prevention programs across the country. The Ministry oversees hospitals and clinics, regulates healthcare practices and pharmaceuticals, and collaborates with international organizations to address global health challenges. Its efforts aim to improve health outcomes, control communicable and non-communicable diseases, and ensure that all Belizeans have access to necessary health services. Through its comprehensive approach to health and wellness, the Ministry plays a critical role in fostering a healthier population and enhancing Belize's overall quality of life.

2.1.2 Mission and vision statements

The Ministry of Health & Wellness' mission is to “provide quality, affordable, comprehensive health services within a resilient environment that promotes equal health and wellbeing. The vision of the Ministry is to provide “Quality health care and well-being for all now and beyond” (Belize Ministry of Health & Wellness, 2024).

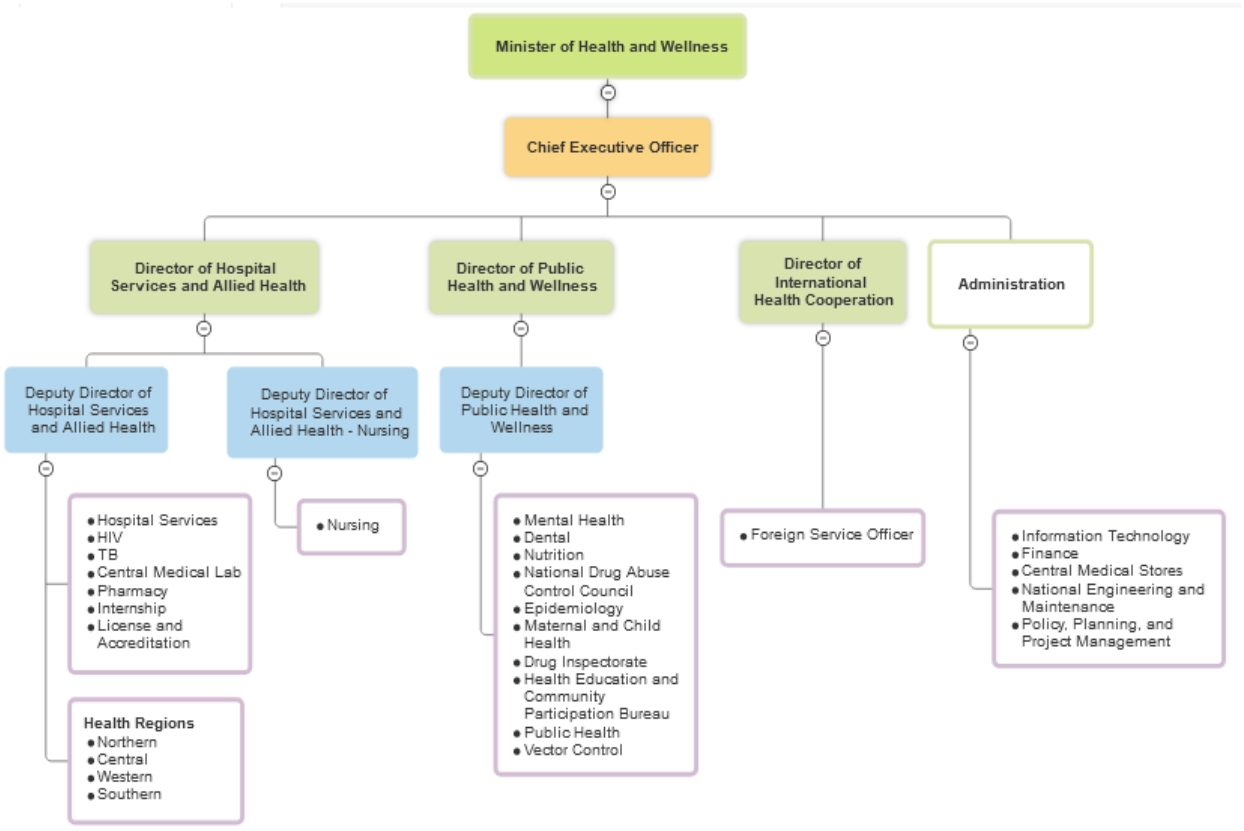
2.1.3 Organizational Structure

The Ministry of Health and Wellness is headed by the Minister, a duly elected member of parliament. A Chief Executive Officer oversees all aspects of the Ministry that the Minister selects. Three directors at headquarters oversee various technical programs managed by a

technical advisor for each programmatic area. Policies, guidelines, standard operating procedures, budgets, projects, and programs are established at this level. Implementation occurs within the country's four health regions, led by regional management teams and healthcare workers.

Figure 1

Organizational Structure of the Ministry of Health and Wellness



(Source: Compiled by the Author)

2.1.4 Products Offered

The Ministry of Health and Wellness offers an array of services to address health conditions affecting the populace and safeguard public health safety. These services encompass clinical offerings found in hospitals and clinics, including medical care, nursing, diagnostic imaging, and provision of pharmaceuticals and laboratory services. The Ministry also engages in

various non-clinical activities, such as epidemiology, public health initiatives, health education, and health policy development, as well as regulating, licensing, and monitoring health facilities in the public and private sectors. These efforts collectively contribute to the Ministry's mission to provide equal health and well-being for all (Ministry of Health & Wellness, 2023).

2.2 Project Management Concepts

The Project Management Institute created "A Guide to the Project Management Body of Knowledge" (PMBOK), establishing a comprehensive framework that includes principles, skills, methodologies, policies, procedures, tools, techniques, and life cycle essentials for effective project management practice. Therefore, this Final Graduation Project (FGP) adheres to professional standards and methodologies.

2.2.1 Project management principles

The Project Management Institute (PMI) outlines 12 principles of project management that serve as a foundational guide for project managers aiming to deliver value and achieve success in their project management (Project Management Institute, 2021, p. 21). These principles emphasize the importance of stewardship, advocating for responsible and respectful management of resources. They highlight the importance of building a cohesive team culture rooted in accountability and respect while stressing the critical role of engaging stakeholders to understand and meet their needs. A central focus of delivering value to the organization and stakeholders is paramount, alongside recognizing systemic interactions within projects to maximize outcomes. Leadership qualities such as motivation, influence, coaching, and a willingness to learn are critical to project success. Tailoring project approaches to fit specific

contexts, incorporating quality into both processes and outcomes, and addressing the inherent complexities of projects through knowledge and learning are also deemed essential.

Figure 2

Project Management Principles

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2.2.2 Project management domains

The Project Management Institute categorizes project management principles into eight performance domains. These domains encompass critical aspects of effective project management, including stakeholder engagement, team collaboration, development approaches, planning, project work execution, value delivery, performance measurement, and risk management. This holistic framework encourages project managers to integrate these domains seamlessly, fostering a comprehensive understanding of project dynamics and ensuring successful project outcomes. The domains guide navigating the complexities of diverse projects, promoting strategic planning, stakeholder collaboration, and continuous improvement throughout the project lifecycle.

The PMBOK 7th Edition identifies the following eight performance domains that are critical for effective project management (Project Management Institute, 2021, p. 5):

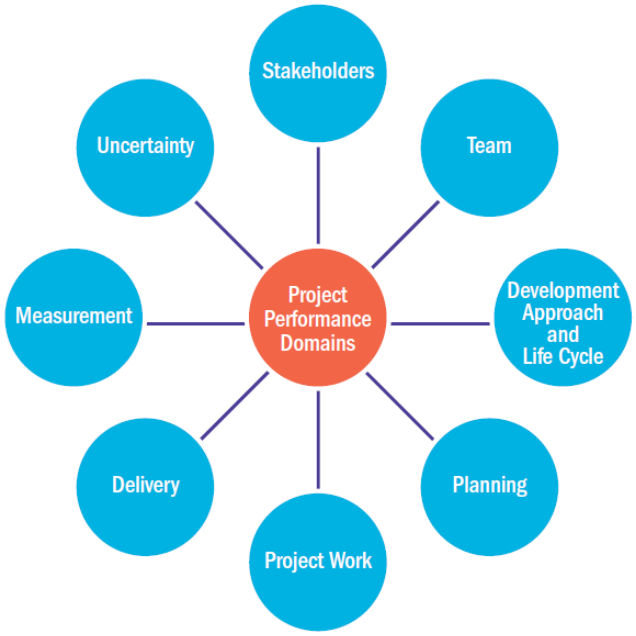
1. Stakeholder: This domain emphasizes the importance of engaging stakeholders appropriately to their interests and involvement in the project. It covers stakeholder engagement and communication strategies to ensure that their needs and expectations are met, and that they are kept informed, and supported throughout the project.
2. Team: This domain focuses on building, leading, and supporting a collaborative project team. It covers aspects such as team formation, empowerment, training, and development, as well as promoting team performance through both effective leadership and conflict resolution.
3. Development Approach and Life Cycle: This domain addresses the selection and application of development methodologies and approaches (e.g., agile, waterfall, hybrid) suitable for the project and its life cycle. It emphasizes adaptability and flexibility in project planning and execution.
4. Planning: This domain highlights the importance of a comprehensive and strategic approach to planning all aspects of the project, including scope, schedule, cost, quality, resources, and risk. This domain involves setting objectives, determining actions to achieve them, and outlining how project performance will be measured and controlled.
5. Project Work: This involves executing project tasks and creating project deliverables. It also covers the management of project activities, resources, and information, ensuring that work is carried out efficiently and effectively to meet project objectives.
6. Delivery: This domain focuses on meeting project objectives and delivering value to stakeholders. It involves coordinating and managing activities to produce the project's

deliverables, managing scope and changes, and ensuring that the project meets its agreed-upon requirements and quality standards.

7. Measurement: This domain involves tracking and assessing project performance and progress using key performance indicators (KPIs) and project metrics. It covers the use of performance measurement and monitoring techniques to ensure that the project stay on track and deliver the expected outcomes.
8. Uncertainty: This domain addresses the identification, analysis, and response to project risks and uncertainties. It involves risk management processes and the ability to adapt to changes and unexpected issues that arise during the project.

Figure 3

Project Management Domains



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2.2.3 Predictive, adaptive and hybrid projects

Project development approaches encompass a range of methodologies and frameworks utilized to guide the planning, execution, and completion of projects. There is an array of approaches tailored to different project types and organizational contexts. The selection of a project development approach hinges on factors such as project complexity, stakeholder preferences, and the dynamic nature of project requirements, ensuring alignment with project goals and objectives. The development approach used to create this project management plan is a hybrid method. The hybrid approaches integrate elements of both predictive and adaptive approaches.

Predictive Projects:

Predictive project management, often associated with the traditional or waterfall approach, is characterized by its linear and sequential phases. In predictive projects, the scope, time, and cost are determined early in the project lifecycle, with a strong emphasis on upfront planning and a clear definition of project requirements and deliverables (Project Management Institute, 2021, p. 35). This approach works best for projects where the outcome and the path to achieving it are well understood from the beginning. Changes to the project scope or objectives are generally difficult to accommodate once the project is underway, making predictive project management ideal for stable environments where requirements are unlikely to evolve significantly.

Adaptive Projects:

Adaptive project management, also known as agile or iterative, is a powerful tool designed to embrace change and uncertainty. In adaptive projects, work is structured in short cycles or iterations, allowing for frequent reassessment and adaptation of project plans. This

approach places a strong emphasis on continuous stakeholder engagement, team collaboration, and responsiveness to change, making it a perfect fit for projects in dynamic environments where requirements, technology, or market conditions may evolve rapidly (Project Management Institute, 2021, p. 38). The adaptive model empowers teams to incorporate feedback and learning throughout the project, leading to more flexible and customer-focused outcomes, a vital advantage of this approach.

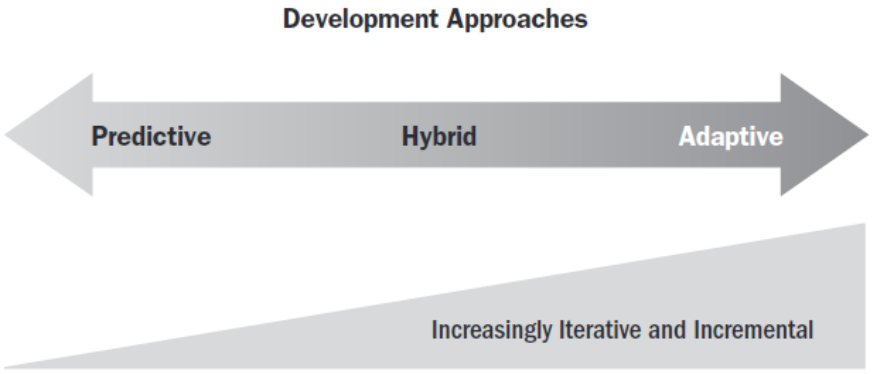
Hybrid Projects:

Hybrid project management combines elements of both predictive and adaptive approaches, leveraging the strengths of each according to the project's needs. Hybrid projects might start with a predictive approach for the initial planning and then switch to an adaptive approach for execution. Alternatively, they might use a predictive framework for specific project deliverables while adopting an adaptive model for others. This approach offers flexibility and adaptability in managing changes while maintaining control and predictability over the project scope and deliverables (Project Management Institute, 2021, p. 36). Hybrid project management benefits complex projects where some aspects are well-defined, and others are more uncertain or subject to change.

Each project management approach—predictive, adaptive, and hybrid—offers distinct advantages and best suits different projects and environments. The choice of approach depends on the project's specific requirements, including its goals, complexity, and the degree of uncertainty involved.

Figure 4

Project Development Approaches



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2.2.4 Project management

The Project Management Institute (PMI) defines project management as applying knowledge, skills, tools, and techniques to project activities to meet project requirements (PMI, 2021, p. 36). This discipline involves initiating, planning, executing, monitoring and controlling, and closing work efforts to achieve specific goals within a set timeframe. It is designed to produce a unique product, service, or result, ensuring that project objectives are achieved, and that the project is completed successfully and efficiently.

Project management is characterized by its systematic approach to managing and guiding project processes from start to finish. The aim is to fulfil stakeholders' expectations and requirements within the constraints of scope, time, and cost while managing risk and ensuring quality (Wrike, n.d.). This definition underscores the importance of project management as a strategic competency that enables organizations to link project results to business goals, thereby driving organizational success and competitive advantage.

2.2.5 Project management knowledge areas and processes

The Project Management Body of Knowledge (PMBOK) outlines 10 Knowledge Areas that categorize project managers' key competencies to effectively manage projects (Project Management Institute, 2017, p. 25). These areas cover the breadth of project management activities and ensure a comprehensive approach to delivering successful projects.

1. Project Integration Management: Ensures project elements are effectively coordinated from initial planning to completion.
2. Project Scope Management: This process focuses on defining and controlling what is included in the project and what is omitted to meet specific project objectives.
3. Project Schedule Management: Involves planning, developing, managing, and controlling project timelines to ensure timely completion.
4. Project Cost Management: Estimating, budgeting, and controlling costs to keep the project within the approved budget.
5. Project Quality Management: This aims to ensure that the project and its deliverables meet the required standards and that stakeholders are satisfied.
6. Project Resource Management: Involves planning, acquiring, deploying, and managing resources (personnel and materials) efficiently.
7. Project Communications Management: Ensures timely and appropriate generation, collection, dissemination, and storage of project information.
8. Project Risk Management: This focuses on identifying, analyzing, and responding to project risks with the aim of minimizing their impact.
9. Project Procurement Management: Deals with acquiring goods and services from outside the project team to meet project objectives.

10. Project Stakeholder Management: Involves engaging stakeholders, understanding their needs and expectations, and managing their influence on the project.

Figure 5.

Project Management Knowledge Areas

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

Note: Reprinted from A Guide to the Project Management Body of Knowledge p.25. Project Management Institute, 2017. Copyright 2017 by the Project Management Institute.

In the realm of project management, the Project Management Body of Knowledge (PMBOK) by the Project Management Institute (PMI) has traditionally organized project management activities into five distinct Process Groups. These Process Groups provide a framework for the project management lifecycle, helping project managers and their teams navigate projects from start to finish. These Process Groups are not necessarily performed linearly; they often overlap and interact throughout the project (Project Management Institute, 2021, p. 170). Together, they provide a robust framework that guides the project management process from inception to completion, ensuring that projects are delivered effectively and efficiently. The five Process Groups are:

1. Initiating: This Process Group involves the tasks necessary to start a new project or a new phase of a project. It includes defining the project or phase and obtaining authorization to proceed. Key activities include identifying stakeholders, defining the initial scope, and developing the project charter.
2. Planning: The Planning Process Group encompasses all activities required to establish the total scope of the effort, define and refine the objectives, and develop the course of action necessary to attain those objectives. This group includes processes related to scope planning, risk management planning, schedule and cost estimation, and project management plan development.
3. Executing: This group involves the processes used to complete the work defined in the project management plan to satisfy the project specifications and objectives. It includes coordinating people and resources, as well as integrating and performing the project activities in accordance with the project management plan.

4. Monitoring and Controlling: The Monitoring and Controlling Process Group consists of those processes required to track, review, and orchestrate the project's progress and performance, identify any areas in which changes to the plan are needed, and initiate the corresponding changes. Key activities include measuring project performance, managing changes to the scope, schedule, and costs, and ensuring that project objectives are achieved.
5. Closing: This group includes the processes to conclude all activities across all Process Groups and formally close the project or phase. This stage involves finalizing all project activities, officially closing the project, and confirming that all work has been completed to the stakeholders' satisfaction.

Figure 6

Project Management Process Groups

Note: Copied from the website, Project Engineer, by Bernie Roseke, 2021. Copyright by Project Engineer. All rights reserved. Project life cycle

2.2.6 Project life cycle

The Project Management Institute (PMI) outlines a project lifecycle framework that facilitates various project types and methodologies, recognizing that projects can differ significantly in complexity, scope, and industry (Project Management Institute, 2017, p. 547).

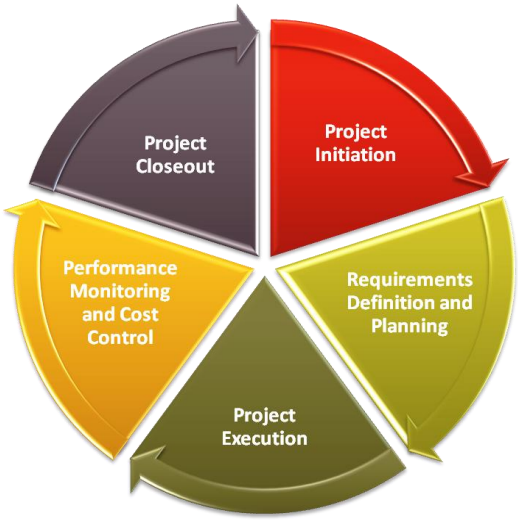
Although the PMI does not prescribe a rigid set of project lifecycle phases, it generally aligns with the traditional model of project management, comprising initiation, planning, execution, monitoring and controlling, and closing phases. This model provides a high-level overview of the project's journey from conception to completion.

The initiation phase marks the formal start of the project, defining its objectives and scope. The planning phase involves detailed preparation, including developing scope, schedule, cost, quality, and stakeholder engagement plans. During the execution phase, the project team works to complete the tasks and produce the project's deliverables. The monitoring and controlling phase run concurrently with execution, focusing on tracking progress and adjusting as necessary to keep the project on track.

Finally, the closing phase concludes the project, formalizing acceptance of the deliverables and documenting lessons learned. This lifecycle framework allows for flexibility and adaptation to suit the specific needs and constraints of different projects, reflecting PMI's understanding of the diverse nature of project management (Bridges, 2023).

Figure 7

Project Lifecycle



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2.2.7 Company strategy, portfolios, programs, and projects

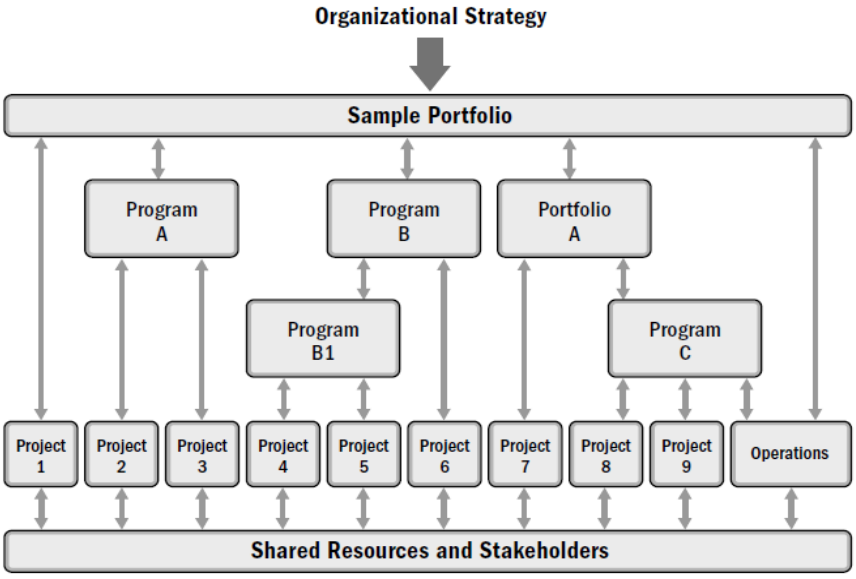
Company strategy defines a business's long-term direction and goals, outlining how to achieve competitive advantage, satisfy customer needs, and ensure sustainable growth. It involves making choices about markets, products, and services and determining the best ways to allocate resources, develop capabilities, and respond to external opportunities and threats. A well-defined company strategy guides decision-making, prioritizes initiatives, and sets the framework for operational plans and projects, ensuring that all efforts are aligned with the company's overarching vision and objectives (Wrike, n.d.). Strategy outlines an organization's overall goals, guiding the direction for portfolios, programs, and projects.

The PMI describes a project as a short-term effort to produce a unique outcome, like a product or service, with a clear start and finish. Projects such as programs or portfolios can be independent or part of more extensive efforts. Similar or related projects are grouped to form programs, facilitating the management of connected dependencies such as resources and improving outcomes (Wrike, n.d.). Portfolios refer to projects and programs aligned with an organization's financial and strategic business objectives (Project Manager, 2023). This hierarchy ensures that an organization's efforts are strategically aligned, efficiently managed and effectively executed to deliver maximum value.

This FGP falls under the project category and contributes to the company's broader business strategy and goals. The Project Management Unit will be facilitated with a project management plan for an urgently needed public health project. Likewise, the associated templates, aligned with the PMI industry standards and best practices, can be adopted for future projects managed by the Ministry.

Figure 8

Project, Programs, and Portfolio Interfaces



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2.3 Other applicable theories/concepts related to the project topic and context

2.3.1 Current situation of the problem or opportunity in study

The Ministry of Health and Wellness has a Policy Analysis, Planning, and Project Management Unit (PPPMU) within its structure, which carries the functions of a project management office (PMO). The PPPMU executes all health-related projects and ensures that outputs are aligned with the Ministry's mission and vision. The PPPMU is evolving with each subsequent project, and its consistency in quality and success in delivering project outcomes have improved their level of maturity. However, the unit requires growth in organizing and improving its project management processes and the consistency of those processes across projects. This organizing and growth component entails standardizing project documents, templates, processes, and best practices, ensuring that they are aligned with industry standards.

Developing a project management plan for a future project to establish a public health entomology laboratory through this FGP will contribute towards the growth mentioned above needed by the PPMU. The importance and urgent need for public health entomology laboratories within vector control programs in Latin America and the Caribbean are particularly pronounced due to the region's climate, biodiversity, and socio-economic factors, which create a conducive environment for the proliferation of vector-borne diseases. These diseases, such as dengue, Zika, chikungunya, malaria, and yellow fever, pose significant public health burdens in these areas, affecting millions of people and straining public health systems.

A public health entomology laboratory plays a crucial role in the surveillance and monitoring of vectors. The region's diverse climates, ranging from tropical rainforests to arid deserts, support a wide variety of vectors, necessitating localized monitoring to accurately understand vector distribution and disease risk. This data is essential for early warning systems and the timely implementation of vector control measures.

Given the region's dynamic nature of vector-borne disease transmission, fuelled by factors such as climate change and urbanization, research and development of new vector control strategies are critically needed. A public health entomology laboratory facilitates the study of local vector species, their resistance patterns to insecticides, and the effectiveness of control measures, enabling the adaptation of strategies to local conditions.

Effective vector management and disease prevention strategies are paramount in Latin America and the Caribbean, where health disparities and limited resources can exacerbate the impact of vector-borne diseases. A dedicated laboratory supports developing and implementing integrated vector management programs, tailored public health interventions, and community engagement efforts to reduce disease transmission.

Local expertise in entomology and vector control is essential for sustainable disease management. A public health entomology laboratory serves as a training center for regional professionals and fosters collaboration among countries which are facing similar public health challenges. Countries can enhance their response to vector-borne diseases by sharing knowledge, expertise, and resources. The region's experience with outbreaks of emerging diseases like the Zika virus underscores the need for preparedness and rapid response capabilities. A public health entomology laboratory can quickly mobilize to identify new threats, study vector-pathogen interactions, and guide public health responses to limit the impact of outbreaks.

2.3.2 Previous research done for the topic in the study

The importance of this FGP in guiding the implementation of this vital public health project is critical for the Ministry of Health and Wellness. Furthermore, the project is aligned with protecting public health from a growing regional threat. To this end, the Pan American Health Organization (PAHO) Plan of Action on Entomology and Vector Control 2018-2023 was designed to strengthen the capacities of Member States in the Americas to control vector-borne diseases. This initiative acknowledges the significant public health threat posed by diseases such as dengue, Zika, chikungunya, and malaria, which are prevalent in many parts of the region. The plan aimed to address these challenges through comprehensive and integrated vector management strategies, emphasizing sustainability, community participation, and evidence-based interventions (Pan American Health Organization, 2018).

Infectious diseases significantly affect public health globally, including in the Americas. The World Health Organization (WHO) reports that diseases transmitted by vectors, including dengue, yellow fever, and other mosquito-borne viruses, malaria, schistosomiasis, leishmaniasis,

Chagas disease, and plague, account for over 17% of all infectious diseases globally, leading to over 700,000 deaths annually (Pan American Health Organization, 2018).

Public health entomology and the management of vector-borne diseases continue to be overlooked in terms of political significance and financial backing, resulting in minimal investment. This has diminished the region's ability to promptly and effectively address a growing dengue problem and the re-emergence of diseases such as chikungunya and Zika. Marginalized populations, lacking sufficient vector prevention and control measures and access to healthcare continue to be the most affected. The emergence of these diseases is impacted by the density of vectors, which, in turn, are influenced by an array of social, economic, and environmental factors and climate change.

Over recent years, the Ministry has collaborated with a local research institution, Belize Vector and Ecology Center (BVEC), in investigating ecological, animal, and public health concerns (University of Notre Dame, 2024). BVEC is an affiliate of the University of Notre Dame Eck Institute for Global Health and the Department of Biological Sciences. However, the Ministry must invest in building capacity to ensure that these types of operational research are carried out extensively and in a timely manner. Therefore, the construction of a public health entomology lab to continuously monitor vector populations, evaluate the efficacy of chemical interventions, and help guide policy and decision-making is of paramount importance in this endeavour.

2.3.3 Other theories related to the topic in the study

Project Management Plan:

According to the Project Management Institute (PMI), a Project Management Plan is a formal, approved document that defines how the project is executed, monitored, controlled, and

closed. The Project Management Plan should be tailored to the project's needs, reflecting the project's complexity and requirements. It serves as a guide for project execution and control, providing a reference for project goals, deliverables, processes, and performance baselines. It integrates and consolidates all subsidiary plans and baselines from the project management knowledge areas, including but not limited to:

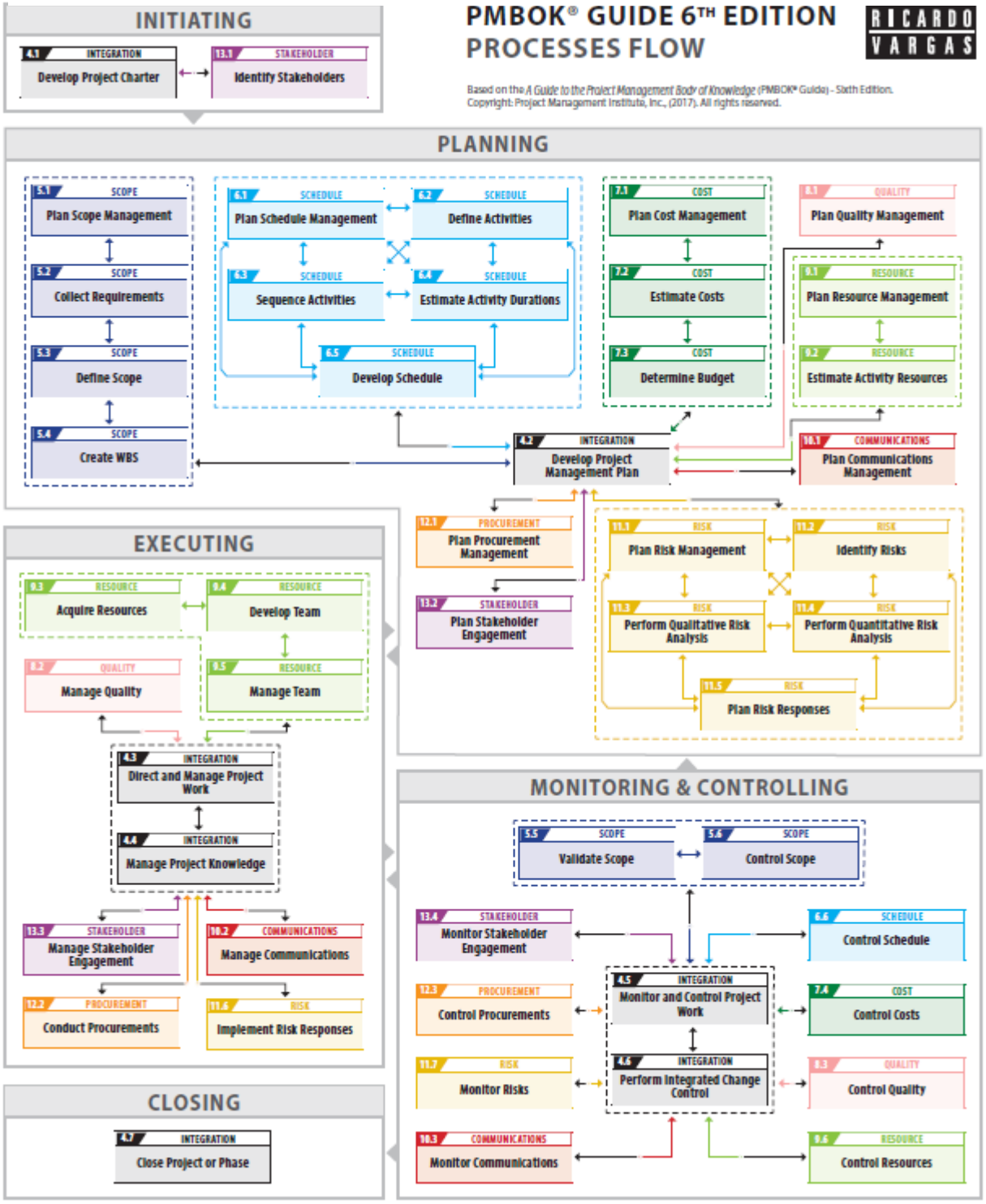
1. Integration Management: How to define, prepare, integrate, and coordinate all subsidiary plans.
2. Scope Management: Outlining how project scope will be defined, validated, and controlled.
3. Schedule Management: Detailing the project schedule, including activities, milestones, and their durations.
4. Cost Management: Budget planning, estimating, funding, and control.
5. Quality Management: Defining quality policies, objectives, and responsibilities to ensure that the project satisfies the needs for which it was undertaken.
6. Resource Management: Identifying, acquiring, and managing resources needed.
7. Communication Management: Plan how project information will be generated, captured, distributed, stored, retrieved, and disposed of.
8. Risk Management: Risk management planning includes risk identification, analysis, response planning, and monitoring.
9. Procurement Management: How to purchase or acquire products, services, or results needed from outside the project team.
10. Stakeholder Management: Strategies to engage project stakeholders.

Project Integration Plan:

Project Integration Management is a critical component of project management that involves coordinating all project elements to ensure that they function seamlessly. This aspect of project management encompasses the processes and activities needed to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups (see Figure 6). It includes developing the project charter and project management plan and directing and managing project work. It also involves monitoring and controlling project work, performing integrated change control, and closing the project or phase. Effective integration management ensures that project components are properly coordinated, resources are allocated efficiently, and potential conflicts are resolved, leading to the completion of the project objectives.

Figure 9

Project Management Process Groups



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3 METHODOLOGICAL FRAMEWORK

A research methodological framework is a blueprint for collecting, measuring, and analyzing data in research studies. It provides a structured approach to solving the research problem, ensuring that the study remains on track and maintains its focus on achieving its objectives (Hassan, 2024). This framework encompasses various components, including the research design, data collection methods, data analysis techniques, and the rationale behind choosing these methods.

3.1 Information sources

Information sources, the origins or channels individuals use to access data, facts, knowledge, or insights, have significantly evolved with the global digital transformation. Traditional sources of information, such as books, academic journals, newspapers, and other forms of print media, have been joined by online platforms, databases, social media, audiovisual materials, and more (Ashikuzzaman, 2023).

3.1.1 Primary sources

Primary information sources are original materials or direct evidence that provide first-hand testimony or direct evidence concerning a topic, subject of inquiry, or study (University of Wisconsin Stevens Point, 2023). These sources are created during the event or under study without secondary analysis, interpretation, influence, or alteration. These sources are foundational to research and scholarship, allowing users to analyze and interpret data or evidence in its original context. In developing the project management plan for establishing a public health entomology laboratory, discussions were held with subject matter experts, primarily professor, researcher, and proprietor of Belize Vector and Ecology Center, Dr John Greico.

3.1.2 Secondary sources

Secondary information sources are materials that interpret, analyze, or summarize data from primary sources (Ashikuzzaman, 2023). They provide second-hand accounts that offer insights, explanations, and commentary on original information. Examples include academic review articles, textbooks, etc. These sources are essential for understanding the broader context and scholarly discussion surrounding a topic, serving as a foundation for further research and analysis. In preparation for the FGP, the primary secondary sources are the PMBOK sixth and seventh editions, which will ensure that the project management plan being developed is aligned with the principles and sound practices of the PMI.

Chart 1

Information sources

Objectives	Primary Sources	Secondary Sources
1. To create an integration management plan to ensure various elements of the project work seamlessly to meet project objectives and deliverables.	• Emails • Meetings • Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Interview with technical officers at Belize Vector and Ecology Center Other subject matter experts	• PMBOK Guide 7th Edition • PMBOK Guide 6th Edition • Project Management Institute (PMI) online database • Project management websites • Journal articles
2. To develop a scope management plan to ensure that the scope is well-defined and completed.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	• The PMBOK 6th edition • Articles from PMI on scope management
3. To develop the schedule management plan to ensure that the project is completed on time.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	• The PMBOK 6th edition • Project management websites
4. To develop a cost management plan to ensure that the project is	• Verbal and written communications with UCI	• The PMBOK 6th edition

Objectives	Primary Sources	Secondary Sources
completed within the allocated budget.	Graduation Seminar Course lecturer and tutor • Subject matter experts	• Project management websites • Articles from PMI on cost management
5. To develop a quality management plan to ensure that the project meets requirements and established quality standards.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Interview with technical officers at Belize Vector and Ecology Center • Other subject matter experts	• The PMBOK 6th edition • Articles from PMI on quality management • Project management websites
6. To develop a resource management plan to ensure that adequate resources are allocated and managed to support project execution.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	• The PMBOK 6th edition • Project management websites • Articles from PMI on resource management
7. To develop a communications management plan to define how information will be communicated within the project team and to external stakeholders, including the methods, frequency, and channels used for communication.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	• The PMBOK 6th edition • Project management websites • Articles from PMI on communications management
8. To develop a risk management plan to help identify, evaluate, plan response to mitigate, and monitor risks.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	• The PMBOK 6th edition • Project management websites • Articles from PMI on risk management
9. To develop a procurement management plan to ensure that the purchasing or acquiring goods and services outside the project team is within budget.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Interview with technical officers at Belize Vector and Ecology Center • Other subject matter experts	• The PMBOK 6th edition • Project management websites • Articles from PMI on procurement management

Objectives	Primary Sources	Secondary Sources
10. To develop a stakeholder management plan to identify stakeholders and plan to manage their expectations effectively.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Interview with technical officers at Belize Vector and Ecology Center • Other subject matter experts	• The PMBOK 6th • Project management websites • Articles from PMI on stakeholder management
11. To create a sustainable development plan that integrates sustainable practices, restores biodiversity, and creates a regenerative ecosystem that not only mitigates environmental impacts but also fosters community resilience and well-being through innovative and inclusive initiatives.	• Interviews with subject matter experts • Interview with technical officers at Belize Vector and Ecology Center	• Sustainable and regenerative project management websites. • Online database and resources including ResearchGate and Google Scholar • Project Management Institute library

(Source: Compiled by: the Author)

3.2 Research methods

Research methods are techniques used to conduct research and analyze data to increase understanding of a topic or issue (Indeed, 2023). These methods are the strategies, processes, or techniques applied in collecting data or evidence for analysis to attain new information or better understand a topic. Research methods are fundamental to conducting scientific studies and are used across various disciplines, including social, natural, and health sciences. The analytical and mixed methods are utilized in developing this FGP, as there is substantial content on the subject matter for reviewing, analyzing, and evaluating. The analytical approach to the development of the FGP entails stating the thesis, gathering resources, evaluating resources, and utilizing resources to support the thesis.

3.2.1 Analytical method

Analytical research is a specific type of research that involves critical thinking and the evaluation of existing information to break down complex problems, understand their components, and solve them (Taylor, 2023). This method is widely used across various fields, including the sciences, humanities, social sciences, and business.

Chart 2

Research Methods

Objectives	Analytical Method
1. To create an integration management plan to ensure that various elements of the project work seamlessly to meet project objectives and deliverables.	The analytical approach will involve conducting meetings and interviews with project team members and organizing focus group discussions. This approach aims to collect qualitative data concerning integration challenges. From these interactions, insights will be extracted that will inform the development of the plan.
2. To develop a scope management plan to ensure that the scope is well-defined and completed.	Primary and secondary data sources will be utilized to define the scope baseline.
3. To develop the schedule management plan to ensure that the project is completed on time.	Secondary data sources will be used to sequence and estimate the duration of activities, which will be the foundation of the schedule management plan.
4. To develop a cost management plan to ensure that the project is completed within the allocated budget.	The PMBOK 6th editions and other secondary sources of information will determine the requisite techniques and tools for devising a cost management plan.
5. To develop a quality management plan to ensure that the project meets requirements and established quality standards.	Information received from various secondary sources, including the PMBOK 6th, as well as technical guidelines on the subject matter, will ensure that the quality management plan meets the stakeholders' requirements and is aligned with industry standards and best practices.
6. To develop a resource management plan to ensure that adequate resources are allocated and managed to support project execution.	The PMBOK 6th edition will be used to determine the tools and techniques to guide the development of the resource management plan's components.

Objectives	Analytical Method
7. To develop a communications management plan to define how information will be communicated within the project team and to external stakeholders, including the methods, frequency, and channels used for communication.	The available information from the PMBOK 6th edition, along with other sources identified in Chart 1, will be used to develop a communications management plan.
8. To develop a risk management plan to help identify, evaluate, plan response to mitigate, and monitor.	The PMBOK 6th, along with subject matter guidelines, will serve as a secondary source of information to guide the development of the communication management plan.
9. Develop a procurement management plan to ensure that the purchasing or acquisition of goods and services outside the project team stays within budget.	The PMBOK 6th edition will provide information to ensure that the procurement management plan is devised using appropriate tools and techniques.
10. To develop a stakeholder management plan to identify stakeholders and plan to manage their expectations effectively.	The PMBOK 6th edition, along with other sources identified in Chart 1, will be the source of information used to develop a stakeholder management plan.
11. To create a sustainable development plan that integrates sustainable practices, restores biodiversity, and creates a regenerative ecosystem that not only mitigates environmental impacts but also fosters community resilience and well-being through innovative and inclusive initiatives.	Primary and secondary data sources will be utilized to identify sustainable and regenerative practices within the project.

(Source: Compiled by: the Author)

3.3 Tools

A project management tool is software, or a system designed to assist in planning, organizing, managing, and tracking a project's progress and resources (Project Management Institute, 2017, p. 725). It facilitates communication, collaboration among team members, and decision-making processes, ensuring that projects are completed within scope, time, and budget constraints.

Chart 3

Project Management Tools

Objectives	Tools
1. To create an integration management plan to ensure that various elements of the project work seamlessly to meet project objectives and deliverables.	• Microsoft Project • Expert Judgement • Meetings • Data gathering and analysis
2. To develop a scope management plan to ensure that the scope is well-defined and completed.	• Microsoft Word • Microsoft Excel • UCI Charter Template • Expert judgment • Data gathering
3. To develop the schedule management plan to ensure that the project is completed on time.	• Microsoft Word • Microsoft Project • Expert judgment
4. To develop a cost management plan to ensure that the project is completed within the allocated budget.	• Microsoft Word • Microsoft Project • Expert judgment • Analogous estimating • Parametric estimating
5. To develop a quality management plan to ensure that the project meets requirements and established quality standards.	• Microsoft Word • Expert judgment • Meetings and interviews with experts • Data gathering
6. To develop a resource management plan to ensure that adequate resources are allocated and managed to support project execution.	• Microsoft Word • Microsoft Project • Expert judgment
7. To develop a communications management plan to define how information will be communicated within the project team and to external stakeholders, including the methods, frequency, and channels used for communication.	• Microsoft Word • Expert judgment • Meetings and interviews with experts
8. To develop a risk management plan to help identify, evaluate, plan response to mitigate, and monitor.	• Microsoft Word • Expert judgment • Risk identification • Meetings and interviews with experts

Objectives	Tools
9. To develop a procurement management plan to ensure that the purchasing or acquiring goods and services outside the project team is within budget.	• Microsoft Word • Expert judgment • Existing organizational policies, tools, etc.
10. To develop a stakeholder management plan to identify stakeholders and plan to manage their expectations effectively.	• Microsoft Word • Expert judgment • Meetings and interviews with experts
11. To create a sustainable development plan that integrates sustainable practices, restores biodiversity, and creates a regenerative ecosystem that not only mitigates environmental impacts but also fosters community resilience and well-being through innovative and inclusive initiatives.	• Expert Judgement • Meetings • Data gathering and analysis

(Source: Compiled by: the Author)

3.4 Assumptions and constraints

Project assumptions and constraints refer to the predetermined conditions, factors, or limitations that influence a project's planning and execution. Assumptions are conditions considered true without proof, while constraints are the restrictions that must be adhered to during the project lifecycle (Usmani, 2023).

Chart 4

Assumptions and constraints

Objectives	Assumptions	Constraints
1. To create an integration management plan to ensure that various elements of the project work seamlessly to meet project objectives and deliverables.	Project elements will transition and integrate seamlessly.	The timeframe for the project is limited, and, therefore, changes may significantly disrupt the transition between activities and phases.
2. To develop a scope management plan to ensure that the scope is well-defined and completed.	The project scope will be well-defined.	There is the possibility of the scope changing as a consequence of limited resources.

Objectives	Assumptions	Constraints
3. To develop the schedule management plan to ensure that the project is completed on time.	A realistic time management plan will be developed to allocate adequate time to complete the project.	The time allotted for completing the project is very limited, and the timeline set for completing tasks and deliverables must be met.
4. To develop a cost management plan to ensure that the project is completed within the allocated budget.	A detailed budget will be developed.	The budget set for the execution of the project must not be exceeded.
5. To develop a quality management plan to ensure that the project meets requirements and established quality standards.	It is assumed that all established standards will be identified within the quality management plan to meet quality expectations.	The Ministry has no established norms or practices to measure project quality.
6. To develop a resource management plan to ensure that adequate resources are allocated and managed to support project execution.	Requisite information sources to develop a resource plan are available.	Some resources may not be available or too costly to include.
7. To develop a communications management plan to define how information will be communicated within the project team and to external stakeholders, including the methods, frequency, and channels used for communication.	The resources required to develop the communication management plan are available. Communication requirements and needs of stakeholders are identified.	There is only one week allocated to create the project charter.
8. To develop a risk management plan to help identify, evaluate, plan response to mitigate, and monitor.	All known risk and mitigation strategies will be identified.	Unidentified risks may arise during execution, and risk plans may require routine updating.
9. To develop a procurement management plan to ensure that the purchasing or acquiring goods and services outside the project team is within budget.	Information required to develop a procurement management plan is available. It is assumed that the Ministry has the information and expertise.	Different types of projects and sponsors have various policies and requirements; this may have resulted in the Ministry not standardizing a set procurement policy.
10. To develop a stakeholder management plan to identify	The information required to identify	Lack of participation or interest in the project from stakeholders.

Objectives	Assumptions	Constraints
stakeholders and plan to manage their expectations effectively.	stakeholders and their requirements is available.	
11. To create a sustainable development plan that integrates sustainable practices, restores biodiversity, and creates a regenerative ecosystem that not only mitigates environmental impacts but also fosters community resilience and well-being through innovative and inclusive initiatives.		Some resources may not be available or too costly to include.

(Source: Compiled by: the Author)

3.5 Deliverables

A deliverable refers to any distinct and confirmable outcome, item, or ability to provide a service that must be delivered to conclude a task, stage, or project and can be physical or non-physical (Project Management Institute, 2017, p. 4).

Chart 5

Deliverables

Objectives	Deliverables
1. To create an integration management plan to ensure that various elements of the project work seamlessly to meet project objectives and deliverables.	• Integration Management Plan
2. To develop a scope management plan to ensure that the scope is well-defined and completed.	A scope management plan that includes: • scope statement • WBS • WBS dictionary • traceability matrix
3. To develop the schedule management plan to ensure that the project is completed on time.	A schedule management plan which includes: • activity list • sequence of activities • activity durations

Objectives	Deliverables
	• schedule model • schedule baseline
4. To develop a cost management plan to ensure that the project is completed within the allocated budget.	A cost management plan which includes: • cost baseline • estimate of costs • project budget.
5. To develop a quality management plan to ensure that the project meets requirements and established quality standards.	A quality management plan that integrates quality assurance throughout the project.
6. To develop a resource management plan to ensure that adequate resources are allocated and managed to support project execution.	A resource management plan that guarantees the efficient use, oversight, and regulation of project resources to achieve project goals within set scope, deadlines, and quality criteria.
7. To develop a communications management plan to define how information will be communicated within the project team and to external stakeholders, including the methods, frequency, and channels used for communication.	A communications management plan that outlines a suitable strategy and plan for engaging stakeholders and addressing project requirements.
8. To develop a risk management plan to help identify, evaluate, plan response to mitigate, and monitor.	A risk management plan involves identifying risks, analyzing them qualitatively, and planning corresponding risk responses.
9. To develop a procurement management plan to ensure that the purchasing or acquiring goods and services outside the project team is within budget.	A procurement management plan that outlines procurement activities, ensuring that they are monitored and controlled to keep the project on schedule and within budget.
10. To develop a stakeholder management plan to identify stakeholders and plan to manage their expectations effectively.	A stakeholder management plan involves identifying stakeholders and devising strategies to engage them effectively and meet their needs and expectations.
11. To create a sustainable development plan that integrates sustainable practices, restores biodiversity, and creates a regenerative ecosystem that not only mitigates environmental impacts but also fosters community resilience and well-being through innovative and inclusive initiatives.	A sustainable development plan that integrates economic, environmental, and social considerations into project planning and execution to ensure long-term viability and positive impacts on both the community and the environment.

(Source: Compiled by: the Author)

4 RESULTS

4.1 Integration Management Plan

Project Integration Management encompasses the processes and tasks involved in identifying, defining, combining, and coordinating the various activities and processes within the Project Management Process Groups (Project Management Institute, 2017, p. 69). Integration management outlines the processes and procedures for unifying and managing various project elements, from initiation through closure, by ensuring that all project components are aligned and harmonized; it significantly improves coordination, resource allocation, and communication within the project team and with stakeholders. The development of the project charter is the first phase in this process, as outlined in section 4.1 and depicted in Chart 6. The subsequent processes outlined in this section will formulate the project integration management plan.

4.1.1 Project Charter

The Project Charter is a foundational document in project management that formally authorizes a project's existence and gives the project manager the authority to allocate organizational resources to project activities (Project Management Institute, 2017, p. 34). It outlines the project's purpose, objectives, scope, key stakeholders, and the roles and responsibilities of the project team. The charter serves as a reference for the project's duration, offering a clear vision and objectives, which help guide decision-making processes. It is typically developed early in the project lifecycle, often during the project initiation phase, and serves as a contract between the project sponsor, key stakeholders, and the project team. By setting the framework and boundaries within which the project must operate, the Project Charter is crucial for ensuring that the project is well-defined and aligned with the organization's strategic goals.

Chart 6

Project Charter

<table>
<tr><th colspan="2">PROJECT CHARTER</th></tr>
<tr><td>Date</td><td>Project Name</td></tr>
<tr><td>September 1, 2024</td><td>Establishment of a Public Health Entomology Laboratory in San Ignacio Town, Belize</td></tr>
<tr><td>Knowledge Areas / Processes</td><td>Application Area (Sector / Activity)</td></tr>
<tr><td>• Project Integration Management
• Project Scope Management
• Project Schedule Management
• Project Cost Management
• Project Quality Management
• Project Resource Management
• Project Communications Management
• Project Risk Management
• Project Procurement Management
• Project Stakeholder Management.

Process groups:
• Initiating
• Planning
• Executing
• Monitoring
• Controlling</td><td>Public Health</td></tr>
<tr><td>Start Date</td><td>Finish Date</td></tr>
<tr><td>September 1, 2024</td><td>November 30, 2024</td></tr>
<tr><td colspan="2">Project Objectives (General and Specific)</td></tr>
<tr><td colspan="2">General Objective: To plan, manage, and execute the establishment of a public health entomology laboratory in San Ignacio Town, Belize.

Specific Objectives:
1. Support the district vector control units with guiding surveillance, monitoring, and control interventions of vectors.
2. To generate data essential for early warning systems and the timely implementation of vector control measures due to the region's diverse climates, ranging from tropical rainforests to arid deserts, which support various vectors.</td></tr>
</table>

3. Facilitate the study of local vector species, their resistance patterns to insecticides, and the effectiveness of control measures, enabling the adaptation of strategies to local conditions.
4. Facilitate research and learning for local and international public health researchers and local students.
5. Contribute to overall improved service delivery and program management, thereby enhancing capacity to work towards regional and global commitments to reduce the burden of vector-borne diseases, such as sustainable development goal 3.3 and the global technical strategy for vector control.
6. Prudent financial management and expenditure through evidence-based interventions.

Project Purpose or Justification (Merit and Expected Results)

The project seeks to establish a public health entomology laboratory in San Ignacio Town, a centrally located municipality in the Cayo District. Through its Vector Control Program, the Belize Ministry of Health and Wellness is tasked with mitigating and controlling the population of disease-carrying vectors, such as mosquitoes, to safeguard public health. Establishing a public health entomology laboratory will facilitate disease surveillance, research into vector biology, and the effectiveness of control methods, as well as aid in developing strategies to combat these diseases. This laboratory will also serve as a research and learning center for local and international public health researchers and students across the country.

Description of Product or Service to be generated by the Project – Project Final Deliverables

The project will provide the following deliverables:

- A 16ft x 24ft prefabricated building (galvanized metal and wood) with 2 rooms, open office space, windows, doors, bathroom facilities, and utilities (water, electricity, internet).
- An equipped, fully functional public health entomology laboratory capable of supporting the following:
    - Operational research in vector control
    - Support identification of vectors
    - Facilitate insecticide resistance testing
    - Evaluate vector control products (traps, pesticides, etc.)
    - Research facility for local and international researchers
    - Training and learning center for local students and researchers
3. Entomology laboratory equipment and furniture as per specifications.
4. Development and compilation of standard operating procedures for laboratory functions

Assumptions

1. The project will be completed within the allocated budget.
2. The project will receive support and cooperation from regulatory bodies by providing the required building and utility installation permits.
3. The relevant stakeholder (Belize Vector and Ecology Center) will provide technical support in setting up the laboratory.
4. The residents in the underserved communities will actively engage and collaborate throughout the project.

5. Training for vector control technicians will be made available through the Ministry of Health and Wellness, as well as the Belize Vector and Ecology Center

Constraints

1. The project budget allocated is affixed at USD $45,000.00
2. The availability of technical partners for laboratory setup may delay completion and functionality.
3. The availability of stakeholders for technician training will delay the lab's functionality.
4. Time allocated for project completion is limited to three months.

Preliminary Risks

1. Availability of entomological equipment and supplies requires importation, which can be delayed.
2. High inflation can increase the cost of inputs and shipping costs.
3. Delays in approval of regulatory permits for construction and utilities.
4. Inclement weather can delay the lab's construction, installation, and setup.
5. Contractual disputes due to time and quality issues and other potential delays from the provider of prefabricated buildings.

Budget

The total estimated Project Cost: USD $ 45,000.00

Milestones and Dates

Milestone	Start Date	End Date
Architectural Design and Engineering Approval	2-Sep-2024	9-Sep-2024
Procurement of prefabricated 16ft x 24ft building	10-Sep-2024	14-Nov-2024
Acquisition of building and utility permits	21-Sep-2024	21-Sep-2024
Procurement of laboratory equipment and supplies	10-Sep-2024	20-Nov-2024
Development and compilation of standard operating procedures for laboratory functions	22-Oct-2024	4-Nov-2024
Installation of utilities (electricity, water, internet)	2-Sept-2024	1-Nov-2024
Quality Assurance Inspection	2-Sept-2024	25-Nov-2024
Setup of laboratory	21-Nov-2024	25-Nov-2024
Project Management	2-Sept-2024	25-Nov-2024
Project Completion	26-Nov-2024	26-Nov-2024

Relevant Historical Information

The importance and urgent need for public health entomology laboratories within vector control programs in Latin America and the Caribbean are particularly pronounced due to the region's climate, biodiversity, and socio-economic factors, which create a conducive environment for the proliferation of vector-borne diseases. These diseases, such as dengue, Zika, chikungunya, malaria, and yellow fever, pose significant public health burdens in these areas, affecting millions of people and straining public health systems.

A public health entomology laboratory is crucial for disease surveillance in regions with diverse climates like Latin America and the Caribbean. This localized monitoring is vital for accurately understanding vector distribution and disease risk, facilitating early warning systems, and timely implementing vector control measures. The dynamic nature of vector-borne disease transmission in this region, fuelled by climate change and urbanization,

underscores the critical need for research and development of new vector control strategies. By studying local vector species, their resistance patterns to insecticides, and the efficacy of control measures, public health entomology laboratories enable the adaptation of strategies to local conditions.

Effective vector management and disease prevention strategies are paramount in Latin America and the Caribbean, where health disparities and limited resources can worsen the impact of vector-borne diseases. A dedicated public health laboratory supports developing and implementing integrated vector management programs, tailored public health interventions, and community engagement efforts to mitigate disease transmission.

Local expertise in entomology and vector control is fundamental for sustainable disease management. Therefore, public health entomology laboratories serve as training centers for regional professionals and foster collaboration among countries facing similar public health challenges. By sharing knowledge, expertise, and resources, countries can enhance their collective response to vector-borne diseases. The region's experience with outbreaks of emerging diseases, such as the Zika virus, underscores the necessity for preparedness and rapid response capabilities. Public health entomology laboratories can swiftly mobilize to identify new threats, study vector-pathogen interactions, and guide public health responses to contain the impact of outbreaks.

As many other countries in the Caribbean and Latin America, Belize has significant limitations in carrying out routine entomological and insecticide resistance surveillance due to the unavailability of a public health entomology laboratory. Over the past two decades, the Ministry of Health and Wellness has relied on the Belize Vector and Ecology Center (BVEC) for most of the technical work. BVEC is a local private research institution operated by two professors from the University of Notre Dame in the United States of America. This small research facility supports foreign-based researchers and the local vector control program. Consequently, there are severe limitations on the extensiveness and timeliness of activities the facility can carry out. Establishing a government-owned public health entomology laboratory would allow both laboratories to complement each other, thereby expanding operations extensively throughout the country.

Stakeholders

Direct Stakeholders:

1. Project Sponsor: Ministry of Health and Wellness
2. Project Manager
3. Senior Finance Officer
4. Project Team members: Director of Project Management Unit (PMU), PMU Engineers, Vector Control Chief of Operations, Director of Public Health and Wellness
5. Project Steering Committee
6. Belize Vector and Ecology Center (technical support)
7. Community Residents
8. Contractor

Indirect Stakeholders: 1. Community leaders and residents 2. San Ignacio Town Council 3. Non-Government Organizations 4. University of Belize 5. Pan American Health Organization 6. External funding agencies 7. Suppliers of equipment and other inputs	
Project Manager: Kim Bautista	**Signature:**
Authorized by: Osvaldo Martinez	**Signature:**

4.1.2 Integrated Change Control Process

The Change Control Process is a systematic approach designed to manage all changes made to a project, ensuring that the changes are thoroughly evaluated, approved, and documented before implementation. This process is essential for securing the project's baselines and ensuring that changes are made through proper controls, evaluations, agreement, and clear communication (Naybour, 2020). It plays a vital role in maintaining effective control over the project by preventing unauthorized modifications and ensuring that all changes are beneficial and aligned with project goals.

This process begins with identifying and submitting a change request, followed by a detailed evaluation to assess the impact on the project's scope, schedule, budget, and quality (Association for Project Management, 2024). A decision is then made by a designated authority to approve, reject, or request further information on the change. Approved changes are carefully planned and executed, with continuous monitoring to assess their impact on the project. Change requests in the Public Health Entomology Laboratory Project will be initiated and managed with a change request form outlined on Chart 7, a Microsoft Word template. A change request log developed in Microsoft Excel is depicted on Chart 8. It will be utilized as a tracking document to

record, detail, and monitor all proposed changes to the project, covering aspects impacting scope, schedule, and budget, ensuring that organized and informed decision-making takes place throughout the project lifecycle.

Chart 7

Change Request Form

ProjectManager

CHANGE REQUEST FORM

Change Description		
Project Name:	Change Name:	Number:
Requested By:	Contact:	Date:
Description of Change:		
Reason for Change:		
Priority [Circle One]: 1. High 2. Medium 3. Low		
Impact on Deliverables:		
Impact of Not Responding to Change (and Reason Why):		
Date Needed:	Approval of Request:	Date:

Change Impact
Tasks/Scope Affected:
Cost Evaluation:
Risk Evaluation:
Quality Evaluation:
Additional Resources:
Duration:
Additional Effort:
Impact on Deadline:
Alternative and Recommendations:
Comments:

Sign Offs	
[Circle One]: 1. Accepted 2. Deferred 3. Rejected 4. More Info Requested	
Comments:	
Project Manager Signature:	Date:
Decision Maker Signature:	Date:

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Chart 8

Change Control Log

ProjectManager

Project Name:	
Project Manager Name:	
Program Manager Name:	

Change No.	Type	Description	Date Identified	Status	Priority	Assigned	Expected Resolution	Action	Impact	Date Work Begins	Escalation Required	Date Work Resolved	Signoff	Comments

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The change control process is a critical part of project management that ensures that any alterations to the project's scope, timeline, budget, or quality are made in a controlled and systematic manner. This process is essential to maintain project integrity, to meet project objectives, and to manage stakeholder expectations. The process is as follows:

1. Identification of need for change: The process begins when a stakeholder identifies the need for a potential change. This could stem from various sources, such as project team members, clients, or external factors.
2. Documentation of change request: This involves completing a change request form that describes the change, its rationale, and its expected impact on the project.
3. Change request review and impact evaluation: The project manager and relevant stakeholders, such as the Change Control Board or Committee, review the change request. They assess its potential impact on the project's scope, time, cost, and quality. This phase may involve detailed analysis to fully understand the implications. The project

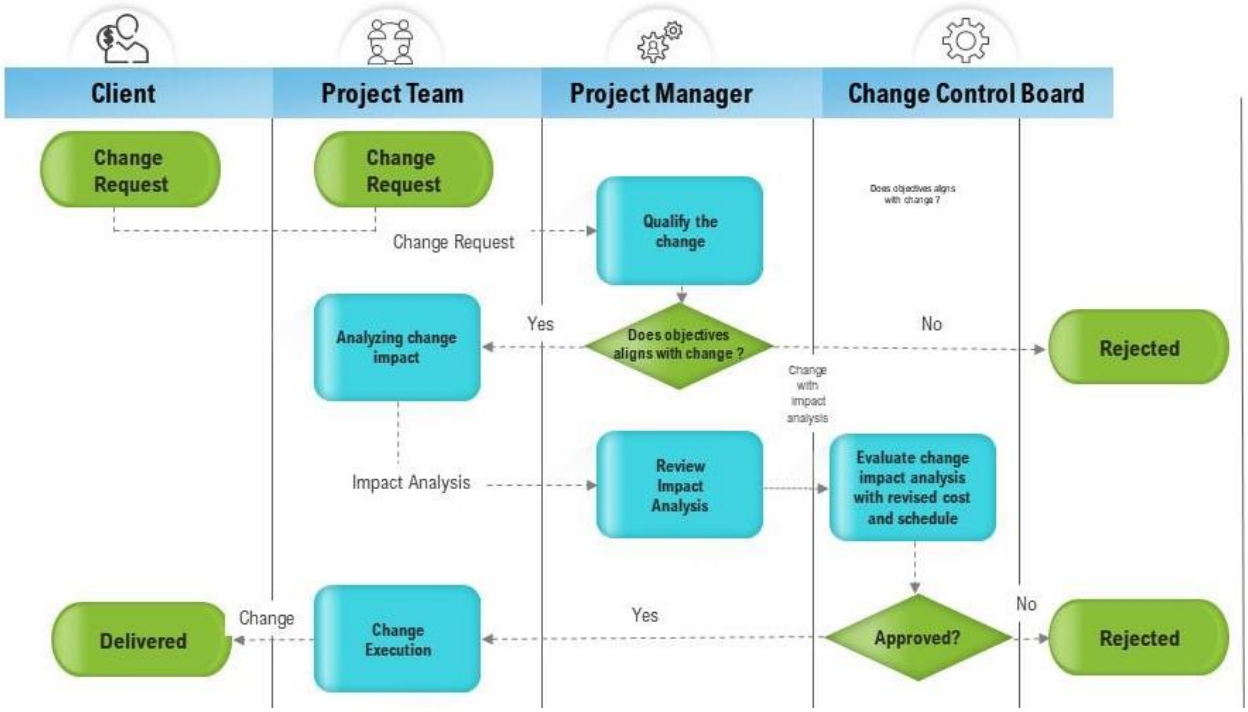
manager, director of the project management unit, technical advisor on vector control, director of public health and wellness, and the chief executive officer are all authorized personnel.

4. Decision (Approval or Denial): Based on the evaluation, the change request is either approved, rejected, or deferred for further information. This decision considers the change's benefits, costs, and impact on the project's overall objectives.
5. Implementation: If approved, the change is planned and implemented. This involves updating project plans, schedules, and documentation to incorporate the approved change. Resources may need to be reallocated and timelines adjusted.
6. Communication: Effective communication is essential throughout the process. Stakeholders should be informed about the status of the change request, the decisions made, and any impacts on the project.
7. Monitoring: After implementation, the change's effects are monitored to ensure it achieves the desired outcome without negatively impacting the project's success.
8. Closure: Once the change has been successfully implemented and its outcomes stabilized, the change request can be formally closed.

The change control process is fundamental to project management. It helps to ensure that changes are made with a full understanding of their implications and that those changes are in the best interest of achieving the project's goals.

Chart 9

Change Control Process Flow



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4.1.3 Lessons Learned

A Lessons Learned summary captures essential insights and knowledge gained from a project's experiences, including successes and challenges. It is a valuable tool for continuous improvement in project management, enabling teams to document and share what worked well and what did not. This process promotes a learning culture within organizations, helping to avoid past mistakes and replicate successes in future projects. Key aspects include detailing the context, impact, and recommendations for future projects. Practical lessons learned practices involve regular updates, ensuring accessibility, encouraging open participation, and applying insights to enhance decision-making process and project outcomes. A well-maintained Lessons Learned Register contributes to more efficient, effective, and successful project management

practices. Chart 10 below outlines a Microsoft Excel sheet with a Lessons Learned Register, which will be updated by the project manager with input from the project team.

Chart 10

Lessons Learned Register

Lessons Learned Template

Today's Date:
Project Name:
Project Manager:
Notes:

ProjectManager

Lesson Number	Positive/Negative	Date Identified	Project Phase	Describe What Happened	What Was the Impact?	How Does This Change Future Projects?	Action(s) taken

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4.1.4 Project Closure

Project closure is the final phase in the project management lifecycle, marking the completion of the project. This phase involves essential steps to ensure all project work is finalized, deliverables are accepted, all documentation is signed off, and any remaining resources are released (Akkartal, 2023). The process includes conducting a post-project evaluation to capture lessons learned, celebrating the project's success with the team, and formally handing over the project output to the client or stakeholders. Additionally, project closure provides an opportunity to review project performance against its objectives, assess the effectiveness of the project management processes used, and identify areas for improvement in future projects (Lucidchart, 2019). The ultimate goal of project closure is to render a clear end to the project,

leaving no unresolved issues or tasks, and to recognize the project's achievements and learnings formally.

The project closure process will ensure that all activities and tasks associated with the Public Health Entomology Laboratory Project are completed to conformity, marking its formal conclusion. The closure process is as follows:

1. Final Deliverable Acceptance: Ensure that all project deliverables have been completed and accepted by the stakeholders according to the project requirements.
2. Contract Closure (if applicable): Review and fulfill any contractual obligations, including final payments, contract amendments, and legal requirements.
3. Documentation Completion: Ensure all project documentation, including reports, plans, and manuals, are finalized, organized, and archived for future reference.
4. Resource Release: Return project resources, including personnel and equipment, to their respective owners or organizations.
5. Lessons Learned: Conduct a comprehensive review to capture lessons learned from the project, documenting successes, challenges, and areas for improvement.
6. Stakeholder Communication: Communicate project closure to all stakeholders, summarizing project outcomes, achievements, and next steps.
7. Project Review or Post-mortem: Conduct a formal review or post-project evaluation to assess the project's overall performance against its objectives, identifying successes and areas for improvement. The project team will carry this out with the project management unit's involvement.

8. Formal Closure: Officially close the project by obtaining formal signoffs from stakeholders, sponsors, and other relevant parties, such as the Ministry of Health and Wellness.
9. Transition Planning: Develop and execute plans to transition project outputs to operational use or hand them over to the appropriate stakeholders. The Ministry of Health and Wellness, project management unit, officially handed over to the vector control program.

While not a mandatory part of the closing process, acknowledging the efforts of the project team and their contributions and achievements is important to building motivation and a positive team culture.

4.2 Scope Management Plan

A Scope Management Plan is an essential document within project management that outlines how the project's scope will be defined, validated, and controlled. It ensures that the project includes all the necessary work to be completed successfully, preventing scope creep. The project management plan covers the development of a detailed project scope statement and creating and maintaining a Work Breakdown Structure (WBS). It defines the roles and responsibilities of the project team and its stakeholders. It also details processes for scope verification and control, including change management procedures to handle any adjustments in a structured manner. By providing clear guidelines for managing project scope, the plan helps align expectations and defines what is included in or excluded from the project (Project Management Institute, 2017, p. 129).

4.2.1 Collect Requirements

Collecting requirements is a critical step within scope management to understand what stakeholders need from the project. This process ensures that the project delivers the intended outcomes and benefits. This crucial step involves gathering stakeholder information to understand their needs, expectations, and constraints. Thus, Chart 11 outlines the requirements expected from the project to establish a public health entomology laboratory in San Ignacio Town, Belize.

Chart 11

Requirements Traceability Matrix

ID	Requirements Description	Business Needs, Opportunities, Goals, Objectives	Project Objectives	Verification	Quality Metrics
R1	Architectural Design and Approval	Laboratory design meeting standards to carry out stated functions	Design according to standards and requirements	Approval by project management unit engineer	Plan approved by central and local building authority.
R2	Procurement of prefabricated building according to specifications	Accommodation of adequate spacing, amenities, and structural integrity	Laboratory constructed to specifications	Inspection by project engineer	Prefabricated structure constructed as per architectural design.
R3	Acquisition of building and utility permits	Electricity, Water, and Internet connectivity	Electricity, water, and internet installed	Inspection by project engineer	The requirements of utility companies were complied with to facilitate installations.
R4	Procurement of laboratory equipment and supplies	Procurement of recommended supplies and equipment	Acquisition and installation of equipment and supplies as per requirements	The procurement process was completed and signed off upon delivery	Equipment and supplies are procured per project procurement guidelines, and items meet specifications.
R5	Laboratory setup	Functionality of laboratory to provide stated services	Installation and setup of equipment and supplies required for functionality	Inspection by project manager	Installation of equipment, furniture, etc., according to design and requirements.
R6	Development of standard operating procedures for laboratory functions	Standard operating guidelines for laboratory procedures	Development of operating guidelines	Completed and printed operating guidelines	Guidelines were developed and aligned with the World Health Organization's and CDC's recommendations and procedures.

ID	Requirements Description	Business Needs, Opportunities, Goals, Objectives	Project Objectives	Verification	Quality Metrics
R7	Project completion	Completion of laboratory project within the timeframe	Project execution and completion according to requirements within the timeframe	Approval and sign-off of the project by the project management unit	Project tasks were completed, and deliverables were met as per specifications and requirements.

(Source: Compiled by: the Author)

4.2.2 Define Scope

Defining the scope is a critical step that involves clearly outlining the boundaries and deliverables of the project. This process includes specifying what will be included in the project and, just as importantly, what will be excluded. The scope definition sets the foundation for the project's planning and execution, helping to manage stakeholders' expectations and guide the project team's work. A clearly defined scope prevents scope creep, basically the expansion of project scope without adjustments to time, cost, and resources.

Chart 12

Project Scope Statement Template

Project Scope Statement	
Project Information	
Project Phase:	Initiation
Project Name:	Establishment of a Public Health Entomology Laboratory in San Ignacio Town, Belize
Estimated Budget:	USD $ 45,000.00
Estimated Project Start:	September 1, 2024
Estimated Project End:	November 30, 2024
Scope Definition	
Scope Description:	The project entails the establishment of a Public Health Entomology Laboratory in San Ignacio Town for the Ministry of Health and Wellness. Through the Vector Control Program, this facility will be utilized to aid in vector identification, surveillance, evaluation of the efficacy of pesticides used for vector control, and research and learning.
Project Deliverables:	• Architectural drawings and plans • 24’ x 16’ prefabricated building completed interior with open office space, and two rooms to be utilized as insectary and insecticide resistance monitoring room, and bathroom facilities • Water, electricity, and internet infrastructure and connectivity • Equipped laboratory with equipment and supplies to conduct requisite functions

	• Standard operating procedures for the laboratory, including vector surveillance and insecticide resistance monitoring
Scope Exclusions:	• Property acquisition—The project does not include the acquisition of land, as the site location will be the San Ignacio Community Hospital compound in San Ignacio Town. • Maintenance and Repairs – major repairs will be covered through the Ministry's project management through capital 2 and 3 budget allocations, while general maintenance and basic repairs will be covered by the Western Health Region maintenance unit, through its recurrent budget. • Parking and landscaping – these amenities are not included in project scope as parking is readily available onsite.
Acceptance Criteria:	• Building designs approved by the project management team • Acquisition of 24' x 16' prefabricated structure with amenities according to specifications • Electricity, water and internet connectivity • Acquisition and installation of equipment and supplies within project timeframe
Assumptions:	• No increase in acquisition costs • Availability of stakeholders • Favourable weather conditions • Access to utilities • Clear project scope • Unimpeded site access • Prefabricated building in compliance with specifications
Constraints:	• Short timeframe for project execution • Budget constraints • Availability of technical stakeholders particularly to support development of standard operating procedures within short timeframe
Scope Statement Decision ☐ Approved ☐ Rejected ☐ Approved with modifications ☐ Deferred	
Date of approval:	
Project Manager	Printed Name: Signature:
Project Sponsor	Printed Name: Signature:

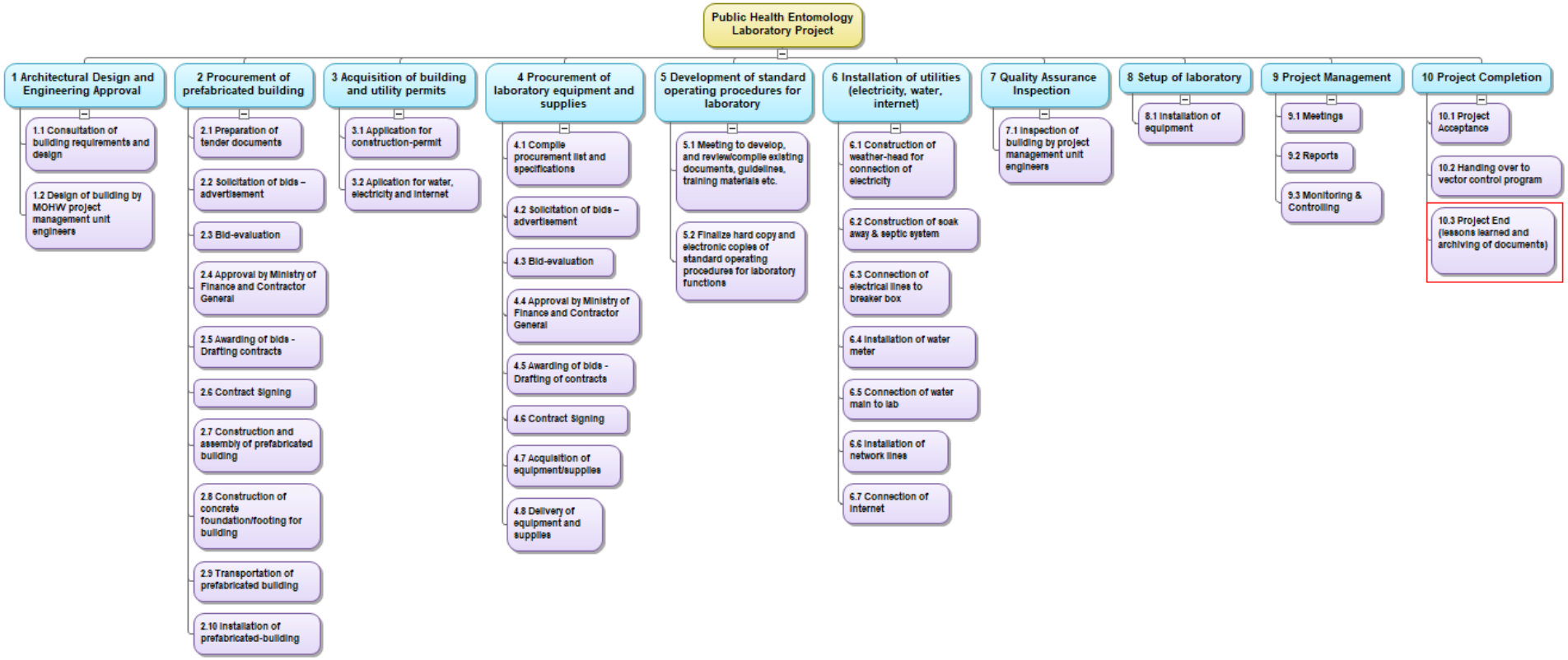
(Source: Compiled by the Author)

4.2.3 Create WBS

The Work Breakdown Structure (WBS) is a hierarchical decomposition of the total scope of work to accomplish the project objectives. The project's overall work is broken into smaller, more manageable pieces, referred to as "work packages," as shown on Chart 13. Breaking down the WBS helps clarify and define the total scope of the project, providing a structured vision of what needs to be accomplished. This organized approach not only ensures thorough planning and execution but also enhances monitoring and control throughout the project lifecycle, allowing for more accurate budgeting, scheduling, and risk management.

Chart 13

Work Breakdown Structure



(Source: Compiled by the Author)

4.2.4 WBS Dictionary

A Work Breakdown Structure (WBS) dictionary supports the detailed documentation of each component in a project's Work Breakdown Structure (WBS). While the WBS visually breaks down the scope of the project into manageable chunks or work packages, the WBS dictionary provides detailed descriptions, definitions, and work assignments for each component. It is an essential tool for clarifying the details of each part of the project's scope, ensuring that everyone involved clearly understands what needs to be done, who is responsible, and what the deliverables are.

Chart 14

WBS Dictionary

Level	WBS Code	WBS Name	Description/Definition	Budget (USD)	Resources
0	0	Public Health Entomology Laboratory Project	All phases of the project were completed	$45,000.00	
1	**1**	**Architectural Design and Engineering Approval**	**Completed architectural drawings according to specifications**	**$100.00**	**Project engineer** **Director of Project Management Unit**
2	1.1	Consultation of building requirements and design	Meeting with Belize Vector and Ecology Center to gather specifications of lab based on needs	$100.00	Project Manager Belize Vector and Ecology Center
2	1.2	Design of building by MOHW project management unit engineers	Drawing of plans according to specifications	$0.00	Project engineer
1	**2**	**Procurement of prefabricated building**	**Completed procurement process based on project procurement guidelines**	**$25,150.00**	**Project Manager** **Procurement officer**
2	2.1	Preparation of tender documents	Gather requirements and prepare an advertisement	$0.00	Project Manager Procurement officer

Level	WBS Code	WBS Name	Description/Definition	Budget (USD)	Resources
2	2.2	Solicitation of bids – advertisement	Advertisement of bids via newspaper, social media, and government tender platforms for 15 days	$150.00	Procurement officer
2	2.3	Bid-evaluation	Bid evaluation and report	$0.00	Project manager Bid evaluation team
2	2.4	Approval by the Ministry of Finance and Contractor General	Review and approval of bid report and contract	$0.00	Ministry of Finance and Contractor General
2	2.5	Awarding of bids - Drafting contracts	Notification of bid evaluation results to bidders	$0.00	Project manager Director of Project Management Unit
2	2.6	Contract Signing	Signing of contract	$12,500.00	Chief Executive Officer Provider
2	2.7	Construction and assembly of prefabricated building	Construction of prefabricated building according to specifications	$0.00	Provider – Plett's Home Builders
2	2.8	Construction of concrete foundation/footing for building	Construction of a concrete foundation for the placement of the building	$0.00	Provider – Plett's Home Builders
2	2.9	Transportation of prefabricated building	Transportation of building to project site	$0.00	Provider – Plett's Home Builders
2	2.1	Installation of prefabricated building	Assembly and affixing of building to foundation	$12,500.00	Provider – Plett's Home Builders
1	**3**	**Acquisition of building and utility permits**	**Requisite building permit and approval for installation of utilities approved**	**$0.00**	**Project engineer** **Director of Project Management Unit**
2	3.1	Application for construction-permit	Application for a building permit through the central building authority	$0.00	Project engineer Director of Project Management Unit
2	3.2	Application for water, electricity, and internet	Application for Internet, Water, and Electricity through the	$0.00	Project engineer

Level	WBS Code	WBS Name	Description/Definition	Budget (USD)	Resources
			Assets and Utilities Unit within the Ministry of Finance		Director of Project Management Unit
1	**4**	**Procurement of laboratory equipment and supplies**	**Requisite equipment and supplies procured and delivered**	**$15,150.00**	**Project Manager** **Procurement officer**
2	4.1	Compile procurement list and specifications	Gather requirements and prepare an advertisement	$0.00	Project Manager Procurement officer
2	4.2	Solicitation of bids – advertisement	Advertisement of bids via newspaper, social media, and government tender platforms for a period of 15 days	$150.00	Procurement officer
2	4.3	Bid-evaluation	Bid evaluation and report	$0.00	Project manager Bid evaluation team
2	4.4	Approval by the Ministry of Finance and Contractor General	Review and approval of bid report and contract	$0.00	Ministry of Finance and Contractor General
2	4.5	Awarding of bids - Drafting of contracts	Notification of bid evaluation results to bidders	$0.00	Project manager Director of Project Management Unit
2	4.6	Contract Signing	Signing of contract	$7,500.00	Chief Executive Officer Provider (Vendor)
2	4.7	Acquisition of equipment/supplies	Acquisition process and lead time	$0.00	Construction Team, Finishers
2	4.8	Delivery of equipment and supplies	Final delivery of equipment and supplies	$7,500.00	Provider (Vendor)
1	**5**	**Development of standard operating procedures for laboratory**	**Compilation and preparation of guidelines and standard operating procedures**	**$1,000.00**	**Vector Control Technical Advisor** **Belize Vector and Ecology Center**
2	5.1	Meeting to develop and review/compile existing documents, guidelines, training materials, etc.	Working meetings to prepare procedural guidelines, etc.	$250.00	Vector Control Technical Advisor Belize Vector and Ecology Center

Level	WBS Code	WBS Name	Description/Definition	Budget (USD)	Resources
2	5.2	Finalize hard copy and electronic copies of standard operating procedures for laboratory functions	Printing of completed documents/guidelines	$750.00	Procurement officer
1	**6**	**Installation of utilities (electricity, water, internet)**	**Inspection of interior spaces and obtaining approval**	**$3,250.00**	**Inspector, Project Manager**
2	6.1	Construction of weather-head for connection of electricity	Concrete post for installation of meter and components	$500.00	Project engineer Private contractor
2	6.2	Construction of soak-away and septic system	Soak away and septic system components for disposal of grey water and sewage waste.	$1000.00	Project engineer Private contractor
2	6.3	Connection of electrical lines to breaker box	Hiring an electrician to connect electricity from the Weatherhead to the building breaker box	$1000.00	Private electrician
2	6.4	Installation of the water meter	Provide access to water and install a water meter	$0.00	Belize Water Services Limited
2	6.5	Connection of water leading to laboratory	Exterior plumbing connection to water main	$250.00	Maintenance Unit
2	6.6	Installation of network lines	LAN cables and connection boxes installed in the office	$500.00	Information Technology Unit
2	6.7	Connection of internet	Installation of switch and configuration of modem	$0.00	Belize Telemedia Limited
1	**7**	**Quality Assurance Inspection**	**Routine comprehensive inspection through project phases**	**$0.00**	**Project Engineer** **Project Manager**
2	7.1	Inspection of the building by project management unit engineers	Inspection and subsequent reports/updates throughout all phases of the project	$0.00	Project engineer Project Manager Vector Control Technical Advisor
1	**8**	**Setup of laboratory**		**$100.00**	**Vector Control Technical Advisor**

Level	WBS Code	WBS Name	Description/Definition	Budget (USD)	Resources
					Belize Vector and Ecology Center
2	8.1	Installation of equipment	The miscellaneous cost associated with the Completed equipment installation, furniture, etc.	$100.00	Vector Control Technical Advisor Belize Vector and Ecology Center
1	**9**	**Project Management meeting**		**$250.00**	
2	9.1	Meetings	Routine project meetings to discuss progress, issues identified,	$250.00	Project Team
2	9.2	Reports	Routine updates are provided during the lifecycle, detailing the status, accomplishments, and challenges faced.	$0.00	Project Manager
2	9.3	Monitoring and controlling	Tracking, reviewing, and regulating project progress and performance	$0.00	Project Manager
1	**10**	**Project Completion**	**Application of project management processes and procedures to the entire project lifetime**	**$0.00**	
2	10.1	Project Acceptance	Formal acceptance from stakeholders, confirming that all deliverables have been met according to requirements	$0.00	Director of Project Management Unit Project Manager
2	10.2	Handing over to the vector control program	Walkthrough of facilities and official handing over to vector control program	$0.00	Director of Project Management Unit Project Manager

Level	WBS Code	WBS Name	Description/Definition	Budget (USD)	Resources
2	10.3	Project End	Administrative closure, release of project resources, and archiving of documents.	$0.00	Director of Project Management Unit Project Manager

(Source: Compiled by: the Author)

4.2.5 Roles and Responsibilities

The roles and responsibilities below provide a framework for organizing and managing the diverse tasks involved in the construction project. The clear delineation of responsibilities helps ensure accountability and effective coordination among team members.

Chart 15

Roles and Responsibilities

Project Role	Responsibilities
Project Manager	• Define project scope, deliverables, and requirements. • Develop project plan and schedule, tasks, and milestones. • Manage resource allocation, including personnel, budget, and materials. • Identify potential risks, assess impacts, and implement mitigation strategies. • Ensure that project deliverables meet the defined standards and customer satisfaction. • Maintain consistent communication with stakeholders, team members, and suppliers. • Track project progress, update stakeholders, and adjust plans as needed. • Ensure that the project adhere to legal, regulatory, and company standards. • Engage with stakeholders, manage expectations, and foster stakeholder relationships. • Formally close project phases or the project, documenting lessons learned and releasing resources.
Project Engineer	• Lead the development of architectural design • Provide technical support to the project manager • Monitor compliance with regulatory bodies • Conduct regular site inspections to monitor progress and provide feedback

Project Role	Responsibilities
Contractor – Plett's Home Builders	• Provision of 24'x16' prefabricated building and amenities as per requirements • Preparation of project site for installation of prefabricated building • Transportation and installation of the prefabricated building at the project site
Utility Companies	• Installation of meter to water main • Provide electrical "line drop" to weather-head with meter • Connection of fiberoptic internet line
Director of Project Management Unit (Ministry of Health & Wellness)	• Signoff on project plans and supporting documents • Provide input and feedback throughout the project • Monitor project execution and milestones • Final approval before handing over the facility to the vector control program
Vector Control Technical Advisor	• Provide technical input into project design and requirements • Collaborate with project team to monitor project implementation • Accompany project engineer on monitoring visits • Develop equipment list with specifications for procurement • Collaborate with stakeholders in the development of standard operating procedures for the entomology lab • Lead setup of the laboratory with Belize Vector and Ecology Center
Belize Vector and Ecology Center (BVEC)	• Support technical input into project design and requirements • Recommendation of equipment list with specifications for procurement • Support the development of standard operating procedures for the entomology lab • Support setup of laboratory
Team Members	• Execute tasks assigned by the project manager and construction manager • Follow safety guidelines on the construction site • Collaborate with specialized teams for various project phases • Report progress and issues to project management

(Source: Compiled by: the Author)

4.2.6 Validate Scope

Validating scope involves formalizing the stakeholders' or clients' acceptance of the completed project deliverables. This process is essential for ensuring that deliverables align with the scope statement, WBS, and WBS dictionary. Validating scope is closely tied to quality

control, as it focuses on meeting the quality requirements specified for the deliverables. After the Project Manager confirms that the deliverables meet the requirements of the project plan, the project sponsor will approve the deliverables. This process is led by the project manager, who can utilize the requirements traceability matrix in Figure 8 to validate the scope. This essential tool is used to verify that all project objectives are achieved and that each stage of the project aligns with the defined initial requirements.

4.2.7 Control Scope

Scope control is a critical aspect of project management that involves managing changes and ensuring that the project stays on track regarding its defined objectives and deliverables. It encompasses a process to monitor, evaluate, and control project scope changes to prevent scope creeps and maintain alignment with the proper plan. To control this process, it will ensure that variances and change request procedures are monitored. Effective monitoring of variances in the project scope will include regular progress reviews, stakeholder communication, and quality assurance inspections.

The change request procedure will include critical components such as submission, evaluation, and approval using the change request log in Chart 7. All changes will be recorded in the change control log on Chart 8. The project manager will track progress against the work breakdown structure dictionary on Chart 14.

4.3 Schedule Management Plan

4.3.1 Schedule Management Introduction

Project schedule management is a critical component of project management that involves planning, developing, managing, and monitoring the project timeline to ensure timely

completion of project tasks. This process ensures that project activities are completed as planned, facilitating the efficient allocation of resources, effective coordination of team efforts, and achievement of project milestones and objectives.

4.3.2 Plan Schedule Management

The Schedule Management Plan establishes the criteria and activities for developing, monitoring, and controlling the project schedule. It details the procedures for how the project timeline will be created, managed, and revised to ensure project completion within the designated timeframe. The plan specifies the scheduling methodology, tools for scheduling, frequency of schedule updates, and the roles and responsibilities of those involved in the project scheduling process. It also outlines how changes to the schedule will be managed and integrated into the overall project plan, ensuring consistent alignment with project goals and objectives. The processes within this plan are part of the project schedule management knowledge area (Project Management Institute, 2017, p. 90) and include the following six processes:

- Plan Schedule Management
- Define Activities
- Sequence Activities
- Estimate Activity Duration
- Develop Schedule
- Control Schedule

4.3.3 Define Activities

In this process, the work packages are broken down into smaller, manageable work units called activities. This detailing makes scheduling more accurate and executable. Each activity is

identified and documented with specific attributes such as scope, duration, resources, and dependencies.

Chart 16

Project Milestones

Milestone Name	Start Date	End Date
Project Start	2-Sept-2024	26-Nov-2024
Architectural Design and Engineering Approval	2-Sep-2024	9-Sep-2024
Procurement of prefabricated 16ft x 24ft building	10-Sep-2024	14-Nov-2024
Acquisition of building and utility permits	21-Sep-2024	21-Sep-2024
Procurement of laboratory equipment and supplies	10-Sep-2024	20-Nov-2024
Development and compilation of standard operating procedures for laboratory functions	22-Oct-2024	4-Nov-2024
Installation of utilities (electricity, water, internet)	2-Sept-2024	1-Nov-2024
Quality Assurance Inspection	2-Sept-2024	25-Nov-2024
Setup of laboratory	21-Nov-2024	25-Nov-2024
Project Management	2-Sept-2024	25-Nov-2024
Project Completion	26-Nov-2024	26-Nov-2024

(Source: Compiled by: the Author)

Chart 17

Activity List

ID	WBS	Task Name	Duration	Start	Finish	Predecessors
0	**0**	**Public Health Entomology Laboratory Project**	62 days	02 Sep '24	26 Nov '24	
1	**1**	**Architectural Design and Engineering Approval**	6 days	02 Sep '24	09 Sep '24	
2	**1.1**	Consultation of building requirements and design	1 day	02 Sep '24	02 Sep '24	
3	**1.2**	Design of building by MOHW project management unit engineers	5 days	03 Sep '24	09 Sep '24	2
4	**2**	**Procurement of prefabricated building**	48 days	10 Sep '24	14 Nov '24	
5	**2.1**	Preparation of tender documents	2 days	10 Sep '24	11 Sep '24	3
6	**2.2**	Solicitation of bids – advertisement	15 days	12 Sep '24	02 Oct '24	5
7	**2.3**	Bid-evaluation	1 day	03 Oct '24	03 Oct '24	6
8	**2.4**	Approval by the Ministry of Finance and Contractor General	10 days	04 Oct '24	17 Oct '24	7

ID	WBS	Task Name	Duration	Start	Finish	Predecessors
9	**2.5**	Awarding of bids - Drafting contracts	1 day	18 Oct '24	18 Oct '24	8
10	**2.6**	Contract Signing	1 day	18 Oct '24	18 Oct '24	8
11	**2.7**	Construction and assembly of prefabricated building	20 days	18 Oct '24	14 Nov '24	8
12	**2.8**	Construction of concrete foundation/footing for building	5 days	18 Oct '24	24 Oct '24	8
13	**2.9**	Transportation of prefabricated building	1 day	25 Oct '24	25 Oct '24	12
14	**2.10**	Installation of prefabricated building	1 day	25 Oct '24	25 Oct '24	12
15	**3**	**Acquisition of building and utility permits**	1 day	21 Oct '24	21 Oct '24	
16	**3.1**	Application for construction-permit	1 day	21 Oct '24	21 Oct '24	10
17	**3.2**	Application for water, electricity, and internet	1 day	21 Oct '24	21 Oct '24	10
18	**4**	**Procurement of laboratory equipment and supplies**	52 days	10 Sep '24	20 Nov '24	
19	**4.1**	Compile procurement list and specifications	3 days	10 Sep '24	12 Sep '24	3
20	**4.2**	Solicitation of bids – advertisement	15 days	13 Sep '24	03 Oct '24	19
21	**4.3**	Bid-evaluation	1 day	04 Oct '24	04 Oct '24	20
22	**4.4**	Approval by the Ministry of Finance and Contractor General	10 days	07 Oct '24	18 Oct '24	21
23	**4.5**	Awarding of bids - Drafting of contracts	1 day	21 Oct '24	21 Oct '24	22
24	**4.6**	Contract Signing	1 day	22 Oct '24	22 Oct '24	23
25	**4.7**	Acquisition of equipment/supplies	20 days	23 Oct '24	19 Nov '24	24
26	**4.8**	Delivery of equipment and supplies	1 day	20 Nov '24	20 Nov '24	25
27	**5**	**Development of standard operating procedures for laboratory**	10 days	22 Oct '24	04 Nov '24	
28	**5.1**	Meeting to develop and review/compile existing documents, guidelines, training materials, etc.	5 days	22 Oct '24	28 Oct '24	17
29	**5.2**	Finalize hard copy and electronic copies of standard operating procedures for laboratory functions	5 days	29 Oct '24	04 Nov '24	28
30	**6**	**Installation of utilities (electricity, water, internet)**	45 days	02 Sep '24	01 Nov '24	
31	**6.1**	Construction of weather-head for connection of electricity	5 days	21 Oct '24	25 Oct '24	10
32	**6.2**	Construction of soak away & septic system	1 day	02 Sep '24	02 Sep '24	
33	**6.3**	Connection of electrical lines to breaker box	1 day	28 Oct '24	28 Oct '24	31
34	**6.4**	Installation of water meter	1 day	29 Oct '24	29 Oct '24	33
35	**6.5**	Connection of water main to lab	1 day	30 Oct '24	30 Oct '24	34
36	**6.6**	Installation of network lines	1 day	31 Oct '24	31 Oct '24	35
37	**6.7**	Connection of internet	1 day	01 Nov '24	01 Nov '24	36
38	**7**	**Quality Assurance Inspection**	61 days	02 Sep '24	26 Nov '24	

ID	WBS	Task Name	Duration	Start	Finish	Predecessors
39	**7.1**	Inspection of the building by project management unit engineers	1 day	04 Nov '24	04 Nov '24	37
40	**8**	**Setup of laboratory**	3 days	21 Nov '24	25 Nov '24	
41	**8.1**	Installation of equipment	3 days	21 Nov '24	25 Nov '24	26
42	**9**	**Project Management**	61 days	02 Sep '24	25 Nov '24	
43	**9.1**	Meetings	61 days	02 Sep '24	25 Nov '24	
44	**9.2**	Reports	61 days	02 Sep '24	25 Nov '24	
45	**9.3**	Monitoring & controlling	61 days	02 Sep '24	25 Nov '24	
46	**10**	**Project Completion**	1 day	26 Nov '24	26 Nov '24	
47	**10.1**	Project Acceptance	1 day	26 Nov '24	26 Nov '24	41
48	**10.2**	Handing over to the vector control program	1 day	26 Nov '24	26 Nov '24	41
49	**10.3**	**Project End (lessons learned and archiving of documents)**	1 day	26 Nov '24	26 Nov '24	41

(Source: Compiled by the Author)

4.3.4 Sequence Activities

All the identified activities are logically arranged to ensure that each process flows into the next without disruption. This sequence involves determining the dependencies between tasks and documenting their relationship. Moreover, it defines the path from project start to finish and is crucial for realistic scheduling.

4.3.5 Estimate Activity Durations

In estimating the duration of the establishment of a public health entomology laboratory project, activities need to be defined and sequenced. Then, the time each activity will take to complete will be estimated. This estimation considers the resources assigned to each task, the work effort required, and any other factors that might affect the duration. While several project estimating techniques were utilized, expert judgment and analogous techniques were used. Expert judgment sources include project engineers and technical experts from the Belize Vector and Ecology Center. The analogous estimating technique uses data from previous projects to calculate similar components.

4.3.6 Develop Schedule

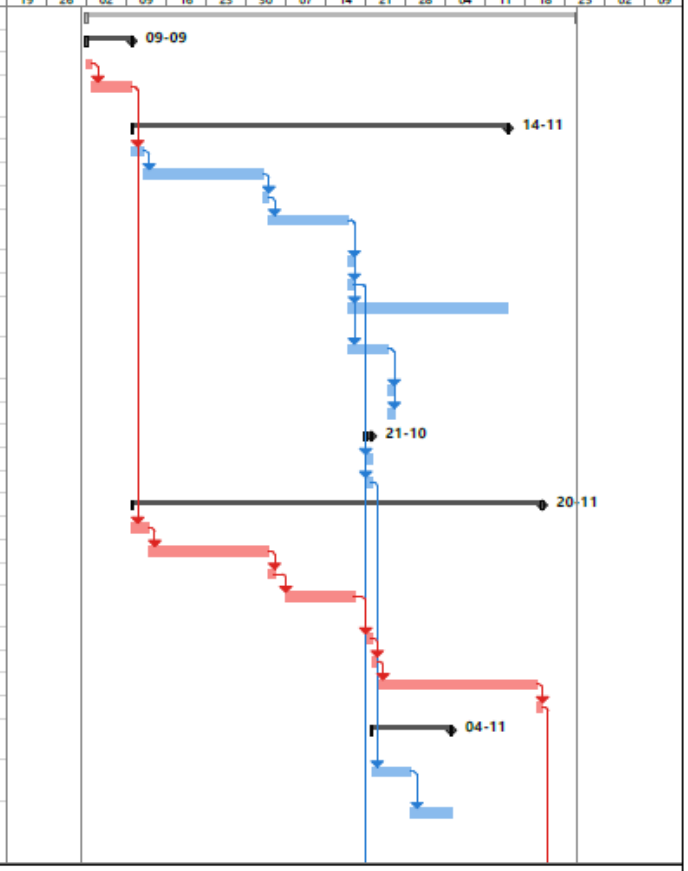
The project schedule was developed in consultation with stakeholders and subject matter experts. This process combines all previous efforts (activity details, sequencing, and duration estimates) to produce the project schedule. It involves determining project activities' start and end dates and assigning resources to tasks. The schedule is visualized in Gantt charts, milestone charts, or network diagrams. Microsoft Project will be utilized to manage the project and can provide charts such as Charts 18 and 19 highlighting the schedule and critical paths. The Critical Path Method helps identify the most extended sequence of tasks that must be completed on time for the project to meet its deadline.

Chart 18

Project Schedule

Public Health Entomology Laboratory Project

ID	WBS	Task Name	Duration	Start	Finish	Predecessors
0	**0**	**Public Health Entomology Laboratory Project**	**62 days**	**02 Sep '24**	**26 Nov '24**	
1	**1**	**Architectural Design and Engineering Approval**	**6 days**	**02 Sep '24**	**09 Sep '24**	
2	1.1	Consultation of building requirements and design	1 day	02 Sep '24	02 Sep '24	
3	1.2	Design of building by MOHW project management unit engineers	5 days	03 Sep '24	09 Sep '24	2
4	**2**	**Procurement of prefabricated building**	**48 days**	**10 Sep '24**	**14 Nov '24**	
5	2.1	Preparation of tender documents	2 days	10 Sep '24	11 Sep '24	3
6	2.2	Solicitation of bids – advertisement	15 days	12 Sep '24	02 Oct '24	5
7	2.3	Bid-evaluation	1 day	03 Oct '24	03 Oct '24	6
8	2.4	Approval by Ministry of Finance and Contractor General	10 days	04 Oct '24	17 Oct '24	7
9	2.5	Awarding of bids - Drafting contracts	1 day	18 Oct '24	18 Oct '24	8
10	2.6	Contract Signing	1 day	18 Oct '24	18 Oct '24	8
11	2.7	Construction and assembly of prefabricated building	20 days	18 Oct '24	14 Nov '24	8
12	2.8	Construction of concrete foundation/footing for building	5 days	18 Oct '24	24 Oct '24	8
13	2.9	Transportation of prefabricated building	1 day	25 Oct '24	25 Oct '24	12
14	2.10	Installation of prefabricated-building	1 day	25 Oct '24	25 Oct '24	12
15	**3**	**Acquisition of building and utility permits**	**1 day**	**21 Oct '24**	**21 Oct '24**	
16	3.1	Application for construction-permit	1 day	21 Oct '24	21 Oct '24	10
17	3.2	Application for water, electricity and internet	1 day	21 Oct '24	21 Oct '24	10
18	**4**	**Procurement of laboratory equipment and supplies**	**52 days**	**10 Sep '24**	**20 Nov '24**	
19	4.1	Compile procurement list and specifications	3 days	10 Sep '24	12 Sep '24	3
20	4.2	Solicitation of bids – advertisement	15 days	13 Sep '24	03 Oct '24	19
21	4.3	Bid-evaluation	1 day	04 Oct '24	04 Oct '24	20
22	4.4	Approval by Ministry of Finance and Contractor General	10 days	07 Oct '24	18 Oct '24	21
23	4.5	Awarding of bids - Drafting of contracts	1 day	21 Oct '24	21 Oct '24	22
24	4.6	Contract Signing	1 day	22 Oct '24	22 Oct '24	23
25	4.7	Acquisition of equipment/supplies	20 days	23 Oct '24	19 Nov '24	24
26	4.8	Delivery of equipment and supplies	1 day	20 Nov '24	20 Nov '24	25
27	**5**	**Development of standard operating procedures for laboratory**	**10 days**	**22 Oct '24**	**04 Nov '24**	
28	5.1	Meeting to develop, and review/compile existing documents, guidelines, training materials etc.	5 days	22 Oct '24	28 Oct '24	17
29	5.2	Finalize hard copy and electronic copies of standard operating procedures for laboratory functions	5 days	29 Oct '24	04 Nov '24	28



Project: Public Health Entomolo
Date: 20 Apr '24

Task	Inactive Milestone	Start-only	Critical Split		
Split	Inactive Summary	Finish-only	Progress		
Milestone	Manual Task	External Tasks	Manual Progress		
Summary	Duration-only	External Milestone			
Project Summary	Manual Summary Rollup	Deadline			
Inactive Task	Manual Summary	Critical			

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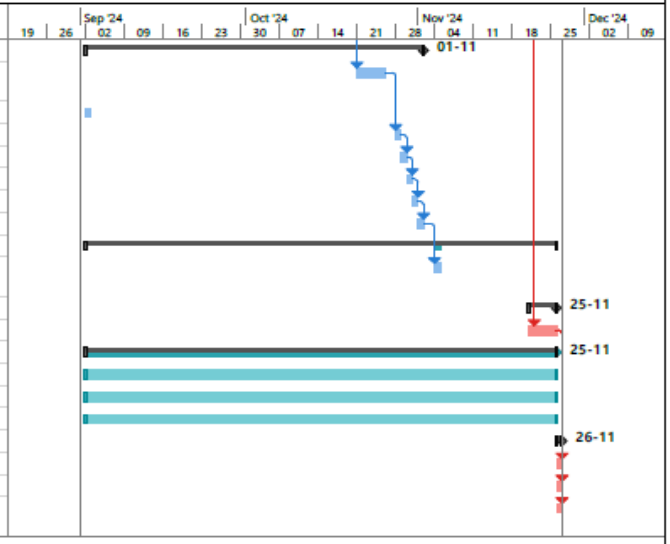
Public Health Entomology Laboratory Project

ID	WBS	Task Name	Duration	Start	Finish	Predecessors
30	**6**	**Installation of utilities (electricity, water, internet)**	**45 days**	**02 Sep '24**	**01 Nov '24**	
31	6.1	Construction of weather-head for connection of electricity	5 days	21 Oct '24	25 Oct '24	10
32	6.2	Construction of soak away & septic system	1 day	02 Sep '24	02 Sep '24	
33	6.3	Connection of electrical lines to breaker box	1 day	28 Oct '24	28 Oct '24	31
34	6.4	Installation of water meter	1 day	29 Oct '24	29 Oct '24	33
35	6.5	Connection of water main to lab	1 day	30 Oct '24	30 Oct '24	34
36	6.6	Installation of network lines	1 day	31 Oct '24	31 Oct '24	35
37	6.7	Connection of internet	1 day	01 Nov '24	01 Nov '24	36
38	**7**	**Quality Assurance Inspection**	**61 days**	**02 Sep '24**	**26 Nov '24**	
39	7.1	Inspection of building by project management unit engineers	1 day	04 Nov '24	04 Nov '24	37
40	**8**	**Setup of laboratory**	**3 days**	**21 Nov '24**	**25 Nov '24**	
41	8.1	Installation of equipment	3 days	21 Nov '24	25 Nov '24	26
42	**9**	**Project Management**	**61 days**	**02 Sep '24**	**25 Nov '24**	
43	9.1	Meetings	61 days	02 Sep '24	25 Nov '24	
44	9.2	Reports	61 days	02 Sep '24	25 Nov '24	
45	9.3	Monitoring & Controlling	61 days	02 Sep '24	25 Nov '24	
46	**10**	**Project Completion**	**1 day**	**26 Nov '24**	**26 Nov '24**	
47	10.1	Project Acceptance	1 day	26 Nov '24	26 Nov '24	41
48	10.2	Handing over to vector control program	1 day	26 Nov '24	26 Nov '24	41
49	10.3	Project End (lessons learned and archiving of documents)	1 day	26 Nov '24	26 Nov '24	41



Project: Public Health Entomolo
Date: 20 Apr '24

Task	Inactive Milestone	Start-only	Critical Split
Split	Inactive Summary	Finish-only	Progress
Milestone	Manual Task	External Tasks	Manual Progress
Summary	Duration-only	External Milestone	
Project Summary	Manual Summary Rollup	Deadline	
Inactive Task	Manual Summary	Critical	

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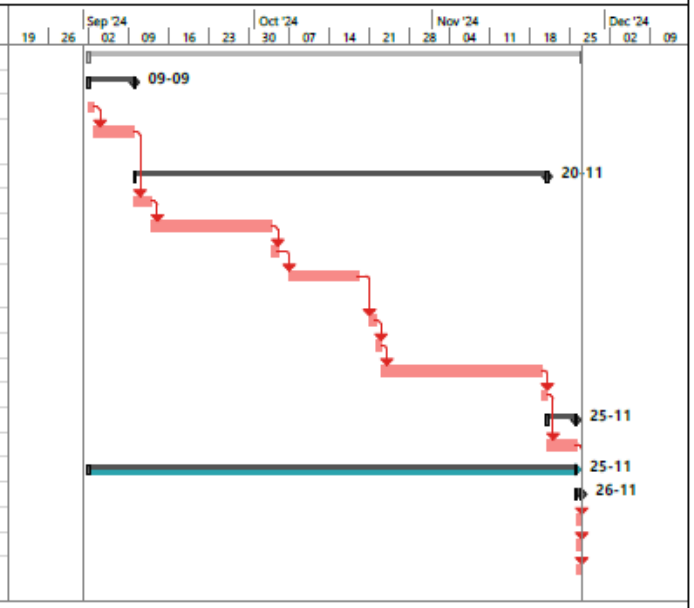
(Source: Compiled by the Author)

Chart 19

Project Critical Path

Public Health Entomology Laboratory Project

ID	WBS	Task Name	Duration	Start	Finish	Predecessors
0	**0**	**Public Health Entomology Laboratory Project**	**62 days**	**02 Sep '24**	**26 Nov '24**	
1	**1**	**Architectural Design and Engineering Approval**	**6 days**	**02 Sep '24**	**09 Sep '24**	
2	1.1	Consultation of building requirements and design	1 day	02 Sep '24	02 Sep '24	
3	1.2	Design of building by MOHW project management unit engineers	5 days	03 Sep '24	09 Sep '24	2
18	**4**	**Procurement of laboratory equipment and supplies**	**52 days**	**10 Sep '24**	**20 Nov '24**	
19	4.1	Compile procurement list and specifications	3 days	10 Sep '24	12 Sep '24	3
20	4.2	Solicitation of bids – advertisement	15 days	13 Sep '24	03 Oct '24	19
21	4.3	Bid-evaluation	1 day	04 Oct '24	04 Oct '24	20
22	4.4	Approval by Ministry of Finance and Contractor General	10 days	07 Oct '24	18 Oct '24	21
23	4.5	Awarding of bids - Drafting of contracts	1 day	21 Oct '24	21 Oct '24	22
24	4.6	Contract Signing	1 day	22 Oct '24	22 Oct '24	23
25	4.7	Acquisition of equipment/supplies	20 days	23 Oct '24	19 Nov '24	24
26	4.8	Delivery of equipment and supplies	1 day	20 Nov '24	20 Nov '24	25
40	**8**	**Setup of laboratory**	**3 days**	**21 Nov '24**	**25 Nov '24**	
41	8.1	Installation of equipment	3 days	21 Nov '24	25 Nov '24	26
42	**9**	**Project Management**	**61 days**	**02 Sep '24**	**25 Nov '24**	
46	**10**	**Project Completion**	**1 day**	**26 Nov '24**	**26 Nov '24**	
47	10.1	Project Acceptance	1 day	26 Nov '24	26 Nov '24	41
48	10.2	Handing over to vector control program	1 day	26 Nov '24	26 Nov '24	41
49	10.3	Project End (lessons learned and archiving of documents)	1 day	26 Nov '24	26 Nov '24	41



Project: Public Health Entomolo
Date: 20 Apr '24

Task	Inactive Milestone	Start-only	Critical Split		
Split	Inactive Summary	Finish-only	Progress		
Milestone	Manual Task	External Tasks	Manual Progress		
Summary	Duration-only	External Milestone			
Project Summary	Manual Summary Rollup	Deadline			
Inactive Task	Manual Summary	Critical			

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(Source: Compiled by the Author)

4.3.7 Control Schedule

Control Schedule ensures that the project remains on track and within the agreed timeline. It involves monitoring the status of project activities to identify potential issues that could impact the schedule and apply appropriate corrective and preventive actions to address any deviations. This process is part of a continuous feedback loop where the project's progress is compared against the project management plan, particularly the schedule baseline. The following are critical aspects of the control schedule:

- Monitoring Progress: Regularly monitoring the project's progress against the schedule baseline is essential. This involves tracking the start and finish dates of project activities, their duration versus the planned duration, and the critical path.
- Comparing Planned to Actual: One of the main components of controlling the schedule is to compare the planned progress (according to the schedule baseline) with the actual project progress. This analysis helps to identify any variances between the expected and actual timeline.
- Identifying Variance Causes: It is essential to analyze and identify the reasons behind these deviations. Common causes include resource constraints, unexpected technical challenges, external factors, or estimation errors.
- Taking Corrective Actions: Depending on the nature and impact of the variance, corrective actions may be necessary to bring the project back on track. These actions could include reallocating resources, adjusting task sequences, or modifying task durations.

- Reporting and Communication: Regular schedule status reporting to stakeholders is crucial. These reports should highlight progress, potential risks, and changes to the schedule, ensuring transparency and keeping everyone informed.
- Change Control: Requested changes may impact the schedule; the change control process outlined in section 4.2.1 will manage this.
- The Critical Path Method (CPM): The CPM is a project management tool that identifies the most extended sequence of dependent tasks required to complete a project and determines the shortest possible duration. By identifying these critical tasks that directly impact the project's finish date, CPM allows project managers to prioritize resources effectively, ensuring that delays in critical tasks do not derail the overall project schedule. Any change or delay in critical tasks will extend the project's duration, directly affecting the project's deadline and potentially increasing costs.

4.4 Cost Management Plan

The Cost Management Plan is another critical component of the project management plan that outlines the procedures, policies, and documentation necessary to manage project costs effectively. It provides a framework for planning, estimating, budgeting, and controlling costs to ensure that the project is completed within the approved budget. This plan establishes the baseline for cost performance, identifies the cost management processes, and assigns roles and responsibilities to ensure cost transparency and accountability. It also details how costs will be reported and monitored, specifies approval processes for budget changes, and integrates with other project management processes, such as scope and schedule management, to maintain financial control throughout the project lifecycle.

4.4.1 Planning and Estimating Cost

Plan Cost Management is the initial phase in the cost management process of a project, focused on establishing policies, procedures, and documentation for planning, managing, executing, and controlling project costs. This crucial step sets the groundwork for effective cost management by defining how costs will be estimated, budgeted, and controlled throughout the project lifecycle. It involves determining the format and criteria for cost structure, the planning of resources, and the scheduling of expenditures.

The costing process begins with identifying and analyzing all relevant cost components, such as labor, materials, equipment, and overhead expenses, and then estimating their individual or aggregate costs. The costing techniques utilized are expert judgment from sources including project engineers and technical experts from the Belize Vector and Ecology Center, as well as analogous estimating techniques that involve data from previous projects for similar components. The work breakdown structure (WBS) and dictionary, scope baseline, and project schedule are some of the critical inputs that factor into this process, with one of the outputs being the breakdown of the project cost, depicted on Chart 20.

Chart 20

Estimated Cost

WBS Code	WBS Name	Description of Task	Resources	Total Cost (USD)
0	**Public Health Entomology Laboratory Project**	**Total project budget**		**$45,000.00**
1	**Architectural Design and Engineering Approval**	**Sub-total**		**$100.00**
1.1	Consultation of building requirements and design	The cost associated with meetings to design and finalize requirements of the laboratory	Project Manager Belize Vector and Ecology Center	$100.00

WBS Code	WBS Name	Description of Task	Resources	Total Cost (USD)
1.2	Design of building by MOHW project management unit engineers	Completion of drawings and estimates	Project engineer (on staff)	$0.00
2	**Procurement of prefabricated building**	**Sub-total**		**$25,150.00**
2.1	Preparation of tender documents	Gather requirements and prepare an advertisement	Project Manager Procurement Officer	$0.00
2.2	Solicitation of bids – advertisement	Advertisement of bids via newspaper, social media, and government tender platforms for a period of 15 days	Procurement officer	$150.00
2.3	Bid-evaluation	Bid evaluation and report	Project manager Bid evaluation team	$0.00
2.4	Approval by the Ministry of Finance and Contractor General	Review and approval of bid report and contract	Ministry of Finance and Contractor General	$0.00
2.5	Awarding of bids - Drafting contracts	Notification of bid evaluation results to bidders	Project manager Director of Project Management Unit	$0.00
2.6	Contract Signing	50% downpayment upon signing of contract	Chief Executive Officer Provider (Vendor)	$12,500.00
2.7	Construction and assembly of prefabricated building	Construction of prefabricated building according to specifications	Provider – Plett's Home Builders	$0.00
2.8	Construction of concrete foundation/footing for building	Construction of a concrete foundation for the placement of the building	Provider – Plett's Home Builders	$0.00
2.9	Transportation of prefabricated building	Transportation of building to project site	Provider – Plett's Home Builders	$0.00
2.1	Installation of prefabricated building	Second payment being 50% of contract cost – paid upon completion of delivery and installation.	Provider – Plett's Home Builders	$12,500.00

WBS Code	WBS Name	Description of Task	Resources	Total Cost (USD)
3	**Acquisition of building and utility permits**	**Sub-total**		**$0.00**
3.1	Application for construction-permit	Application for a building permit through the central building authority	Project engineer Director of Project Management Unit	$0.00
3.2	Application for water, electricity, and internet	Application for Internet, Water, and Electricity through the Assets and Utilities Unit within the Ministry of Finance	Project engineer Director of Project Management Unit	$0.00
4	**Procurement of laboratory equipment and supplies**	**Sub-total**		**$15,150.00**
4.1	Compile procurement list and specifications	Gather requirements and prepare an advertisement	Project Manager Procurement Officer	$0.00
4.2	Solicitation of bids – advertisement	Advertisement of bids via newspaper, social media, and government tender platforms for a period of 15 days	Procurement officer	$150.00
4.3	Bid-evaluation	Bid evaluation and report	Project manager Bid evaluation team	$0.00
4.4	Approval by the Ministry of Finance and Contractor General	Review and approval of bid report and contract	Ministry of Finance and Contractor General	$0.00
4.5	Awarding of bids - Drafting of contracts	Notification of bid evaluation results to bidders	Project manager Director of Project Management Unit	$0.00
4.6	Contract Signing	50% downpayment upon signing of contract	Chief Executive Officer Provider (Vendor)	$7,500.00
4.7	Acquisition of equipment/supplies	Acquisition process and lead time	Construction Team, Finishers	$0.00
4.8	Delivery of equipment and supplies	Cost associated with the second payment is 50% of the contract cost upon delivery of equipment and supplies	Construction Team, Finishers	$7,500.00

WBS Code	WBS Name	Description of Task	Resources	Total Cost (USD)
5	**Development of standard operating procedures for laboratory**	**Sub-total**		**$1,000.00**
5.1	Meeting to develop and review/compile existing documents, guidelines, training materials, etc.	The cost associated with working meetings to prepare procedural guidelines, etc.	Vector Control Technical Advisor Belize Vector and Ecology Center	$250.00
5.2	Finalize hard copy and electronic copies of standard operating procedures for laboratory functions	Printing of completed documents/guidelines – color and perfect binding	Procurement officer	$750.00
6	**Installation of utilities (electricity, water, internet)**	**Sub-total**		**$3,250.00**
6.1	Construction of weather-head for connection of electricity	The hiring of a private contractor to construct concrete posts for the installation of meters and components as per electricity provider requirements	Project engineer Private Contractor	$500.00
6.2	Construction of soak-away and septic system	The cost associated with hiring a private contractor to construct soakaway and septic system components for disposing of grey water and sewage waste.	Project engineer Private Contractor	$1,000.00
6.3	Connection of electrical lines to breaker box	Hiring an electrician to connect electricity from Weatherhead to the building breaker box	Private electrician	$1,000.00
6.4	Installation of water meter	Provide access to water and install a water meter	Belize Water Services Limited	$0.00
6.5	Connection of water main to laboratory	The cost associated with pipes, fittings, supplies, etc., to connect water lines.	Maintenance Unit	$250.00
6.6	Installation of network lines	LAN cables and connection boxes installed in the office	Information Technology Unit	$500.00
6.7	Connection of internet	Installation of switch and configuration of modem	Belize Telemedia Limited	$0.00

WBS Code	WBS Name	Description of Task	Resources	Total Cost (USD)
7	**Quality Assurance Inspection**	**Sub-total**		**$0.00**
7.1	Inspection of the building by project management unit engineers	Inspection and subsequent reports/updates throughout all phases of the project	Project engineer Project Manager Vector Control Technical Advisor	$0.00
8	Setup of laboratory	Installation of equipment	Vector Control Technical Advisor Belize Vector and Ecology Center	$0.00
8.1	Installation of equipment	Completed installation of equipment, furniture, etc.	Vector Control Technical Advisor Belize Vector and Ecology Center	$0.00
9	**Project Management**	**Sub-total**		**$250.00**
9.1	Meetings	The cost associated with meetings, including printed materials, stationaries, meals	Project Team	$250.00
9.2	Reports	Routine updates are provided during the lifecycle, detailing the status, accomplishments, and challenges faced.	Project Manager	$0.00
9.3	Monitoring and controlling	Tracking, reviewing, and regulating project progress and performance	Project Manager	$0.00
10	**Project Completion**	**Sub-total**		**$100.00**
10.1	Project Acceptance	Formal acceptance from stakeholders, confirming that all deliverables have been met according to requirements	Director of Project Management Unit Project Manager	$0.00
10.2	Handing over to the vector control program	Cost associated with handing over ceremony (decorations and refreshments)	Director of Project Management Unit Project Manager	$100.00

WBS Code	WBS Name	Description of Task	Resources	Total Cost (USD)
10.3	Project End	Administrative closure, release of project resources, and archiving of documents.	Director of Project Management Unit Project Manager	$0.00
		Total Project Budget		**$45,000.00**

(Source: Compiled by the Author)

4.4.2 Determine Budget

The process of determining the budget is an essential process that involves estimating and allocating the total financial resources required to complete a project. This process begins with detailed cost estimation, where labor, materials, equipment, and other expenses are calculated, as outlined in section 4.5.1. After estimating individual costs, these are aggregated to form a comprehensive project budget. To safeguard against risks and uncertainties, a 10% contingency reserve is incorporated. A 3% management reserve is also set aside for unforeseeable work within the project's scope. These reserves cover risks not identified or anticipated in the planning phase. The management reserve is not included in the cost baseline. A breakdown of these costs can be seen on Chart 22.

4.4.3 Control Costs

Control Costs refers to the process of monitoring and managing the allocation of financial resources throughout the lifecycle of a project to ensure that it does not exceed the approved budget. This essential aspect of project cost management involves comparing actual costs incurred to the planned budget and forecasting future financial performance based on current trends. Key activities in this process include tracking expenditures, validating cost performance against the baseline, and implementing corrective actions to address any variances. Effective cost control requires sophisticated tools and techniques, such as Earned Value Management (EVM),

which integrates scope, schedule, and cost data to provide a comprehensive view of project performance and progress. Regular cost reviews help to identify and mitigate financial risks by allowing project managers to make informed adjustments to project plans, schedules, and resource allocations. The inputs used in this process include the cost management plan, cost baseline, and performance measurement baseline. The methods employed are expert judgment, earned value analysis, and variance analysis. The project manager will consistently monitor and control project costs and report every month, enabling the timely implementation of corrective actions to ensure that the project remains within the approved budget. The following summarizes the process of controlling costs:

- Establishing the Cost Baseline: It is essential to establish a cost baseline, the approved version of the project budget. This baseline will be a reference point for all cost comparisons throughout the project lifecycle.
- Monitoring Costs: Regular monitoring of project costs against the baseline must be ongoing. This involves tracking actual expenditures and commitments to determine how they align with the planned budget.
- Employing Cost Control Tools and Techniques:
    - Earned Value Management (EVM): Using the earned value analysis approach, the budget execution performance will be analyzed, comparing the actual schedule and cost performance against the performance measurement baseline. Key metrics such as Schedule Variance (SV), Cost Variance (CV), Schedule Performance Index (SPI), and Cost Performance Index (CPI) can be utilized.

- Variance Analysis: This involves identifying the difference between planned and actual performance. Cost variance (CV) and schedule variance (SV) are calculated to flag any deviations from the baseline.
- Expert Judgment: Consulting with project team members and other stakeholders with expertise and experience in similar projects can provide insights into cost management challenges and solutions.
- Implementing Changes and Corrective Actions: If deviations from the baseline are identified, corrective actions must be formulated and implemented to bring the project back within budgetary limits. This necessary action might involve reallocating resources, adjusting project scope, or revising procurement strategies. These changes must follow the integrated change control process found in section 4.2.1.
- Reporting: Regular cost performance reports are essential for communicating the project's financial status to stakeholders. These reports provide transparency and support decision-making processes regarding project adjustments. For this project, a financial report will be made monthly.

The project will utilize the Earned Value Management (EVM) performance indicators on Chart 20.

Chart 21

Earned Value Management (EVM) Indicators

Metric	Formula	Green	Yellow	Red
Schedule Variance (SV)	EV - PV	+ means project ahead of schedule	Neutral = on schedule	- means the project is behind schedule
Cost Variance (CV)	EV - AC	+ means the project is under budget	Neutral = on-budget	- means project over budget

Metric	Formula	Green	Yellow	Red
Schedule Performance Index (SPI)	EV/PV	> 1 means the project is ahead of schedule	1 = on schedule	< 1 means the project is behind schedule
Cost Performance Index (CPI)	EV/AC	> 1 means the project is under budget	1 = on budget	< 1 means the project is over budget

Alert	Response
Green	The project schedule and budget are on track.
Yellow (Alert)	The project schedule and budget are behind and not on track
Red (Critical)	The project requires urgent attention

Planned Value (PV) Actual Cost (AC) Earned Value (EV) Planned Value (PV)
(Source: Compiled by the Author)

The monthly projected expenditure on Chart 22 is essential for budget control, cash flow management, and overall financial planning. This projection will assist the project manager, and stakeholders in understanding how funds are expected to be utilized monthly throughout the project.

The financial S-curve on Chart 22 is a useful visual tool that illustrates the cumulative costs and revenues throughout a project. Characterized by its distinctive 'S' shape, the curve maps out three key phases: a slow start with low initial expenditures, a rapid growth phase where spending accelerates as major activities ramp up, and a tapering off stage as the project nears completion and expenses decrease. This graphical representation assists in monitoring financial progress, managing budget allocations efficiently, and forecasting future financial needs. During project execution, the actual expenditure can be plotted against planned expenditure, whereby discrepancies can be identified, and corrective actions can be taken promptly.

Chart 22

Project Monthly Expenditures

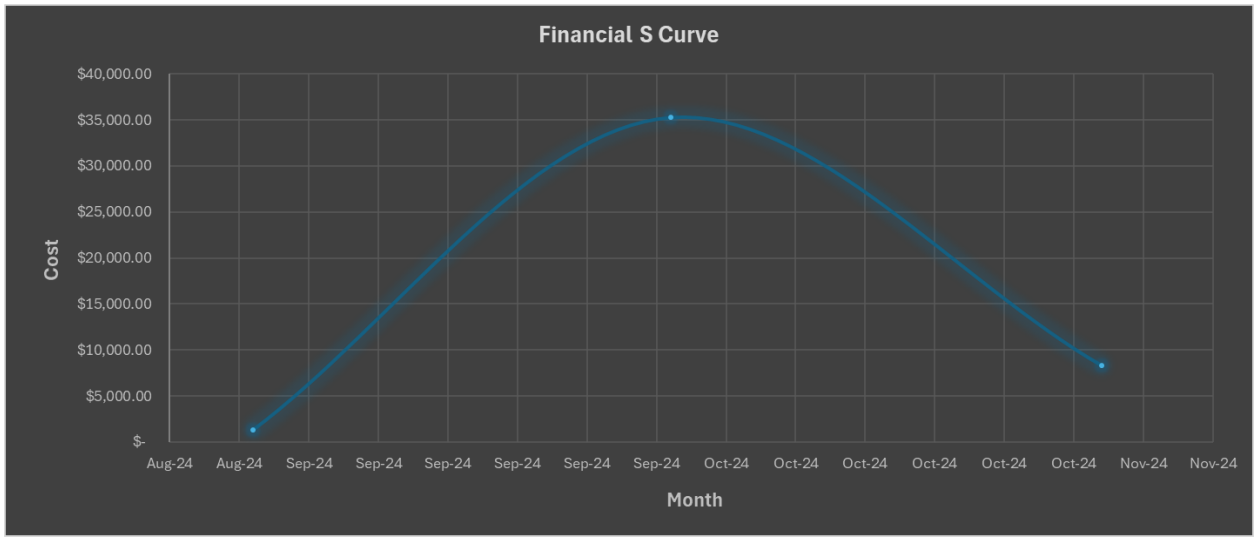
WBS Code	WBS Name	Description of Task	Total Cost (USD)	Start	Finish	Duration (days)	Sept	Oct	Nov
6	**Installation of utilities (electricity, water, internet)**	**Sub-total**	**$3,250.00**	**02 Sep '24**	**01 Nov '24**	**45 days**			
6.1	Construction of weather-head for connection of electricity	Hiring of private contractor to construct concrete post for installation of meter and components as per electricity provider requirements	$500.00	21 Oct '24	25 Oct '24	5 days		$ 500.00	
6.2	Construction of soak-away and septic system	Cost associated with hiring of private contractor to construct soak away and septic system components for disposal of grey water and sewage waste.	$1,000.00	02 Sep '24	02 Sep '24	1 day	$ 1,000.00		
6.3	Connection of electrical lines to breaker box	Hiring of electrician to connect electricity from weatherhead to building breaker box	$1,000.00	28 Oct '24	28 Oct '24	1 day		$ 1,000.00	
6.4	Installation of water meter	Provide access to water and installation of water meter	$0.00	29 Oct '24	29 Oct '24	1 day			
6.5	Connection of water main to laboratory	Cost associated with pipes, fittings, supplies etc. to connect water lines.	$250.00	30 Oct '24	30 Oct '24	1 day		$ 250.00	
6.6	Installation of network lines	LAN cables and connection boxes installed in office	$500.00	31 Oct '24	31 Oct '24	1 day		$ 500.00	
6.7	Connection of internet	Installation of switch and configuration of modem	$0.00	01 Nov '24	01 Nov '24	1 day			
7	**Quality Assurance Inspection**	**Sub-total**	**$0.00**	**02 Sep '24**	**26 Nov '24**	**61 days**			
7.1	Inspection of building by project management unit engineers	Inspection and subsequent reports/updates throughout all phases of project	$0.00	04 Nov '24	04 Nov '24	1 day			
8	Setup of laboratory	Insallation of equipment	$0.00	**21 Nov '24**	**25 Nov '24**	**3 days**			
8.1	Installation of equipment	Completed installation of equipment, furniture etc.	$0.00	21 Nov '24	25 Nov '24	3 days			
9	**Project Management**	**Sub-total**	**$250.00**	**02 Sep '24**	**25 Nov '24**	**61 days**			
9.1	Meetings	Cost associated with meetings, including printed materials, stationaries, meals	$250.00	02 Sep '24	25 Nov '24	61 days	$ 100.00	$ 150.00	
9.2	Reports	Routine updates provided during the lifecycle, detailing the current status, accomplishments, and challenges faced.	$0.00	02 Sep '24	25 Nov '24	61 days			
9.3	Monitoring and controlling	Tracking, reviewing, and regulating project progress and performance	$0.00	02 Sep '24	25 Nov '24	61 days			
10	**Project Completion**	**Sub-total**	**$100.00**	**26 Nov '24**	**26 Nov '24**	**1 day**			
10.1	Project acceptance	Formal acceptance from stakeholders, confirming that all deliverables have been met according to requirements	$0.00	26 Nov '24	26 Nov '24	1 day			
10.2	Handing over to vector control program	Cost associated with handing over ceremony (decorations and refreshments)	$100.00	26 Nov '24	26 Nov '24	1 day			$ 100.00
10.3	Project End	Administrative closure, release of project resources and archiving of documents.	$0.00	26 Nov '24	26 Nov '24	1 day			
		Total Cost Estimate	**$45,000.00**						
		Contingency Reserve (10%)	**$4,500.00**						
		Total Cost Baseline	**$49,500.00**						
		Management Reserve (3%)	**$1,485.00**						
		Total Project Budget	**$50,985.00**						
					PV Total		$ 1,350.00	$ 35,300.00	$ 8,350.00
					PV Cummulative		$ 1,350.00	$ 36,650.00	$ 45,000.00

(Source: Compiled by the Author)

WBS Code	WBS Name	Description of Task	Total Cost (USD)	Start	Finish	Duration (days)	Sept	Oct	Nov
0	**Public Health Entomology Laboratory Project**	**Total project budget**	**$45,000.00**	**02 Sep '24**	**26 Nov '24**	**62 days**			
1	**Architectural Design and Engineering Approval**	**Sub-total**	**$100.00**	**02 Sep '24**	**09 Sep '24**	**6 days**			
1.1	Consultation of building requirements and design	Cost associated with meetings to design and finalize requirements of laboratory	$100.00	02 Sep '24	02 Sep '24	1 day	$ 100.00		
1.2	Design of building by MOHW project management unit engineers	Completion of drawings and estimates	$0.00	03 Sep '24	09 Sep '24	5 days			
2	**Procurement of prefabricated building**	**Sub-total**	**$25,150.00**	**10 Sep '24**	**14 Nov '24**	**48 days**			
2.1	Preparation of tender documents	Gather requirements and prepare advertisement	$0.00	10 Sep '24	11 Sep '24	2 days			
2.2	Solicitation of bids – advertisement	Advertisement of bids via newspaper, social media and government tender platform for a period of 15 days	$150.00	12 Sep '24	02 Oct '24	15 days	$ 150.00		
2.3	Bid-evaluation	Bid evaluation and report	$0.00	03 Oct '24	03 Oct '24	1 day			
2.4	Approval by Ministry of Finance and Contractor General	Review and approval of bid report and contract	$0.00	04 Oct '24	17 Oct '24	10 days			
2.5	Awarding of bids - Drafting contracts	Notification of bid evaluation results to bidders	$0.00	18 Oct '24	18 Oct '24	1 day			
2.6	Contract Signing	50% downpayment upon signing of contract	$12,500.00	18 Oct '24	18 Oct '24	1 day		$ 12,500.00	
2.7	Construction and assembly of prefabricated building	Construction of prefabricated building according to specifications	$0.00	18 Oct '24	14 Nov '24	20 days			
2.8	Construction of concrete foundation/footing for building	Construction of concrete foundation for placement of building	$0.00	18 Oct '24	24 Oct '24	5 days			
2.9	Transportation of prefabricated building	Transportation of building to project site	$0.00	25 Oct '24	25 Oct '24	1 day			
2.1	Installation of prefabricated-building	Second payment being 50% of contract cost – paid upon completion of delivery and installation.	$12,500.00	25 Oct '24	25 Oct '24	1 day		$ 12,500.00	
3	**Acquisition of building and utility permits**	**Sub-total**	**$0.00**	**21 Oct '24**	**21 Oct '24**	**1 day**			
3.1	Application for construction-permit	Application for building permit through central building authority	$0.00	21 Oct '24	21 Oct '24	1 day			
3.2	Application for water, electricity and internet	Application for Internet, Water and Electricity through Assets and Utilities Unit within Ministry of Finance	$0.00	21 Oct '24	21 Oct '24	1 day			
4	**Procurement of laboratory equipment and supplies**	**Sub-total**	**$15,150.00**	**10 Sep '24**	**20 Nov '24**	**52 days**			
4.1	Compile procurement list and specifications	Gather requirements and prepare advertisement	$0.00	10 Sep '24	12 Sep '24	3 days			
4.2	Solicitation of bids – advertisement	Advertisement of bids via newspaper, social media and government tender platform for a period of 15 days	$150.00	13 Sep '24	03 Oct '24	15 days		$ 150.00	
4.3	Bid-evaluation	Bid evaluation and report	$0.00	04 Oct '24	04 Oct '24	1 day			
4.4	Approval by Ministry of Finance and Contractor General	Review and approval of bid report and contract	$0.00	07 Oct '24	18 Oct '24	10 days			
4.5	Awarding of bids - Drafting of contracts	Notification of bid evaluation results to bidders	$0.00	21 Oct '24	21 Oct '24	1 day			
4.6	Contract Signing	50% downpayment upon signing of contract	$7,500.00	22 Oct '24	22 Oct '24	1 day		$ 7,500.00	
4.7	Acquisition of equipment/supplies	Acquisition process and lead time	$0.00	23 Oct '24	19 Nov '24	20 days			
4.8	Delivery of equipment and supplies	Cost associated with second payment being 50% of contract cost upon delivery of equipment and supplies	$7,500.00	20 Nov '24	20 Nov '24	1 day			$ 7,500.00
5	**Development of standard operating procedures for laboratory**	**Sub-total**	**$1,000.00**	**22 Oct '24**	**04 Nov '24**	**10 days**			
5.1	Meeting to develop, and review/compile existing documents, guidelines, training materials etc.	Cost associated with working meetings to prepare procedural guidelines etc.	$250.00	22 Oct '24	28 Oct '24	5 days		$ 250.00	
5.2	Finalize hard copy and electronic copies of standard operating procedures for laboratory functions	Printing of completed documents/guidelines – color and perfect bound	$750.00	29 Oct '24	04 Nov '24	5 days			$ 750.00

Chart 23

Financial S Curve



(Source: Compiled by the Author)

4.4.4 Cost Management and Reporting

On a monthly basis, the project manager will report to the director of the project management unit in the Ministry of Health and Wellness, who will be responsible for disseminating reports to relevant stakeholders. The Earned Value Management performance indicators outlined on Chart 21, the monthly projected expenditure on Chart 22, and the financial s-curve on Chart 23 will be utilized to manage expenditure. Chart 24 represents a template for a project financial report that tracks expenditures for each task or activity and provides a snapshot of budget performance. This template is done in Microsoft Excel, but similarly, an expenditure report can be obtained from accounting software such as QuickBooks, project management software such as Microsoft Project, or project management dashboards such as Microsoft Power BI, Project Manager, or Monday.com, all dependent on the complexity of the project. These tools will significantly reduce the risk of going over budget and ensure that the project stays on schedule.

Chart 24

Budget Log and Report

	A	B	C	D	E	F	G	H	I	J
1	**Project Financial Report**									
2	**Project Name:**								**Report Number:**	
3	**Project Number:**								**Report Date:**	
4	**Project Manager:**									
5										
6	**Budget Status**									
7	**Total Budget**									
8	**Actual Expenditure**									
9	**Variance -/+**									
10	**Budget Log**									
11	Task ID	Date	Description	Planned Cost	Actual Cost	Approved By	Supplier	Order or Check #	Invoice #	Comments
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										

(Source: Compiled by: the Author)

4.5 Quality Management Plan

A quality management plan (QMP) is a roadmap to achieve project success by outlining how quality will be ensured throughout its lifecycle. It defines clear quality objectives that meet customer expectations. The QMP then details processes for achieving those objectives, including quality control activities, metrics for measurement, and procedures for addressing non-compliance. The three essential components entail planning quality management, managing quality, and controlling quality (Project Management Institute, 2017, p. 271). These components ensure consistent delivery of high-quality deliverables that meet project requirements.

4.5.1 Plan Quality Management

Plan Quality Management is one of the critical processes crucial for ensuring that the project meet the necessary quality standards and stakeholder expectations. This process involves identifying quality requirements and/or standards for the project and its deliverables and

documenting how the project will demonstrate compliance with these requirements. This planning stage sets the foundation for managing and controlling quality throughout the project lifecycle.

During this phase, the project managers and the team will establish quality objectives aligned with the project's goals and stakeholder needs. They determine relevant quality standards and develop specific metrics that will be used to measure project performance against these standards. Key activities in this process include outlining procedures for quality assurance, quality control, and continuous quality improvement. The roles and responsibilities of quality management are clearly defined, ensuring accountability and consistent application of quality practices across the project.

4.5.2 Quality Objectives

The following are the quality objectives of the project:

1. Maintain project balance and efficiency by aligning the triple scope, schedule, and cost constraints.
2. Ensure structural soundness of laboratory structure according to approved design.
3. Ensure compliance with local regulatory bodies regarding building codes and electricity, water, and internet service provider regulations.
4. Comply with requirements and standards to perform functions as experts recommend.
5. Provide technically sound operational guidelines per World Health Organization and Center for Disease Control standards for vector surveillance and insecticide resistance monitoring.

4.5.3 Quality Metrics and Baseline

Quality Metrics and Baseline are fundamental tools to ensure that projects meet established standards and achieve intended objectives. Quality Metrics refer to specific criteria that measure the quality of project deliverables and processes, including performance, reliability, defect frequency, compliance, and customer satisfaction. These metrics provide a quantitative basis for evaluating project success against predefined standards. The Quality Baseline, on the other hand, is the approved version of project quality plans, which serve as reference points for measuring actual quality performance. This baseline includes detailed quality objectives and standards, facilitating effective monitoring and control by allowing project managers to detect deviations and make necessary adjustments; this is outlined on Chart 25. The Quality Metrics and Baseline form an essential framework for maintaining project quality, guiding continuous improvement, and ensuring alignment with project goals and stakeholder expectations.

Chart 25

Quality Metrics and Baseline

Quality Objective	Metric	Metric Definition	Expected Outcome/Results	Measurement Frequency	Responsible
To ensure alignment with the triple constraint of scope, schedule, and cost to maintain project balance and efficiency.	Completion of deliverables in project scope	Percentage of project deliverables completed	100% of deliverables completed as outlined on Charts 11 and 12	Weekly	Project Manager
	Schedule Variance	Variance between planned and actual schedule	Schedule variance within ±5% of the planned schedule	Weekly	Project Manager
	Cost Performance Index	Cost efficiency of budget expressed as a ratio of earned value to actual cost	Cost performance index maintained at or above 1.0		
Structural soundness of laboratory structure according to the approved design	Structural Integrity	Construction of building according to specifications	Completed laboratory structure built and installed according to project requirements	Weekly	Project Engineer
Compliance with local regulatory bodies concerning building codes and electricity, water, and internet service provider regulations.	Regulatory Compliance	Adherence to national regulatory requirements	Compliance with service providers' requirements	Monthly	Project Engineer Project Manager
Compliance with requirements and standards to carry out functions as recommended by experts.	Laboratory functionality	Availability of all equipment and supplies required to carry out functions	All equipment and supplies were procured and installed to enable the lab's functionality.	Monthly	Project Manager
Technically sound operational guidelines per World Health Organization and Center for Disease Control standards.	Technical Compliance	Alignment of procedural manual with WHO & CDC standards	Completed standard operating procedures aligned with global standards	Monthly	Project Manager

(Source: Compiled by the Author)

4.5.4 Manage Quality

The Manage Quality process ensures that project deliverables and processes meet established quality standards and stakeholder expectations. Quality assurance should be carried out proactively. The project manager monitors quality, reports to stakeholders, and takes corrective actions. There are various tools and techniques, such as audits, checklists, and quality reports, which can be applied to this project. The application of these tools depends on the project team member responsible for monitoring quality at various project stages. For example, the project engineer can utilize a checklist for onsite visits, monitoring and evaluating various aspects of the building and construction site; the output would be a site visit report. The project manager will evaluate the development of each output against the requirement traceability matrix found on Chart 11.

The entire project team is responsible for the quality assurance framework. The primary tools for ensuring quality include the quality documents outlined on Chart 26 and the Plan-Do-Check-Act (PDCA) quality improvement process.

4.5.5 Quality Documents

Quality documents are essential artifacts for ensuring and controlling the quality of outputs throughout the project's lifecycle. They provide a framework, set standards, guide operations, and record quality-related activities. They are critical for ensuring that projects meet the defined requirements and standards for successful project delivery and stakeholder satisfaction. They also establish how to measure success and address any issues that might arise. These documents ensure consistent delivery of high-quality work that meets all project requirements. Chart 26 presents the documentation that will be assembled for the project.

Chart 26

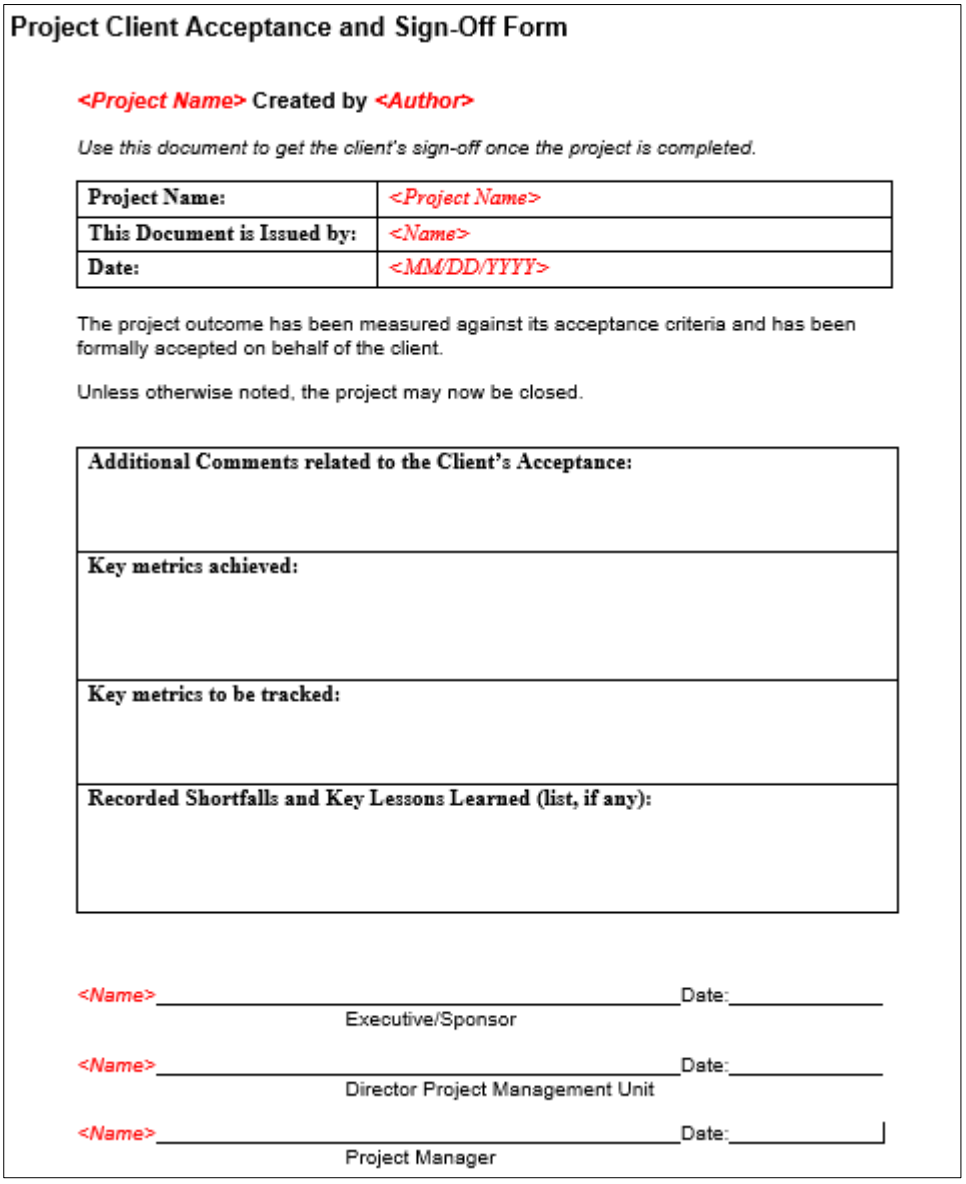
Quality Documents

Category	Quality Documents and Standards
Quality Standards	• World Health Organization standards and recommendations - https://iris.paho.org/bitstream/handle/10665.2/51689/9789275121016_eng.pdf?sequence=1&isAllowed=y • Central building authority standards • Public Utilities Commission standards
Specifications and Requirements	• Technical specifications as outlined by the Ministry of Health and Wellness Project Management Unit • Technical specifications as outlined in project documents
Checklists	• Construction inspection checklist • Final inspection checklist
Reporting	• Project engineer site visit reports • Performance monitoring reports
Quality Records	• Site inspection reports • Change control log – **Chart 8** • Non-conformance report • Project acceptance form/report – **Chart 27**

(Source: Compiled by the Author)

Chart 27

Project Acceptance and Sign Off Form



Project Client Acceptance and Sign-Off Form

<Project Name> Created by *<Author>*

Use this document to get the client's sign-off once the project is completed.

Project Name:	*<Project Name>*
This Document is Issued by:	*<Name>*
Date:	*<MM/DD/YYYY>*

The project outcome has been measured against its acceptance criteria and has been formally accepted on behalf of the client.

Unless otherwise noted, the project may now be closed.

Additional Comments related to the Client's Acceptance:
Key metrics achieved:
Key metrics to be tracked:
Recorded Shortfalls and Key Lessons Learned (list, if any):

<Name> _____ Date: _____
Executive/Sponsor

<Name> _____ Date: _____
Director Project Management Unit

<Name> _____ Date: _____
Project Manager

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4.5.6 Quality Continuous Improvement Plan

The Plan-Do-Check-Act (PDCA) cycle on Chart 28 is an iterative four-step quality management tool used in project management to promote continuous improvement in projects. It provides a systematic approach for planning, testing, reviewing, and refining processes and

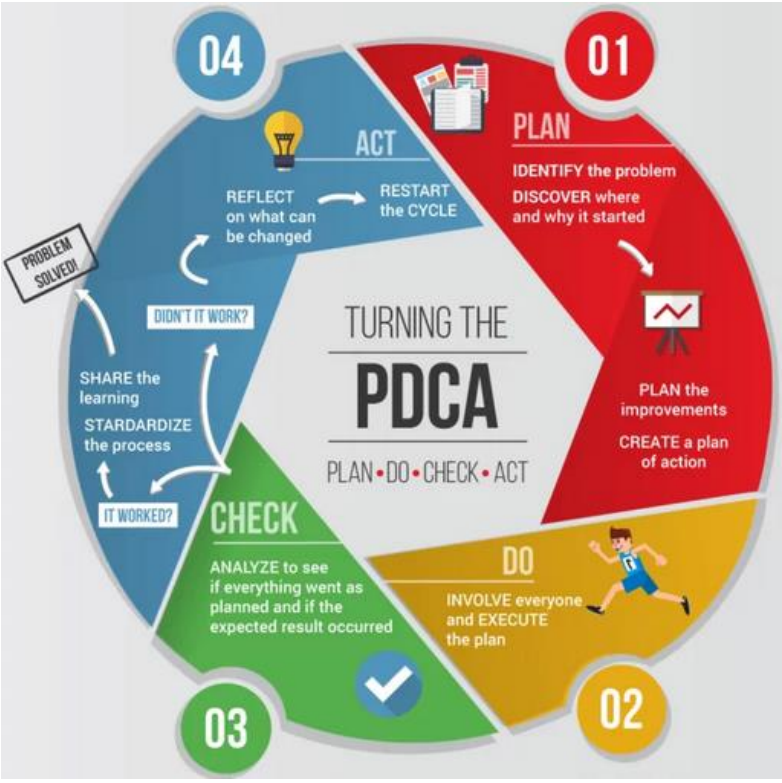
products. The PDCA cycle helps teams enhance various aspects of project delivery, ensuring that projects are executed efficiently, effectively, and are aligned with the client's requirements and objectives. The PDCA cycle is typically applied as follows:

- In the "Plan" phase, the project team identifies a goal or a problem that needs resolution. This involves defining clear project objectives based on stakeholder requirements and developing a project plan with detailed steps and timelines. Allocating resources and assigning roles and responsibilities and establishing metrics for success and methods for gathering data are very important.
- During the 'Do' phase, the team implements the plan on a small scale or in a controlled environment to test its viability. Key actions include:
    - Executing the tasks as per the project plan.
    - Monitoring the process and collecting data for analysis.
    - Keeping detailed documentation of actions and outcomes to facilitate evaluation.
- The "Check" phase involves analyzing the data collected during the 'Do' phase to evaluate whether the project's objectives are being achieved and whether the plan is working as expected. It includes:
    - Comparing the actual outcomes against the expected results.
    - Identifying any deviations, issues, or opportunities for improvement.
    - Engaging with stakeholders to get feedback and to integrate their insights into the assessment.
- Based on the results and insights gained from the 'Check' phase, the 'Act' phase focuses on refining and optimizing the plan. This may involve:
    - Making necessary adjustments to the project plan to address shortcomings.

- Standardizing successful processes for broader application within or across other projects.
- Documenting lessons learned and updating project management practices and standards.

Chart 28

Continuous Improvement Cycle Diagram



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4.5.7 Control Quality

The control quality process is a critical component of the project management lifecycle, focusing on monitoring and recording the results of executing the quality activities to assess performance and to recommend necessary changes. Project deliverables are inspected and measured to meet the quality standards and requirements specified in the project management

plan (see Chart 11 requirement traceability matrix). The primary objectives of the Control Quality process are to:

1. Verify that deliverables meet the quality requirements outlined in the project scope and defined by stakeholders.
2. Identify causes of poor process or product quality and recommend and/or take action to eliminate them.
3. Validate that project outputs are complete and correct.
4. Facilitate the acceptance of project deliverables.

Quality will be monitored and controlled as follows:

Chart 29

Actions to Monitor and Control Quality

Quality Aspect	Actions
Quality Management	Quality assurance is headed by the project manager but is the responsibility of the entire project team. Team members must be trained in the framework of quality assurance as it relates to projects. The metrics on Chart 25 and quality documents on 26 are the tools to apply.
Monitor Quality	The project manager will utilize the metrics on Chart 25 to monitor the measurements and expected results for key quality areas to be monitored throughout the project. Results are shared with team members, and corrective actions are taken to address the issues identified.
Communication Management	The quality management plan must be shared with the project team, wherein the roles and responsibilities must be transparent, regarding monitoring and reporting quality issues. Quality issues identified by the project engineer and project manager should be communicated immediately so that corrective actions may be taken. Quality audits, checklists, and reports should be communicated immediately, whereby issues can be addressed, even outside of routinely scheduled project meetings.
Corrective Action	While the entire project team is responsible for quality assurance, the project manager is responsible for ensuring that corrective measures are taken to address quality issues.

(Source: Compiled by the Author)

Corrective action refers to the steps taken to address issues, deviations, or problems encountered during the execution of a project. When a project encounters challenges such as

delays, budget overruns, quality issues, or scope changes, corrective action is necessary to realign the project with its objectives and ensure its successful completion. Corrective actions typically involve identifying the root cause of the problem, developing and implementing a plan to address it, and monitoring the results to ensure effectiveness. This process helps project managers and teams to maintain control over the project's progress and to mitigate risks that could compromise its success. The process depicted in Chart 30 is carried out as follows:

- Identify the Issue: Recognize and define the problem or deviation from the project plan or objectives.
- Root Cause Analysis: Investigate the underlying causes of the issue to understand why it occurred.
- Develop Action Plan: Create a plan outlining specific actions to address the root causes and mitigate the issue.
- Assign Responsibilities: Assign tasks and responsibilities to team members or stakeholders in implementing the corrective action plan.
- Implement Corrective Measures: Execute the planned actions to address the problem and bring the project back on track.
- Monitor Progress: Track the progress of corrective actions to ensure that they are being implemented effectively and are achieving the desired results.
- Adjust as Necessary: Continuously assess the effectiveness of the corrective actions and make adjustments if needed to address any new issues or challenges that arise.
- Communicate Updates: Keep stakeholders informed about the progress of corrective actions and any project plan or timeline changes.

- Document Lessons Learned: Document the corrective action process and outcomes to capture lessons learned for future projects.

Chart 30

Corrective Action Process

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4.6 Resource Management Plan

The Project Management Institute (PMI) defines a Resource Management Plan as a component of the project management plan that describes how project resources should be categorized, allocated, managed, and released (Project Management Institute, 2017, p. 318). The plan encompasses the processes necessary to efficiently identify, acquire, and utilize physical and team resources. It ensures that the right resources are available at the correct times and are utilized effectively throughout the project, balancing costs, efficiency, and effectiveness in alignment with the project's overall goals. This comprehensive plan includes detailing the types

and quantities of resources required, scheduling their use to prevent conflicts, and outlining strategies for optimizing their use.

4.6.1 Plan Resource Management

The approach to planning resource management is structured to facilitate processes that ensure efficient resource allocation and utilization. These processes defined below include planning, estimating, acquiring and controlling resources, and developing and managing the project team (Project Management Institute, 2017, p. 307).

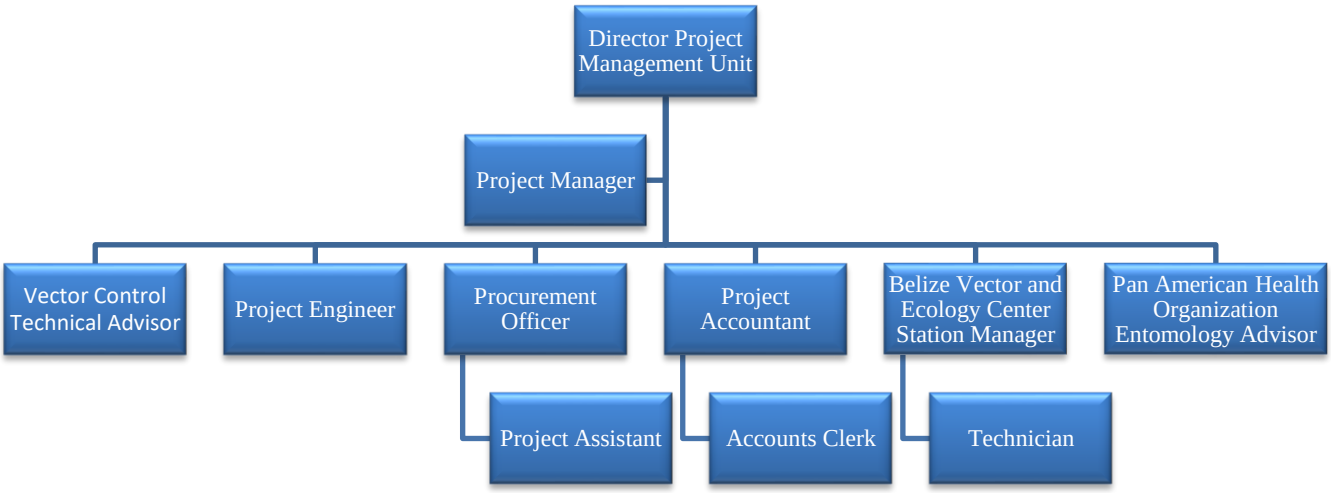
- Plan Resource Management involves defining how to estimate, acquire, manage, and utilize physical and team resources.
- Estimate Activity Resources, where project managers determine the type and quantities of resources required for each activity.
- Acquire Resources, focusing on obtaining the necessary team members, equipment, and materials.
- Develop Team to improve team members' competencies and interactions to enhance project performance.
- Manage Team involves tracking team performance, providing feedback, resolving issues, and managing changes to optimize project outcomes.
- Control Resources, where the focus is on ensuring that resources are allocated and used according to the plan and adjusting as necessary based on performance assessments and issue resolution.

4.6.2 Roles and Responsibilities

The project organizational structure on Chart 31 displays how the project team will be organized and how roles, responsibilities, and communication channels will be established. A clear organizational structure ensures effective decision-making, coordination, and project delivery. A RACI matrix is a tool that clarifies roles and responsibilities within a team or organization. It defines who is responsible for completing tasks, who is accountable for the overall outcome, who needs to be consulted for input, and who needs to be informed about progress. The project manager will assign these roles to specific individuals, as depicted on Chart 32. The following chart outlines the project team's organizational structure for the project.

Chart 31

Project Team Organizational Structure



(Source: Compiled by the Author)

Chart 32

Project Resource Management Roles and Responsibilities

Role	Responsibilities
Director Project Management Unit	• Strategic Resource Planning: Develop resource management strategies to align with organizational goals and project portfolios. • Resource Allocation Oversight: Oversee the allocation of resources across all projects to optimize utilization and avoid conflicts or over-commitment.

Role	Responsibilities
	• Resource Governance: Establish and enforce resource management policies, procedures, and standards to ensure consistent resource handling across projects. • Performance Monitoring: Monitor the efficiency and effectiveness of resource usage across projects, identifying areas for improvement. • Cross-Project Coordination: Facilitate communication and coordination between project managers to share resources effectively and ensure that projects support each other where possible. • Tool and Technology Implementation: Select and implement resource management tools and technologies that enhance visibility and control over resources, such as software and dashboards. • Reporting: Provide comprehensive reports on resource status, utilization, and forecast needs to senior management to aid decision-making.
Vector Control Technical Advisor	• Support the development of technical drawings and plans • Provide technical oversight of the project • Develop a list of items for procurement • Support technical site visits • Develop standard operating procedures for laboratory functions • Lead set up of laboratory
Project Manager	• Resource Planning: Determine the type, amount, and timing of resources required to achieve project objectives. • Resource Allocation: Assign resources to maximize their effectiveness in the project schedule while considering budget constraints. • Resource Optimization: Utilize techniques such as levelling and smoothing to address resource overallocation and to balance the workload. • Team Building: Recruit, hire, and assemble the project team based on skills, experience, and requirements. • Team Development: Facilitate training, provide feedback, and support team members to enhance their skills and performance. • Resource Scheduling: Develop and maintain a schedule that outlines when and how project resources will be utilized. • Monitoring Resource Usage: Track the consumption of resources and ensure that it aligns with the project plan and budget. • Conflict Resolution: Address resource conflicts by prioritizing tasks or obtaining additional resources as necessary. • Performance Reviews: Conduct regular assessments of resource performance against the project plan to ensure efficiency and effectiveness. • Adjusting Resources: Adjust resource allocation based on project progress and changes in project scope or objectives. • Communication: Communicate resource needs, expectations, and changes to project stakeholders and team members. • Compliance and Standards: Ensure that resource management practices comply with organizational policies and industry standards. • Risk Management: Identify and mitigate risks related to resource scarcity and allocation inefficiencies. • Stakeholder Management: Engage with senior stakeholders to communicate resource needs, constraints, and impacts on project delivery.

Role	Responsibilities
Project Engineer	• Develop technical drawings and plans • Conduct site visits to monitor progress • Utilize a monitoring tool (checklist) to evaluate progress and quality • Provide technical report to project manager
Procurement Manager	• Prepare a list of items for procurement based on requirements from the project manager • Evaluate bids • Prepare contracts
Project Assistant	• Provide administrative support to the project team • Prepare tender advertisement in newspaper, social media, Ministry website, Ministry of Finance Procurement Portal • Follow up with vendors
Project Accountant	• Management of project budget • Prepare financial reports for the director PMU and project manager • Monitoring of contract payments • Ensure adherence to government financial regulations and tendering policy
Accounts Clerk	• Prepare purchase orders • Support project accountant and project manager • Payment of invoices
BVEC Manager	• Provide technical support on the requirements of the facility • Provide technical support in the development of standard operating procedure guidelines for laboratory functions • Provide technical support for the installation of equipment
BVEC Technician	• Support set up of laboratory
PAHO Entomology Advisor	• Provide technical support on the requirements of the facility • Provide technical support in the development of standard operating procedure guidelines for laboratory functions

(Source: Compiled by the Author)

Chart 33

Responsibility Assignment Matrix

Project Team Members											
Task Name	Director Project Management Unit	Vector Control Technical Advisor	Project Manager	Project Engineer	Procurement Manager	Project Assistant	Project Accountant	Accounts Clerk	BVEC Manager	BVEC Technician	PAHO Advisor
Architectural Design and Engineering Approval	A	C	A	R	I	I	I	I	C	C	C
Procurement of prefabricated building	I	I	A	R	R	R	R	R	C	C	C
Acquisition of building and utility permits	I	I	A	R	I	I	I	I	I	I	I
Procurement of laboratory equipment and supplies	I	C	A	I	R	R	R	R	C	C	C
Development of standard operating procedures for laboratory	I	R	A	I	R	R	R	R	C	C	C
Installation of utilities (electricity, water, internet)	I	I	A	R	R	I	I	I	I	I	I
Quality Assurance Inspection	A	A	R	R	I	I	I	I	C	C	C
Project Management	A	C	R	R	R	R	R	R	I	I	I

Project Team Members											
Task Name	Director Project Management Unit	Vector Control Technical Advisor	Project Manager	Project Engineer	Procurement Manager	Project Assistant	Project Accountant	Accounts Clerk	BVEC Manager	BVEC Technician	PAHO Advisor
Project Completion (closing)	A	A	R	R	R	R	R	R	I	I	I
R - Responsible A - Accountable C - Consult I - Inform											

(Source: Compiled by the Author)

4.6.3 Acquisition of Team Members

The acquisition of team members within project management is a crucial step that involves identifying, recruiting, and securing the necessary human resources to complete a project successfully. This process starts by defining the required skills, experience, and number of team members based on the project's scope and complexity. Project managers then collaborate with human resources and other departments to find and recruit suitable candidates, which may involve internal staffing adjustments, hiring new employees, or contracting external consultants and specialists. Effective acquisition also includes negotiating roles and responsibilities, ensuring that team members clearly understand their duties and the expectations placed upon them. Throughout this process, it is vital to consider team dynamics and how new members will fit into and contribute to the existing team structure, aiming to create a cohesive and efficient working environment that enhances overall project performance.

The following is the approach of the Ministry of Health and Wellness Project Management Unit (PMU) in acquiring the requisite team members:

- The Project Manager will be sourced from an existing project that is nearing completion, particularly since this is a short-term, basic project.
- The project engineer, procurement manager, project assistant, accounts officer, and accounts clerk will be sourced from the PMU, which serves as a Project Management Office (PMO) within the Ministry’s structure.
- The vector control technical advisor is a post within the Ministry, and the officer will be tasked with providing technical lead for the project.

- The Belize Vector and Ecology Center manager and technician will provide technical support, as there is already a working relationship with the Ministry of Health and Wellness.
- The Pan American Health Organization (PAHO) Entomology Advisor will be sourced through a technical cooperation request to the PAHO country office.

4.6.4 Team Development

Team development is an important aspect that directly impacts project success. Team development encompasses nurturing project team members' skills, knowledge, and capabilities to enhance their performance and contribution to project objectives. The project manager is charged with assessing team members' skills sets and competencies to identify areas for development. This evaluation can be conducted through performance reviews, skills assessments, or feedback sessions to understand individual strengths and areas for improvement. Once areas for development are identified, training and development programs should be implemented to address skills gaps and enhance the capabilities of team members.

The following are vital processes and strategies for team development:

- Team-building activities, such as icebreakers, team lunches, and off-site retreats, are encouraged to build trust, enhance communication, and strengthen relationships among team members.
- Ongoing training and development for team members. Providing opportunities for skill-building, professional development workshops, and specialized training sessions ensures that team members have the necessary knowledge and expertise.
- Developing strong leadership skills, such as communication, conflict resolution, and decision-making, is essential for building a positive team culture.

- Implementing formal recognition programs, such as employee of the month awards or project completion bonuses, helps boost morale, motivation, and team engagement.

4.6.5 Recognition and Rewards

Recognition and rewards are vital in motivating teams and optimizing resource utilization. Effective recognition acknowledges the contributions of team members, fosters a positive work environment, and enables a sense of belonging and purpose within the project. Project managers can incentivize high performance and encourage collaboration by implementing a system of rewards aligned with project goals and individual achievements. Through formal recognition programs, such as employee of the month awards or performance bonuses, or informal gestures like public praise and thank-you notes, recognizing and rewarding contributions reinforces desired behaviors and strengthens team cohesion. This approach not only boosts morale but also enhances productivity. Within the government public service, several options may be applied to project team members, including honorariums, certificates, and social activities to celebrate milestones and achievements outlined on Chart 34.

Chart 34

Reward and Recognition

Reward/Recognition	Type	Description
Public or Internal Acknowledgement	Recognition	Acknowledging team members during meetings through verbal recognition or issuing certificates of achievement. Public recognition through the Ministry of Health's social media and website.
Milestone achievement and successful project completion	Celebratory	Social event in the context of team building and camaraderie to celebrate successful project completion.
Team and Individual Recognition	Financial	Honorarium may be awarded as per public service compendium of allowances 2015, to officers performing extraordinary duties.

(Source: Compiled by the Author)

4.6.6 Control Resources

Controlling resources is a critical process that ensures that project resources, including personnel, equipment, materials, and facilities, are made available and are used effectively and efficiently, monitoring planned versus actual use throughout the project lifecycle (Project Management Institute, 2017, p. 352). The following are the steps involved in controlling resources:

- Performance Measurement: This step involves measuring the actual performance of resources against the planned performance. Key performance indicators (KPIs) may be used to assess resource utilization, productivity, and quality.
- Monitoring Resource Usage: The project managers will continuously monitor resource usage to ensure that it is according to the project plan. This includes tracking resource consumption, identifying deviations from the plan, and investigating the root causes of resource-related issues.
- Implementing Corrective Actions: When deviations from the planned resource usage are identified, corrective actions are implemented to address the issues and bring resource usage back on track. This may involve reallocating resources, adjusting project schedules, or resolving resource constraints.
- Updating the Resource Management Plan: The resource management plan is updated accordingly as resource usage or availability changes occur. This will ensure that the project remains aligned with resource, budgetary, and other constraints.
- Communicating Resource Status: The project manager will communicate regularly with stakeholders to provide updates on resource usage, issues, and corrective actions.

Transparent communication helps to ensure that stakeholders know about resource-related risks and can make informed decisions.

The following processes and tools will be applied to control resources effectively:

- The project manager will use Microsoft Project to manage resources during various phases. Project management software and dashboards such as Monday.com or ProjectManager.com are helpful if access is readily available; however, for a small-scale project, Microsoft Project in combination with Excel templates will suffice.
- Any change requests will be managed using the change control form on Chart 7, with approved changes documented in the change control log on Chart 8.

4.7 Communication Management Plan

The Communications Management process is designed to ensure that the information needs of the project and stakeholders are met effectively and efficiently (Project Management Institute, 2017, p. 359). This process includes three key components: Plan Communications Management, Manage Communications, and Monitor Communications. Plan Communications Management involves developing an appropriate approach and plan for project communications based on stakeholders' information needs, available organizational assets, and the project's constraints. Manage Communications is the execution of the communication activities as planned, ensuring timely and appropriate generation, collection, distribution, storage, retrieval, management, monitoring, and the ultimate disposition of project information. Monitor Communications involves continuously assessing communication activities to ensure that stakeholder information needs are being met, and to promptly identify and rectify any issues.

4.7.1 Plan Communications Management

The Plan Communications Management process involves developing an approach and plan for project communication activities based on the information needs of the stakeholders, available organizational assets, and the project's needs. The process requires identifying stakeholders, determining their communication requirements, and defining the most appropriate and efficient communication methods and technologies. The outcome is a comprehensive communications management plan specifying who needs what information, when it is needed, how it will be communicated, and who will be responsible for delivering it. This plan includes details on the frequency of communications, the type of information to be communicated, the format for disseminating the information, and the escalation processes for resolving any communication issues. The tools and techniques for communication, such as interactive methods, push methods, and pull methods, are defined on Chart 35 below:

Chart 35

Communication Types, Methods, and Artifacts

Communication Type	Communication Methods and Artifacts
Interactive communication	• Project face-to-face meetings • Phone Calls • WhatsApp • Videoconferencing • Working meetings – applying creativity and problem-solving techniques (brainstorming) • Focus Groups
Push communication	• Internal Memorandums • E-mails • Reports – site visit/inspection reports, project updates, financial reports, etc. • Press Release
Pull communication	• Intranet Site – internal Ministry of Health data repositories • Project Management Software -Microsoft Project • Cloud Storage – One Drive & Google Drive

(Source: Compiled by the Author)

A communication matrix on Chart 36 also formulates part of the communication management plan and details the specifics of each communication activity, ensuring clarity and consistency. The communication matrix is a detailed table or chart that outlines the specific communication requirements for a project, defining the critical elements of project communication and ensuring that information is conveyed effectively and efficiently to all stakeholders. The communication matrix typically includes the following components:

- Communication Type: The specific type or form of communication (e.g., status report, meeting, newsletter).
- Objective: The purpose or goal of the communication (e.g., inform, update, request feedback).
- Frequency: How often will communication occur (e.g., daily, weekly, monthly, ad hoc).
- Audience: The recipients of the communication, including specific individuals, groups, or stakeholders (e.g., project team, sponsor, clients).
- Delivery Method: The channel or medium through which the communication will be delivered (e.g., email, meeting, intranet, phone call).
- Owner/Responsibility: The person responsible for preparing and delivering the communication (e.g., project manager, team leader).

Chart 36

Communication Matrix

Communication Type	Objective	Frequency	Audience	Delivery Method	Owner
Project Kick-off Meeting	Introduce the project, objectives, and team. Schedule, risk, communication, and other project management subsidiary plans discussed, including indicators and budgets.	Once	Project Team, Sponsor, Client	In-person/Virtual Meeting	Project Manager
Technical Meeting	Technical planning of requirements for deliverables and working meetings for laboratory procedural manual	Weekly	Project Manager, Vector Control Technical Advisor, BVEC, PAHO	In-person/Virtual Meeting	Project Manager
Steering Committee Meeting	Decision-making and oversight, reviewing risks, making mitigation decisions, providing financial updates and budget performance, and approving changes.	Monthly	Steering Committee	In-person/Virtual Meeting	Project Manager
Vendor and Contractor Meetings	Discuss requirements, specifications, progress updates, etc.	Weekly or as needed	Project Manager Project Engineer	In-person/Virtual Meeting	Project Manager
Weekly Status Report	Update on project progress and issues	Weekly	Project Team, Sponsor	Email	Project Manager
Team Meeting	Discuss tasks, progress, and issues	Weekly	Project Team	In-person/Virtual Meeting	Project Manager
Change Control Meeting	Review and approve change requests	As Needed	Change Control Board	In-person/Virtual Meeting	Project Manager

Communication Type	Objective	Frequency	Audience	Delivery Method	Owner
Budget Report	Update on project budget and expenditures	Monthly	Project Sponsor, Finance Team	Email	Finance Manager Project Manager
Technical Review	Discuss technical issues and solutions	Bi-monthly	Technical Team, Project Team	In-person/Virtual Meeting	Vector Control Technical Advisor
Project Closure Meeting	Review project outcomes and lessons learned	Once	Project Team, Sponsor, Ministry of Health and Wellness Senior Management	In-person	Director of Project Management Unit Project Manager
Knowledge Sharing Session	Share best practices and insights	Quarterly	Entire Organization	Intranet, Recorded Video	Director of Project Management Unit Project Manager

(Source: Compiled by the Author)

4.7.2 Manage Communication

The Manage Communication process involves creating, collecting, distributing, storing, retrieving, and disseminating project information in accordance with the communications management plan. The goal is to ensure that information is communicated effectively and efficiently to all stakeholders as outlined in the communication matrix outlined on Chart 36. The tools and techniques to be applied to the project include:

- **Communication Technology**: Tools and systems used to facilitate communications such as email, video conferencing, and electronic messaging.
- **Communication Methods**: Information will be communicated through interactive meetings and push-and-pull methods, as outlined on Chart 35.
- **Communication Skills:** Application of essential skills for effective communication, including active listening, conflict management, and negotiation.
- **Project Management Information System (PMIS)**: Software and tools that assist in collecting, storing, and distributing project information. Microsoft Project will be utilized for this project.
- **Performance Reporting**: Technical, progress, and financial reports to stakeholders.
- **Interpersonal and Team Skills**: Skills such as conflict management, cultural awareness, and emotional intelligence are critical for effective communication.
- **Meetings**: Formal and informal meetings whereby project information will be communicated and discussed.

4.7.3 Communication Escalation Process

The project escalation process is structured to elevate issues, risks, or decisions to higher authority levels when they cannot be resolved at the current level. Effective escalation processes

ensure that problems are addressed promptly and efficiently, preventing minor issues from becoming significant roadblocks. The process is as follows:

1. Identify the Issue
    - Criteria for Escalation: Define what constitutes an issue that needs escalation (e.g. unresolved conflicts, risks, decisions that require higher authority).
    - Action to take: Document the issue, including relevant details such as the nature of the problem, impacts, attempted solutions, and stakeholders involved.
2. Initial Resolution Attempt
    - Attempt to resolve the issue within the project team through meetings, etc.
    - Leverage existing project resources, tools, and expertise to address the issue.
3. Escalation Trigger
    - Assessment: Determine whether the issue can be resolved at the current level. If not, trigger the escalation process.
    - Notification: Inform relevant stakeholders that the issue is being escalated, providing context and documentation.
4. Escalate to the Next Level
    - Immediate Supervisor: Escalate the issue to the project manager or immediate supervisor.
    - Provide Documentation: Supply all relevant information, including the issue description, impact analysis, attempted resolutions, and recommended actions.
5. Review and Action
    - Management Review: The project manager or next level of authority reviews the issue and decides on the next steps.

- Action to take: Develop and implement an action plan to resolve the issue. This may include reallocating resources, making decisions, or involving other stakeholders.

6. Monitor and Communicate
    - Progress Updates: Regularly update relevant stakeholders on the progress of the issue resolution.
    - Feedback: Ensure that there is a mechanism for feedback and further communication if the issue remains unresolved.
7. Escalation to Higher Authority
    - Higher Authority: If the issue remains unresolved, escalate it to a higher level of management or governance body (e.g., steering committee, project sponsor).
    - Critical Issues: For critical issues impacting the project's strategic goals or significant milestones, promptly escalate directly to the highest authority.
8. Resolution and Documentation
    - Resolution: Once resolved, document the solution and the steps to address the issue.
    - Lessons Learned: Record any lessons from the escalation process to improve future issue management and prevent recurrence.
9. Communication of Resolution
    - Inform Stakeholders: Communicate the resolution to all relevant stakeholders, ensuring transparency and clarity.
    - Update Records: Update project documentation, including risk registers, issue logs, and the communication management plan as necessary.

A communication escalation matrix, as outlined on Chart 36, is a structured tool that outlines the specific steps, roles, and responsibilities for escalating issues within a project. It helps ensure that issues are addressed promptly and by the appropriate levels of authority.

Chart 37

Escalation Matrix

Issue Type	Criteria	Initial Action	Escalation Point	Escalation Actions	Escalation Timeframe
Minor Issues	Low impact, quickly resolved	Address internally within the project team	Project Manager	Discuss in team meetings, document issues and resolution	24-48 hours
Moderate Issues	Moderate impact requires managerial input	Attempt resolution within the team, document actions taken	Project Manager	Hold meetings with relevant stakeholders, allocate additional resources if needed	48-72 hours
Major Issues	High impact, potential to delay project milestones	Document issue, impact analysis, attempt resolution	Director Project Management Unit	Convene a problem-solving session, re-evaluate project plan	72 hours - 1 week
Critical Issues	Severe impact jeopardizes project success	Immediate documentation, notify the project manager	Project Sponsor Director Project Management Unit Steering Committee	Initiate emergency meetings, formulate and implement a recovery plan, consider project re-baseline	Within 24 hours

(Source: Compiled by the Author)

Components of the Communication Escalation Matrix are defined as follows:

- Issue Type: Categorizes issues (e.g., minor, moderate, major, critical).
- Criteria: Defines the impact and nature of issues that fall under each category.
- Initial Action: Describes the first steps to be taken when an issue is identified.
- Escalation Point: Specifies the role or person to whom the issue should be escalated.

- Escalation Actions: Outlines the actions that must be taken once the issue is escalated.
- Escalation Timeframe: Provides a timeframe for the issue to be escalated and addressed.

4.7.4 Monitor Communications

Monitor Communications process involves ensuring that the information needs of the project stakeholders are met. The process ensures that the correct information is provided to the right people at the right time and helps identify any gaps or issues in the communication process. The project manager oversees this process through the guidance of the communications management plan, reviewing project communication types, methods, and artifacts outlined on Chart 35. Focus is placed on any communication issues logged for additional requirements, whereby the project manager takes the lead on improving the process. Any changes or modifications must be reflected in the communications matrix on Chart 36.

4.8 Risk Management Plan

4.8.1 Risk Management

Risk management planning identifies, analyzes, and prepares for potential risks that could impact a project. It involves assessing potential threats and opportunities, determining their likelihood and impact, and developing strategies to mitigate adverse effects or capitalize on positive ones (Project Management Institute, 2017, p. 395). Risk management planning aims to minimize uncertainties and ensure that risks are managed proactively, allowing for more informed decisions. The output of this process is the risk management plan, which outlines the processes, tools, roles, and responsibilities for managing risks throughout the project.

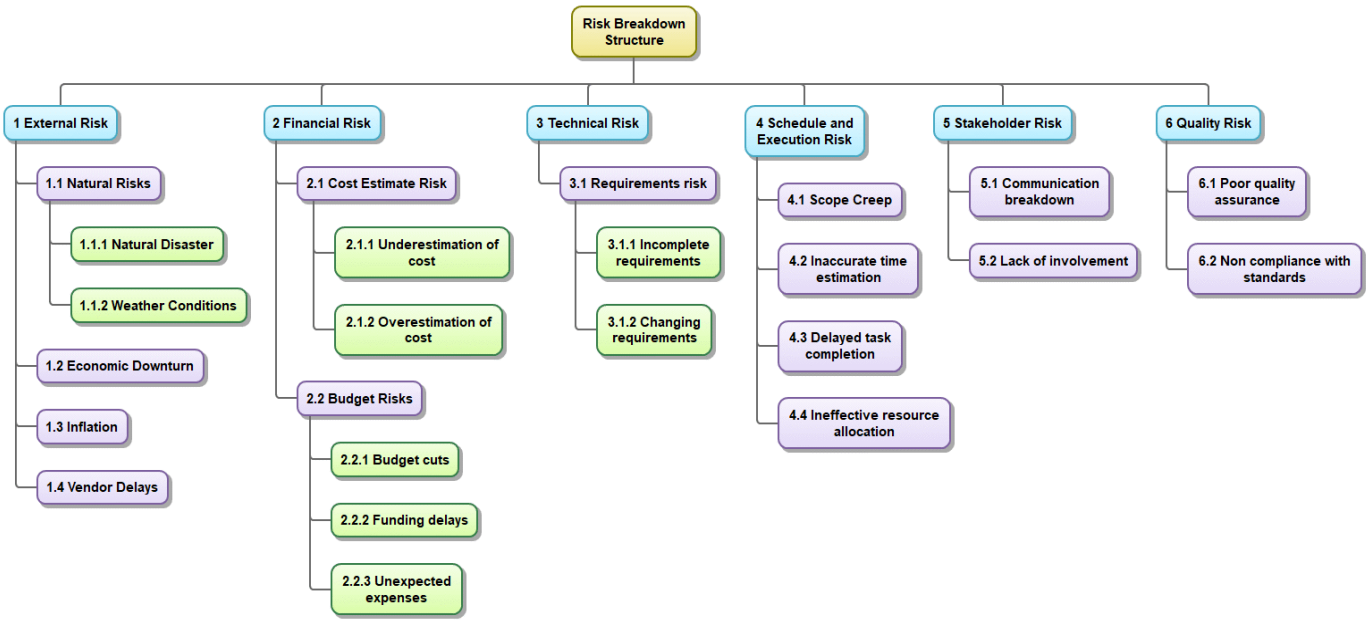
4.8.2 Identify Risks

The Risk Management Plan involves a process of risk identification through methods such as brainstorming, expert consultations, and SWOT analysis, followed by qualitative and quantitative risk analysis to prioritize and evaluate the severity of identified risks. Response strategies are then developed to avoid, mitigate, transfer, or accept risks, with detailed action and contingency plans for high-impact risks. Regular monitoring and control mechanisms, including risk reviews and risk register updates, ensure ongoing risk management. Communication with stakeholders through meetings and reports, along with training programs and awareness campaigns for the project team, are critical components that may be included in the plan. Continuous review and improvement processes are implemented to keep the risk management practices practical and up to date.

A Risk Breakdown Structure (RBS) is developed to aid in identifying risks. This hierarchical framework is used to categorize and organize project risks systematically. It breaks down risks into various levels, starting from high-level categories and progressively deconstructing them into more specific risks. This process helps to thoroughly identify and assess risks, ensuring that no potential risk is overlooked. Chart 37 outlines the risk breakdown structure for the public health entomology laboratory.

Chart 38

Risk Breakdown Structure



(Source: Compiled by: the Author)

4.8.3 Perform Risk Analysis

Probability and Impact Matrix

A Probability and Impact Matrix is a project management tool that prioritizes risks based on their likelihood of occurring (probability) and the severity of their consequences (impact). This matrix helps project managers to focus on the most significant risks that could affect the project's success. Risks are assessed and assigned scores for probability and impact, typically ranging from very low to very high. These scores are then multiplied to generate a risk rating, which is plotted on the matrix. For this project, risks will be calculated into three priority levels - high, medium, or low. High-priority risks require immediate and proactive management, medium-priority risks need regular monitoring and contingency planning, and low-priority risks are acknowledged but do not require intensive management.

Chart 39

Probability and Impact Matrix

		Threats					Opportunities				
Probability	0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05
	0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
	0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
	0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
	0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
		0.05	0.10	0.20	0.40	0.80	0.80	0.40	0.20	0.10	0.05
		Impact									

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Probability and Impact Matrix Legend:

High	Risks that can significantly impact the project
Medium	The risk that can moderately impact the project
Low	The risk that can minimally impact the project

Interpretation and Management of Risks

- Red Zone (High Priority): Immediate action is required to mitigate or avoid these risks. They have a high probability and/or high impact and can severely affect the project if not managed properly.
    - Develop and implement immediate risk response plans.
    - Assign dedicated risk owners to manage and monitor these risks closely.
    - Regularly report the status of these risks to senior management and stakeholders.
- Yellow: Regular monitoring and contingency planning are needed. These risks are significant but not as critical as those in the red zone.
    - Develop contingency plans and monitor these risks regularly.

- Assign risk owners to keep track of these risks and update the project manager on any changes.

- Green Zone (Low Priority): These risks are low impact and low probability. They should be acknowledged and monitored but do not require intensive management.
  - Monitor these risks periodically to ensure they remain low.
  - Keep these risks in the risk register for documentation and awareness.

A Probability and Impact Scale is applied to assess and prioritize risks based on their likelihood of occurrence (probability) and the severity of their consequences (impact). Probability is rated from very low to very high, indicating the chance of a risk happening. The impact is similarly rated, reflecting the potential effect on the project if the risk occurs. This dual assessment allows for creating a Probability and Impact Matrix on Chart 41 and will guide the project manager in focusing efforts on the most critical risks. The definitions for probability and impact are defined below on Chart 40.

Chart 40

Probability and Impact Definitions

Probability		Impact Score	Time	Cost	Quality and Schedule
Very High	> 70%	0.80	> 1 month	> $10,000	Very high impact on overall Budget and Schedule
High	51-70%	0.40	1 month	$5,000 - $10,000	Significant impact on overall Budget and Schedule
Medium	31-50%	0.20	2 – 3 weeks	$2,000 - $5,000	Some impact on overall Budget and Schedule
Low	10-30%	0.10	1 – 2 weeks	$1,000 - $2,000	Minor impact on overall Budget and Schedule
Very Low	< 10%	0.05	1 week	< $1,000	Insignificant impact on Budget and Schedule

(Source: Compiled by the Author)

Chart 41

Risk Register

Code	Risk Description	RBS	Cause	Probability	Impact	Risk Score	Response	Owner
R1	Natural Disaster	1.11	Climate Impact	0.5	0.9	0.45	Develop a disaster preparedness response plan	Director Project Management Unit
R2	Weather Conditions	1.1.2	Inclement Weather	0.5	0.5	0.25	Establish contingency plans for weather delays	Project Manager
R3	Economic Downturn	1.2	Economic Recession may affect funding	0.2	0.8	0.16	Identify alternate sources for funding and cost-reduction methods	Project Sponsor, Director, Project Management Unit
R4	Inflation	1.3	Increase in budget	0.3	0.8	0.24	Identify alternative vendors and cost-reduction methods	Project Manager, Procurement Manager, Project Accountant
R5	Vendor Delays	1.4	The project schedule and completion date were compromised	0.4	0.5	0.20	Communicate to stakeholders and adjust the schedule	Project Manager, Procurement Manager

Code	Risk Description	RBS	Cause	Probability	Impact	Risk Score	Response	Owner
R6	Underestimation of cost	2.1.1	Budget overrun	0.5	0.6	0.3	Establish a contingency fund	Project Manager, Procurement Manager, Project Sponsor
R7	Overestimation of cost	2.1.2	Wasted resources and missed opportunities to invest in other areas of the project	0.1	0.1	0.01	Regularly monitor political and regulatory environments.	Project Manager, Project Team
R8	Budget cuts	2.2.1	Impact on project scope and acquisitions	0.1	0.7	0.07	Identify alternative vendors and cost-reduction methods	Project sponsor
R9	Funding delays	2.2.2	Delayed implementation	0.1	0.4	0.04	Maintain communication with the project sponsor and identify alternate sponsor	Project sponsor
R10	Unexpected expenses	2.2.3	Budget overrun	0.3	0.3	0.09	Establish a contingency fund	Project Manager, Project Sponsor
R11	Incomplete requirements	3.1.1	Impact on project scope	0.1	0.9	0.09	Clarify scope and objectives and document changes	Project Team

Code	Risk Description	RBS	Cause	Probability	Impact	Risk Score	Response	Owner
R12	Changing requirements	3.1.2	Scope creep	0.1	0.5	0.05	Clarify scope and objectives and document changes	Project Team
R13	Scope Creep	4.1	Schedule delays and negative budget impact	0.2	0.5	0.10	Ensure clear communication with stakeholders and management of the change control process	Project Manager
R14	Inaccurate time estimation	4.2	Schedule delays and resource availability impacted	0.2	0.5	0.10	Communicate to stakeholders and adjust the schedule	Project Team
R15	Delayed task completion	4.3	Schedule delays and resource availability	0.1	0.6	0.06	Communicate to stakeholders and adjust the schedule	Project Manager
R16	Ineffective resource allocation	4.4	Schedule delays and resource availability	0.1	0.7	0.07	Communicate to stakeholders	Project Manager
R17	Communication breakdown	5.1	Schedule delays and resource availability	0.1	0.5	0.06	Review and adjust the communication plan	Project Team
R18	Lack of involvement	5.2	The negative impact of implementation and quality	0.1	0.7	0.07	Review and adjust the communication plan	Project Manager
R19	Poor quality assurance	6.1	Delays, defects, resource wastage	0.1	0.7	0.07	Review quality management plan for improvement	Project Manager, Project Team

Code	Risk Description	RBS	Cause	Probability	Impact	Risk Score	Response	Owner
R20	Non-compliance with standards	6.2	Delays, defects, resource wastage	0.1	0.8	0.08	Communicate requirements to vendors and stakeholders	Project Manager, Project Team

(Source: Compiled by the Author)

4.8.4 Risk Response

Risk response refers to the strategies and actions taken to address identified risks and mitigate their potential impact on project objectives. Once risks are identified and analyzed, project managers and stakeholders must determine the most appropriate responses to manage them effectively. There are several common risk response strategies:

1. **Avoidance**: Change project plans to eliminate the risk or protect project objectives.
2. **Mitigation**: Reduce the probability or impact of the risk.
3. **Transfer**: Shift the impact of the risk to a third party.
4. **Acceptance**: Acknowledge the risk and decide to deal with it if it occurs.

Chart 42

Risk Response Strategies

Risk	Response Strategy	Actions
Delays in vendor delivery	Mitigation	Add penalty clauses in contracts, identify backup vendors.
Key team member leaves the project.	Transfer	Take out project insurance, cross-train team members.
Changes in regulatory requirements	Avoidance	Stay updated with regulations and include compliance checks in the project plan.
Budget overrun	Acceptance	Establish a contingency reserve and monitor expenses closely.

(Source: Compiled by the Author)

Chart 43

Risk Management Roles and Responsibilities

Role	Responsibility
Project Manager	Lead the risk management process and ensure adherence to the plan.
Project Team	Identify and report potential risks and contribute to risk analysis.
Risk Manager	Facilitate risk identification and analysis sessions and maintain the risk register.
Stakeholders	Provide input on risk identification and impact and review risk reports.

(Source: Compiled by the Author)

4.8.5 Risk Monitoring and Control

The project manager is tasked with risk monitoring and control, which will require continuous tracking of identified risks, identifying new risks, and evaluating the effectiveness of risk responses throughout the project. This process will ensure that risk mitigation strategies are effectively implemented and that the project remains aligned with its objectives despite potential threats. Key activities include regularly reviewing and updating the risk register, conducting risk audits, and holding periodic risk review meetings with the project team and stakeholders. Effective risk monitoring and control require proactive communication, using risk indicators and thresholds to detect changes in risk status and the readiness to implement contingency plans when necessary.

Activities:

- Regular Risk Reviews: Conduct risk review meetings at least once a month.
- Risk Audits: Periodically audit the risk management process and adjust as necessary.
- Risk Reassessment: Reassess risks regularly to identify new risks and reassess current risks.
- Risk Reporting: Update stakeholders on the status of identified risks and the effectiveness of risk responses.

Documentation:

- Updated Risk Register: Regularly update the risk register with new risks, status changes, and results of risk response actions.
- Risk Reports: Generate risk reports summarizing the status and effectiveness of risk management activities.

4.9 Procurement Management Plan

Procurement management involves acquiring goods, services or works from external sources to meet project objectives (Project Management Institute, 2017, p. 459). This process is divided into three main phases: Plan Procurement Management, Conduct Procurements, and Control Procurements. The processes encompass planning, executing, and controlling procurement activities to ensure the timely and cost-effective delivery of required resources. This includes defining procurement needs, selecting appropriate procurement methods, evaluating and selecting vendors, and managing contracts. Procurement management for the project to establish a public health entomology lab will be managed by the procurement manager within the project management unit of the Ministry of Health and Wellness, with the support of the project manager. The focus will be to ensure that all procurements align with the project's scope, budget, and schedule while complying with the Government of Belize's financial regulations.

4.9.1 Plan Procurement Management

The Plan Procurement Management process involves identifying which project needs can best be fulfilled by procuring products, services, or results from external sources. This phase includes defining the procurement approach, preparing procurement documents, and developing a comprehensive procurement management plan. Key activities include determining what to procure, how to procure it, how much is needed, and when. It also involves selecting appropriate contract types and establishing criteria for evaluating vendor proposals.

This process involves a series of systematic steps to develop a procurement strategy and plan tailored to meet the project's requirements.

- Firstly, it requires identifying what needs to be procured externally, based on project scope and requirements. This involves a thorough analysis to determine which components can be best obtained from outside vendors.
- Determine the most suitable procurement methods and contract types for each requirement. This decision-making process considers factors such as complexity, risk, and urgency.
- Develop procurement documents such as requests for proposals (RFPs) or requests for quotations (RFQs). These documents outline the project requirements and solicitation terms for potential vendors.
- Establish criteria for vendor selection and evaluation. This will ensure that vendors are assessed based on relevant factors such as cost, quality, capability, and past performance.
- Define roles and responsibilities for procurement activities within the project team (see Chart 44). Clear delineation of responsibilities ensures accountability and effective coordination throughout the procurement process.

The Ministry of Health and Wellness project management unit has a procurement manager, procurement officer, project accountant, and project manager who will all be tasked with managing procurement. The expertise and experience within the unit will add value to the planning process, especially through previous relationships with vendors and by having in place requisite project artifacts, policies, and procedures that support the procurement process. Documents such as the scope, resource, and quality management plan factor into the procurement management plan. All procurement processes must follow the legal requirements of the donor, as well as the Government of Belize financial regulations and any other procurement and contract requirements from the Ministry of Finance or the office of the Contractor General.

Expert judgment, data analysis gathering through market research, source selection analysis, and meetings are tools and techniques that will be applied to this project.

Chart 44

Procurement Roles and Responsibilities

Role	Responsibilities
Project Manager	• Overall accountability for procurement activities within the project. • Developing and overseeing the implementation of the Procurement Management Plan. • Ensuring that procurement activities are aligned with project objectives, budget, and schedule. • Monitoring procurement performance and addressing any issues or risks that may arise.
Procurement Manager	• Managing the day-to-day procurement activities and processes. • Developing procurement strategies and policies in alignment with organizational goals. • Identifying potential suppliers, soliciting bids, and negotiating contracts. • Ensuring compliance with procurement regulations and ethical standards. • Manage relationships with vendors and resolve any disputes or issues.
Project Accountant	• Budgeting and cost control • Financial Analysis and reporting • Vendor payments and invoice processing • Financial compliance • Audit support • Contract management • Risk management and mitigation

(Source: Compiled by the Author)

4.9.2 Conduct Procurements

The process of conducting procurements involves obtaining seller responses, selecting a seller, and awarding a contract (Project Management Institute, 2017, p. 482). This process includes developing or utilizing approved documents such as requests for proposals (RFQs) or quotations (RFQs). These documents outline the project requirements and solicitation terms for potential vendors. The process encompasses issuing procurement documents, receiving bids or proposals, and applying selection criteria to choose the most suitable seller. Key activities

include conducting bidder conferences, evaluating proposals, and negotiating contract terms. The outcome of this process is the selection of a seller and the formalization of agreements to procure the necessary goods or services to meet project objectives.

4.9.3 Procurement Process

The procurement process is led by the procurement manager with the support of the project assistant, project accountant, and accounts clerk. The process outlined in Chart 45 entails the following:

- Preparation of procurement documentation by project and procurement managers:
    - Ensure all procurement documents are complete and approved.
- Solicit seller responses through newspaper and social media advertisements, including the Government of Belize Ministry of Finance Procurement Portal:
    - Advertise procurement opportunities.
    - Engage with bidders to clarify requirements and answer questions.
- Receive bid submissions:
    - Collect and securely store proposals from prospective sellers.
- Evaluation of proposals by committee:
    - Review and evaluate proposals using predefined criteria.
    - Compare proposals against independent estimates and project requirements.
    - Use approved evaluation templates to compare and score, as depicted in Chart 45.
    - Select the seller(s) who best meet the project needs based on evaluation criteria.
    - Engage in negotiations to finalize terms and conditions.
- Award contracts:
    - Prepare and sign contracts with selected sellers.

    - Ensure all contractual obligations and expectations are clearly defined.
- Communicate decisions:
    - Inform all stakeholders of the procurement decisions.
    - Notify unsuccessful bidders and provide feedback if necessary.
- Update project documents:
    - Update all relevant project documents and plans to reflect procurement decisions and agreements.
- Monitor and manage contracts:
    - Continuously monitor seller performance and manage the contract to ensure compliance with terms and conditions.

The following are principles upon which the procurement process is founded:

- Ensure fairness, transparency, and adherence to ethical standards throughout the procurement process.
- Identify and mitigate risks associated with procurement.
- Engage stakeholders to ensure their needs and expectations are met.
- Always adhere to organizational policies, legal requirements, and industry standards.

Chart 45

Bid Evaluation Template

MINISTRY OF HEALTH AND WELLNESS
EVALUATION OF QUOTATIONS

Supply of: _____

Project: _____

SPECIFICATIONS
The listing below summarizes the items and specifications for the items in this evaluation.

Item	Specifications
•	•
•	•
•	•

PRICE EVALUATION

No.	Supplier / Description of Goods	Vendor 1	Vendor 2	Vendor 3
1				
2				
3				
	Total			
	Comments (conform to specifications)			

EVALUATION COMMITTEE RECOMMENDATION

ITEM	LOWEST EVALUATED BIDDER	LOWEST EVALUATED PRICE
Total		

RECOMMENDED AWARD

ITEM	QUANTITY	AWARD PRICE	AWARD FIRM
Total			

SIGNATURES:

Procurement Manager Project Management Unit Ministry of Health and Wellness	Project Manager Project Management Unit Ministry of Health and Wellness	Chief Executive Officer Ministry of Health and Wellness

(Source: Compiled by the Author)

Chart 46

Procurement process flowchart

(Source: Compiled by the Author)

4.9.4 Vendor Selection Criteria

Selecting the right vendor is essential for ensuring the successful execution of procurement activities. The selection criteria help evaluate and compare potential vendors to determine which one best meets the project's needs; the vendor selection criteria are as follows:

- Cost
    - Evaluate the total cost of the vendor's proposal, including any additional fees.
    - Assess the flexibility and attractiveness of the payment terms offered, ensuring the vendor is aware of the Government of Belize payment policies, which include payments to bank accounts and up to 30-day waiting period for payment from the date of receipt of invoice.
- Quality
    - Assess the quality of the products or services offered by the vendor.
    - Check for relevant quality certifications if applicable (e.g., ISO standards or local standards from a competent authority).
- Delivery
    - Consider the time the vendor will take to deliver the goods or services.
    - Evaluate the vendor's history of on-time delivery.
- Experience and Reputation
    - Assess the vendor's experience in the industry or with similar projects such as this one.
    - Check references, reviews, and ratings from previous clients for concerns or doubts.
- Technical Capability
    - Assess whether the vendor has the resources and capacity to meet the project's demands.
- Financial Stability
    - Evaluate the financial risks associated with the vendor.

- Compliance and Regulatory
    - Ensure that the vendor complies with relevant laws and regulations.
    - Assess the vendor’s adherence to ethical standards and practices.
- Support and Service
    - Evaluate the availability and quality of the vendor’s customer support services.
    - Consider the vendor’s ability to provide maintenance, support, and warranty services.
- Location
    - Consider the geographical location of the vendor and its impact on logistics and communication.
- Other Considerations
    - Assess how well the vendor’s values, culture, and work ethics align with your organization.
    - Evaluate the ease of communication and collaboration with the vendor.

4.9.5 Control Procurements

The Control Procurements process ensures that procurement activities are conducted efficiently and effectively, according to the agreed terms and conditions. This process involves managing procurement, monitoring contract performance, making necessary changes and corrections, and ensuring all procurement activities align with the project's requirements. The process encompasses a range of activities designed to ensure that both the buyer and the seller fulfil their contractual obligations. The following are critical aspects of the process:

- A key aspect of controlling procurements is implementing a contract change control system. This system helps to manage changes to the contracts, ensuring that any modifications are documented, tracked, and approved. Changes may arise due to various factors, such as scope adjustments, schedule changes, or unforeseen issues that require contract amendments. The contract change control system ensures that all changes are handled systematically, minimizing disputes and maintaining control over the procurement process.
- Conducting procurement performance reviews will assess the seller's performance against the contract terms, including delivery times, quality of goods or services, and compliance with specifications. Performance reviews help identify any deviations from the contract and provide an opportunity to address issues proactively.
- Inspections and audits are evaluations to verify that the vendor's work meets the contractual requirements and standards. Inspections can include physical examinations such as those carried out by the project engineer during site inspections. These site visits by the project engineer and project manager ensure that the deliverables are of the required quality and that the project remains on track.
- Performance reporting through regular performance reports provides stakeholders with up-to-date information on the status of procurement activities; highlighting any issues or risks is essential. These reports typically include data on the progress of deliveries, adherence to the schedule, financial expenditures, and overall vendor performance. This process demonstrates transparency and maintains trust in the procurement process.
- Closing procurements is a critical final step that involves verifying that all work is completed satisfactorily, all deliverables are accepted, and all financial transactions are

finalized. Properly closing procurements ensures that all contractual obligations have been met, and there are no outstanding issues. It also includes documenting lessons learned and updating organizational process assets, contributing to continuous improvement in future procurement activities.

4.10 Stakeholder Management Plan

Project stakeholder management involves identifying all people or organizations affected by the project, analyzing their expectations and impact, and developing appropriate strategies for effectively engaging stakeholders in project decisions and execution (Project Management Institute, 2017, p. 503). The key processes include identifying stakeholders, planning stakeholder engagement, managing stakeholder engagement, and monitoring stakeholder engagement. This ensures that stakeholders' needs and expectations are understood and managed, enabling positive relationships and enhancing project success.

The product of this process is the stakeholder management plan, which outlines strategies and actions for effectively engaging stakeholders. The plan details how stakeholders will be identified, analyzed, and engaged. It provides a structured approach for managing stakeholder expectations and communications, ensuring that stakeholder needs are addressed and that their influence on the project is appropriately managed.

4.10.1 Identify Stakeholders

The process of identifying stakeholders is a vital knowledge area that involves identifying all individuals, groups, or organizations that could affect or be affected by the project and documenting relevant information regarding their interests, involvement, influence, and potential impact on project success. It is the first step in developing the stakeholder management plan. It uses tools and techniques such as stakeholder analysis, data gathering through surveys and

interviews, and data representation such as stakeholder maps. The primary output is the stakeholder register, as outlined on Chart 47.

4.10.2 Stakeholder Register

A stakeholder register is a critical document required to identify and record all stakeholders involved in a project. Detailed information about each stakeholder, including their interests, influence, impact, and engagement requirements, is required as outlined on Chart 47. This register should also include stakeholders' names, roles, contact information, and their levels of power and interest in the project. The project manager will use this matrix to plan and execute effective stakeholder management strategies to ensure that stakeholders' needs and expectations are met.

Understanding the power scale of stakeholders is crucial for effective stakeholder management. The power scale helps categorize stakeholders based on their ability to influence project outcomes. This categorization is often visualized, using tools like the Power/Interest Grid, which plots stakeholders according to their power level and interest in the project. The following is a detail of the stakeholder power scale:

Low Power

- Stakeholders with limited influence over the project’s decisions and outcomes.
- Typically includes team members, end-users, and lower-level staff.
- These stakeholders may have valuable insights but do not have significant decision-making authority.

Medium Power

- Stakeholders with a moderate level of influence.
- Includes middle management, departmental heads, and key functional managers.

- They can influence specific aspects of the project and have a say in certain decisions but are not the final decision-makers.

High Power

- Stakeholders with significant influence and decision-making authority.
- Includes project sponsors, senior executives, regulatory bodies, and major financiers.
- These stakeholders can impact the project's direction, funding, and significant milestones.

Chart 47

Stakeholder Register

ID	Stakeholder	Functional Area	Role/Responsibilities	Expectations	Requirements	Power/Interest (high/medium/low)
1	Project Sponsor - Ministry of Health and Wellness	Sponsorship	Provide strategic and financial support	ROI expected and project completion	Detailed reports, financial audits, periodic updates	high/high
2	Project Manager	Project Management	Project oversight and management	Successful project delivery within scope, schedule, and budget constraints and adherence to project management standards	Daily oversight, direct communication with all teams	medium/high
3	Project Steering Committee	Project Oversight	Provide oversight, monitor implementation and technical support	Project alignment with organizational goals and strategic direction.	Detailed reports, financial audits, periodic updates	high/high
4	Project Team: • Vector control technical advisor • Director of Project • Project Manager • Project Engineer • Management Unit • Belize Vector and Ecology Center (representative) • PAHO Advisor	Subject Matter Experts	Provide technical support	Successful project execution, meeting technical/resource requirements, and supporting the project	Precise specifications, regular procurement updates, and status reports	high/high
5	Academia	Research and Collaboration	Research opportunities, collaboration	Partnership agreements, joint research projects	Sensitize on opportunities and remain engaged in development	low/medium

ID	Stakeholder	Functional Area	Role/Responsibilities	Expectations	Requirements	Power/Interest (high/medium/low)
6	Vector Control Program Technicians	Laboratory Users	Users of the lab to carry out vector surveillance, etc.	Operational research and vector surveillance strengthened	Provide training to enable staff to take ownership	high/high
7	Pan American Health Organization (PAHO)	International Public Health Organization – Technical Support	Provide technical support	Technical support was provided in listing requirements for the lab and the development of guidelines for the operation	Provide regular updates on implementation	low/high
8	Belize Vector and Ecology Center (BVEC)	Local Research Institution - Technical Support	Provision of technical support and assistance with setup	Minimize disruptions and provide a positive local impact	Joint initiatives and regular updates.	low/high
9	Vendors (suppliers)	Goods and services provider	Provision of goods and services	Compliance with terms of contracts.	Remain engaged through the procurement process, being clear on requirements, terms, policies, etc.	medium/low
10	Local Building Authority	Regulatory	Enforce regulations, safety standards	Regulatory compliance and service quality oversight	Compliance with regulations and standards	medium/low
11	Utility Companies	Service Provider	Provision of water, electricity, and internet	Water, electricity, and internet installed.	Compliance with regulations and standards	medium/low

(Source: Compiled by the Author)

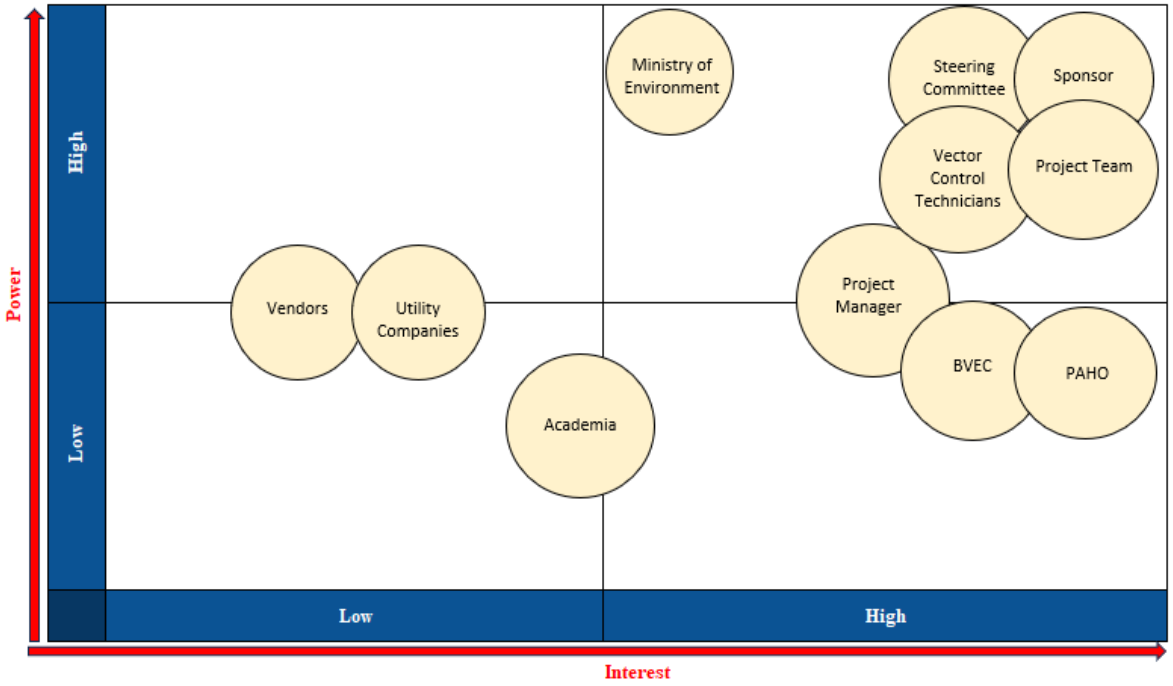
4.10.3 Stakeholder Power/Interest Grid

The Power/Interest Grid is a visual tool used to categorize project stakeholders based on their power level and interest in the project. The grid helps project managers understand which stakeholders need to be engaged more closely and which stakeholders require less attention. The grid provides a way to systematically assess and plan for stakeholder interactions to ensure that the project manager can efficiently allocate resources and communication efforts. The process is guided by the stakeholder register, with the output being a grid divided into four quadrants, each representing a different combination of power and interest. The strategy is as follows:

- High Power/High Interest Stakeholders: Manage Closely
- High Power/Low Interest Stakeholders: Keep Satisfied
- Low Power/High Interest Stakeholders: Keep Informed
- Low Power/Low Interest Stakeholders: Monitor

Chart 48

Stakeholder Power/Interest Grid



(Source: Compiled by the Author)

4.10.4 Plan Stakeholder Engagement

The plan stakeholder engagement process is critical in the development of the stakeholder management plan. This process involves developing strategies to engage stakeholders throughout the project to ensure that stakeholders are adequately involved in project decisions and activities and that their needs and expectations are met or managed. This process aims to create and maintain positive stakeholder relationships through appropriate engagement strategies and communication plans. The various tools and techniques applied in this process are as follows:

Inputs

- Project Charter - provides high-level information about the project and its key stakeholders.
- Communication management plan and other relevant subsidiary plans.
- Project Documents - contains the stakeholder register, assumption log, and risk register.
- Agreements - contracts and agreements that outline stakeholder responsibilities and expectations.
- Enterprise Environmental Factors: organizational culture, political climate, and market conditions that could influence stakeholder engagement.
- Organizational Process Assets: historical data, lessons learned, and templates from previous projects.

Tools and Techniques

- Expert Judgment - consulting with individuals or groups with specialized knowledge in the subject area.
- Data Gathering - focus groups to collect stakeholder information.
- Data Analysis - stakeholder analysis and assumptions and constraints analysis.

- Decision-Making - prioritization/ranking to determine engagement strategies.
- Meetings - discussions with key team members and stakeholders to plan engagement activities.

4.10.5 Stakeholder Engagement Assessment Matrix

The stakeholder engagement assessment matrix is a valuable tool used to assess and analyze the current and desired levels of stakeholder engagement. This matrix helps project managers identify gaps in stakeholder engagement and develop strategies to move stakeholders from their current level to the desired level of engagement. The matrix is derived from the stakeholder power interest grid on Chart 49, evaluating current (C) and desired (D) engagement levels. Stakeholders can be categorized into various levels of engagement, typically including:

- Unaware - stakeholders are unaware of the project and its potential impacts.
- Resistant - stakeholders are aware of the project but are resistant to change or to the project's impacts.
- Neutral - stakeholders are aware of the project but neither support nor oppose it.
- Supportive - stakeholders know the project and support its goals and outcomes.
- Leading - stakeholders are actively engaged in ensuring the project's success and are leading efforts to achieve project objectives.

Chart 49

Stakeholder Engagement Assessment Matrix

ID	Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
1	Project Sponsor - Ministry of Health and Wellness					C, D
2	Project Manager					C, D
3	Project Steering Committee					C, D

ID	Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
4	Project Team: • Vector control technical advisor • Director of Project • Project Manager • Project Engineer • Management Unit • Belize Vector and Ecology Center (representative) • PAHO Advisor					C, D
5	Academia					C, D
6	Vector Control Program Technicians			C	D	
7	Pan American Health Organization (PAHO)					C, D
8	Belize Vector and Ecology Center (BVEC)				C	D
9	Vendors (suppliers)	C			D	
10	Local Building Authority				C, D	
11	Utility Companies	C			D	
C: Current Engagement Level D: Desired Engagement Level						

(Source: Compiled by the Author)

4.10.6 Manage Stakeholder Engagement

The manage stakeholder engagement process is led by the project manager. It involves communicating and working with stakeholders to meet their needs and expectations, addressing issues as they occur, and enabling appropriate stakeholder involvement throughout the project. The key objectives include:

- Actively engage stakeholders in project decisions and activities.
- Identify and address stakeholder concerns and issues promptly.

- Ensure that stakeholder expectations are managed and aligned with project goals.
- Develop and maintain positive relationships with stakeholders to facilitate project success.

The various input documents include the communications management plan and other relevant subsidiary plans, including the stakeholder register. Historical information, lessons learned, and templates from previous projects also contribute to this process. The tools and techniques involve:

- Communication Skills—These are essential for effective stakeholder engagement, including active listening, conflict resolution, and negotiation.
- Interpersonal and Team Skills - building trust, managing conflicts, and facilitating stakeholder involvement.
- Ground Rules - establishing guidelines for stakeholder engagement and interactions.
- Meetings - regular and structured meetings with stakeholders to discuss project progress, address concerns, and make decisions.
- Stakeholder Engagement Assessment Matrix - assess and track stakeholder engagement levels.

4.10.7 Monitor Stakeholder Engagement

The Monitor Stakeholder Engagement is the process of continuously tracking stakeholder relationships and assessing the effectiveness of engagement strategies to ensure that stakeholders' needs and expectations are being met. This process involves gathering and analyzing data on stakeholder interactions, monitoring changes in stakeholder influence and interest, and adjusting engagement plans as necessary. The project manager is tasked with regularly reviewing

stakeholder engagement activities and making necessary adjustments, which allow for addressing emerging issues, improving communication, and enhancing stakeholder satisfaction.

The various documents contributing to this process include the communications management plan, resource management plan, stakeholder register, and risk register. The tools and techniques to be applied by the project manager are:

- Data Analysis:
    - Stakeholder Analysis - to understand changes in their influence, interest, or engagement levels.
    - Root Cause Analysis - identifying the underlying reasons for issues or changes in stakeholder engagement.
- Decision Making:
    - Use multiple criteria to evaluate and prioritize stakeholder engagement strategies.
- Data Representation:
    - Stakeholder Engagement Assessment Matrix - tracking and comparing current and desired engagement levels.
- Communication Skills:
    - Gathering stakeholder feedback to assess the effectiveness of engagement activities and to make necessary adjustments.
    - Providing clear and concise updates to stakeholders to keep them informed and engaged.
- Interpersonal and Team Skills:
    - Active Listening - paying close attention to stakeholder concerns and responding appropriately.

    - Demonstrating leadership to inspire and motivate stakeholders.
    - Networking - building and maintaining relationships with stakeholders.
- Meetings:
    - Conduct regular meetings to review stakeholder engagement activities, address issues, and make adjustments.

The outputs of this process include work performance information, which provides insights into how healthy stakeholder engagement activities are performing and highlights any areas needing improvement. Change requests may be generated if adjustments to the stakeholder engagement strategies or other project aspects are necessary to better align with stakeholder needs and expectations. The process also results in updates to the stakeholder engagement plan and other relevant plans, such as the communications management plan. Project documents, including the stakeholder register, issue log, and lessons learned register, are updated to reflect the latest information and actions taken regarding stakeholder engagement. These updates ensure that the project team remains informed about stakeholder dynamics and can continue to manage stakeholder interactions effectively.

4.11 Sustainable Development Plan

In the context of green project management, the Sustainable Development Plan seeks to integrate environmental stewardship with social and economic sustainability throughout the project. While ambitious, the plan sets achievable sustainability goals aligned with global standards such as the United Nations Sustainable Development Goals (SDGs), in the case of this project, directly relates to SDG 3.3, which aims to combat communicable diseases such as malaria and neglected tropical diseases. It incorporates green project management practices,

including efficient resource utilization, waste reduction, and the adoption of renewable energy sources to minimize the environmental footprint.

Active stakeholder engagement ensures that community needs and expectations are met, ensuring transparency and collaboration. The plan includes stringent monitoring and reporting systems to track environmental performance, manage risks, and ensure compliance with environmental regulations. By incorporating these principles, the project aims to mitigate adverse environmental impacts and enhance social well-being and economic prosperity, ultimately delivering a project that benefits both the planet and its people.

4.11.1 Identifying Sustainability Impacts

Led by the project manager, the project team will utilize the Green Project Management P5 analysis. Identifying sustainability impacts using the P5 framework involves evaluating the project's effects on People, Planet, Prosperity, Peace, and Partnership. For people, assess impacts on health, well-being, and social equity. For planet, analyze resource use, pollution, biodiversity, and climate change. For prosperity, consider economic growth, job creation, and income distribution. For peace, social cohesion, conflict prevention, and human rights must be evaluated. For partnership, examine stakeholder engagement, collaboration, and capacity building. This approach ensures a balanced assessment of the project's sustainability across all dimensions, enabling targeted mitigation and enhancement strategies. In addition to performing a P5 analysis, the project team will carry out the following:

- Stakeholder Identification and Consultation:
    - Identify critical stakeholders, including local communities, government agencies, and NGOs.

    - Conduct consultations to gather input on perceived and potential impacts across the P5 dimensions.
- Impact Mitigation and Enhancement:
    - Develop strategies to mitigate negative impacts and enhance positive outcomes.
    - Implement measures such as community development programs and economic opportunities.
- Monitoring and Reporting:
    - Identify key performance indicators (KPIs) which will be monitored to assess the sustainability impacts of the project.
    - Regularly report on sustainability performance to stakeholders, ensuring transparency and accountability.
- Continuous Improvement:
    - Use feedback from monitoring and stakeholder consultations to improve sustainability practices continuously.
    - Adjust project plans and operations as needed to align with sustainability goals.
    - Discuss sustainability impacts in weekly project meetings

4.11.2 Responding to Sustainability Impacts

Responding to sustainability impacts identified through the P5 framework (People, Planet, Prosperity, Peace, Partnership) involves developing and implementing targeted strategies to mitigate adverse effects and enhance positive outcomes. The following is the approach to be taken by the project team:

- Action Planning:

    - Develop detailed action plans for each identified impact, outlining specific measures, timelines, and responsible parties.

- Resource Allocation:
    - Allocate necessary resources, including budget and personnel to implement sustainability initiatives effectively. This step can be as simple as allocating funds for meetings with community leaders and academia stakeholders.
- Monitoring and Evaluation:
    - Establish monitoring frameworks to track progress and measure the effectiveness of mitigation and enhancement strategies. Adjust plans based on feedback and outcomes.
- Reporting and Communication:
    - Regularly report on sustainability performance to stakeholders during weekly project meetings, ensuring transparency and accountability. Use feedback to continuously improve sustainability practices.

4.11.3 Roles and Responsibilities

The project manager and project team, along with the sustainability impact owners (the Ministry of Health and Wellness), will collaborate to ensure that the project is managed sustainably. The sustainability impact owner is the individual or team responsible for overseeing and ensuring the effective management of sustainability impacts within a project or organization. The following is a summary of their roles and responsibilities:

- Project Manager:
    - Overall responsibility for leading the project team in carrying out the P5 impact analysis process.

  - Coordinate with stakeholders and ensure their participation in the assessment.
  - Ensure that the analysis aligns with green project management principles and objectives and that identified opportunities are embedded into the project.
  - Prepare reports on sustainability activities and key performance indicators.
- Sustainability Impact Owner:
  - Make expertise in environmental sustainability and green project management practices available to sensitize the project team.
  - Participate in the impact analysis process by providing input, feedback, and data related to environmental concerns.
  - Assist in identifying key environmental indicators and metrics for measuring impacts.
  - Collaborate with the assessment team to ensure that their environmental priorities are addressed.
  - Contribute insights and recommendations for enhancing environmental performance and minimizing ecological footprints.
  - Develop and manage the sustainability strategy for the project.
  - Ensure that sustainability goals are met across all P5 dimensions.
  - Conduct regular assessments and report on sustainability performance
- Project Team:
  - Support in the p5 analysis through the provision of information.
  - Assist in identifying opportunities for implementing green practices and technologies.
  - Support the implementation of agreed actions, considering areas of expertise.

- Assist in the monitoring of key performance indicators.

4.11.4 Budget

Incorporating a P5 impact analysis into the budget is critical for the sponsor and the project management unit. It involves allocating resources to ensure comprehensive assessment and implementation of sustainability measures across the dimensions of People, Planet, Prosperity, Peace, and Partnership. This budget should encompass various aspects, including data collection and analysis, stakeholder engagement meetings, implementation of mitigation strategies, monitoring and reporting, and continuous improvement efforts.

Costs will include hiring a subject matter expert, implementing green technologies such as solar lighting, a water tank for capturing rainwater, water-efficient plumbing, and supporting community development initiatives, such as facilitating internships and educational sessions for students, are identified specifications for facility amenities and community engagement that will be implemented. Additionally, provisions should be made for capacity building, training, and innovation to enhance sustainability practices. Allocating sufficient resources to sustainable development initiatives will maximize positive impacts and deliver long-term value to stakeholders and the environment.

4.11.5 Key Performance Indicators

The preliminary P5 impact analysis key performance indicators (KPIs) outlined on Chart 50 offer a structured framework for evaluating the sustainability impacts of the project across the People, Planet, Prosperity, Peace, and Partnership dimensions. These indicators provide measurable benchmarks to comprehensively assess the project's social, environmental, and economic performance. By tracking KPIs, stakeholders can gain insights into the project's overall sustainability performance and identify areas for improvement. The P5 impact analysis KPIs

facilitate informed decision-making and help ensure that projects contribute positively to local communities and the broader ecosystem while enabling long-term sustainability.

Chart 50

P5 Key Performance Indicators

P5 Domain	Category	Element	Key Performance Indicator	Metric
People	Community Engagement	Participation	Percentage of Community Engagement	Percentage of local community involved in project planning and decision-making.
			Number of Community Feedback Sessions (meetings)	Number of community feedback sessions held
	Health & Safety Worker	Safety	Incidence Rate of Occupational Accidents	Number of occupational accidents
	Public Health Impact	Training	Number of vector control personnel and public health officers trained	Number of public health professionals trained in entomology through lab programs.
			Reduction in Disease Transmission Rates	Percentage reduction in vector-borne disease transmission post-construction.
Planet	Resource Efficiency	Energy	Reduction in Energy Consumption	Percentage reduction in energy consumption compared to baseline.
		Water	Reduction in Water Consumption	Percentage reduction in water consumption compared to baseline
Prosperity	Economic Development	Allocation	Percentage of Budget Allocated Locally	Percentage of project budget allocated to local suppliers and contractors.
		Job Creation	Number of Jobs Created Locally	Number of jobs created locally during construction.
	Training & Capacity Building	Workforce	Percentage of Workforce from Marginalized Communities	Percentage of project workforce from underprivileged or marginalized communities.
Peace	Human Rights Compliance	Wages	Percentage of Workforce Provided with Fair Wages	Percentage of construction workforce

P5 Domain	Category	Element	Key Performance Indicator	Metric
				provided with fair wages.
		Standards	Adherence to Labor Standards	Compliance with labor standards and regulations.
Partnership	Stakeholder Engagement	Partnerships	Number of Partnerships Established	Number of partnerships with academic institutions, research organizations, or international agencies.
		Satisfaction	Level of Satisfaction Among Stakeholders	Satisfaction level among critical stakeholders regarding project communication and consultation.
	Collaborative Governance	Transparency	Level of Transparency in Project Governance	Access to project information and decision-making processes.

(Source: Compiled by the Author)

4.11.6 Monitoring and Reporting

Implementing effective mechanisms for monitoring and reporting P5 impact analysis key performance indicators (KPIs) outlined on Chart 50 is essential for ensuring transparency, accountability, and continuous improvement. The following actions will be applied to facilitate monitoring and reporting:

- One mechanism involves data collection to track relevant metrics across dimensions. This may include regular surveys, interviews, and meetings to capture community feedback, workforce health and safety data, resource usage, economic indicators, social cohesion measures, and stakeholder engagement levels.
- Additionally, implementing a structured reporting framework is crucial, ensuring stakeholders receive timely and comprehensive updates on project performance. This framework may form part of the project manager's weekly reporting obligations or be

sent online through emails to relevant parties, allowing for transparent communication of progress, challenges, and achievements.

- Encouraging feedback mechanisms within the reporting framework enables stakeholders to provide input, ask questions, and contribute to improving the project's sustainability performance.

5 CONCLUSIONS

The establishment of a Public Health Entomology Laboratory in Belize represents a significant step forward in addressing vector-borne diseases within the region. This initiative addresses a significant public health problem in Latin America and the Caribbean. It aligns with international commitments, particularly Sustainable Development Goal 3.3, which aims to combat communicable diseases such as malaria and neglected tropical diseases. By adhering to the Project Management Institute (PMI) principles and best practices, this project management plan provides a robust framework to ensure that the project is aligned with the Ministry of Health's mission and vision.

This project management plan incorporates the principles of sustainable and regenerative development principles and outlines clear guidance on project scope, objectives, budget, resources, risks, stakeholder management, and communication strategies. By following these guidelines, the Ministry's Project Management Unit will be well-equipped to assure quality standards and drive organizational success. The conclusions to the specific objectives of this project management plan are as follows:

1. The Integration Management Plan outlines the comprehensive approach required to ensure that all project components are cohesively aligned and effectively managed. Critical components of this plan include the project charter, scope, schedule, cost, quality, resource, communication, risk, procurement, and stakeholder management plans. These components collectively ensure that all project elements are harmonized and managed cohesively. Integration ensures that changes are managed effectively, that resources are optimized, and that all stakeholders are aligned with the project's goals and objectives.

The project management team will use this plan as a roadmap to guide execution, monitoring, and control processes.

2. The Scope Management Plan establishes a robust framework for defining, managing, and controlling project scope. This plan serves as a guide to ensure that project scope remains well-defined, controlled, and aligned with project objectives and stakeholder expectations. Key components of this plan include scope planning, scope definition, work breakdown structure (WBS) creation, scope verification, and scope control. By establishing transparent processes and responsibilities for each of these components, this plan aims to minimize scope creep, ensure that project deliverables are well-defined, and facilitate effective communication and collaboration among project stakeholders. Through proactive scope management practices, project risks are minimized, resource use is optimized, and project value is maximized.
3. The Schedule Management Plan provides a comprehensive framework for developing, monitoring, and controlling the project schedule. By outlining the strategies, tools, and techniques to be employed throughout the project lifecycle, this plan ensures that the project schedule remains accurate, achievable, and aligned with project objectives. Timely delivery of the project is crucial for achieving project success and meeting stakeholder expectations. As such, the project management team must be committed to adhering to the schedule outlined in this plan and taking proactive measures to mitigate any schedule-related challenges that may arise during project execution.
4. The Cost Management Plan establishes a comprehensive framework for managing project costs from initiation to closure. By outlining the strategies, methodologies, and tools to be employed, this plan ensures prudent financial management, maximization of project

value, and adherence to budgetary constraints. Effective cost management is vital for project success and organizational sustainability. As such, the project management team must be committed to adhering diligently to the budgetary constraints outlined in this plan and to take proactive measures to optimize resource allocation and control costs. Regular monitoring and review of project expenditures will be conducted to track variances from the baseline budget, identify cost drivers, and implement cost-saving measures where necessary.

5. The Quality Management Plan is a blueprint for maintaining excellence in all project deliverables. By setting clear quality objectives, implementing robust quality assurance measures, and establishing effective quality control processes, this plan ensures that the project meets or exceeds stakeholders' expectations and adheres to industry best practices. Throughout the project, the team should continuously monitor and evaluate quality performance, utilizing feedback mechanisms and quality metrics to identify areas for improvement and implement corrective actions. Effective quality management requires the collaboration and engagement of all project stakeholders. Quality is not just a goal, but a commitment embedded in every aspect of a project. From initial planning to final delivery, every team member must be committed to upholding the highest quality standards in their work. This commitment is essential not only for meeting customer requirements but also for building trust, enhancing reputation, and driving the long-term success of the project management unit within the Ministry.
6. The Resource Management Plan is crucial to utilize and to allocate resources to achieve project objectives effectively. By outlining clear strategies, processes, and responsibilities for resource acquisition, allocation, and optimization, this plan ensures that the project

team has the necessary resources to deliver on time, within budget, and to stakeholders' satisfaction. The success of this project hinges on the project manager's ability to effectively manage and leverage human, financial, material, and other resources throughout the project. Regular monitoring and evaluation of resource utilization should be conducted to track performance against planned targets, identify bottlenecks or inefficiencies, and implement corrective actions as necessary.

7. The Communications Management Plan is a vital tool for facilitating clear, timely, and effective communication among all project stakeholders. This plan ensures that information flows smoothly, that decisions are made promptly, and that project progress is transparent to all involved parties by outlining communication objectives, strategies, channels, and responsibilities. The project team must adhere to the communication protocols outlined in this plan, utilizing a combination of formal and informal channels to disseminate information, solicit feedback, and address concerns. Feedback mechanisms will be in place to encourage open dialogue and continuous improvement in communication; this process demonstrates a commitment to responsiveness and adaptability in meeting stakeholder needs and expectations.
8. The Risk Management Plan provides a structured approach to identifying, assessing, and mitigating risks that may impact project objectives. By outlining clear strategies, methodologies, and responsibilities for risk management, this plan ensures that potential threats are identified early, analyzed thoroughly, and addressed effectively to minimize their impact on project success. The project team must appreciate that risk management is not only about eliminating all uncertainties, but also about understanding and managing them systematically and proactively. Throughout the project lifecycle, the project

manager must regularly review and update the risk register, prioritizing risks based on their likelihood and impact, and implementing appropriate response strategies to mitigate or transfer risk exposure. This risk awareness and accountability culture will empower team members to identify, escalate, and address risks promptly, ensuring that project objectives are achieved with minimal disruption.

9. The Procurement Management Plan provides a structured approach to acquiring goods and services necessary for project execution. By outlining clear strategies, processes, and responsibilities for procurement, this plan ensures that the project obtains the required resources efficiently, on time, and within budget. Through proactive planning and implementation of procurement processes, the project team should aim to maximize value while minimizing risks associated with procurement activities. The project team must adhere to the procurement processes outlined in this plan, including supplier selection, contract negotiation, and performance evaluation. Regular monitoring and evaluation of procurement activities must be conducted to track supplier performance, identify areas for improvement, and address any issues or concerns that may arise.
10. The Stakeholder Management Plan outlines the approach for effectively engaging and collaborating with stakeholders to ensure project success. By outlining clear strategies, communication channels, and responsibilities for stakeholder management, this plan ensures that all stakeholders' needs, expectations, and concerns are identified, addressed, and integrated into project decision-making processes. Throughout the project, the team should continuously assess stakeholder expectations, interests, and influence, tailoring communication and engagement strategies accordingly. Feedback should be solicited

after addressing concerns and involving stakeholders in key project decisions; this will demonstrate commitment to transparency, inclusivity, and accountability.

11. The Sustainable Development Plan establishes a comprehensive framework for promoting environmental stewardship, social responsibility, and economic viability. By outlining clear strategies, practices, and responsibilities, this plan ensures that the project contributes positively to the environment and society while achieving its objectives. Sustainable development goes beyond minimizing negative impacts; it focuses on creating systems that restore and enhance the natural environment, support community well-being, and foster economic resilience. The project team must adhere to the principles and practices outlined in this plan, including resource conservation, waste reduction, biodiversity enhancement, and community engagement. By integrating these principles into all aspects of project planning and execution, we ensure that sustainability is embedded in core operations.

6 RECOMMENDATIONS

1. To ensure the effective implementation of the Integration Management Plan, it is recommended that the project management unit establish a robust governance structure that clearly defines roles and responsibilities, fostering accountability and efficient decision-making. The project manager hired by the project management unit must be provided with project management software to centralize data and streamline processes. The project manager should conduct regular integration to assess progress and make necessary adjustments, ensuring alignment with project objectives. Comprehensive documentation, continuous monitoring, and a collaborative team environment are critical for transparency and success.
2. To ensure the effective implementation of the Scope Management Plan, the project manager should meet with the project team to define a clear and detailed scope definition, including all project deliverables and boundaries. Engaging stakeholders early and continuously throughout the project will ensure that they meet their needs and expectations. The project manager should conduct monthly scope reviews, and validation processes should be conducted to manage scope changes efficiently and maintain alignment with project objectives. Utilizing project management software or a dashboard for documentation and tracking will enhance transparency and control.
3. To ensure the effective implementation of the Schedule Management Plan, the project manager must engage from early on with the project team and key stakeholders to establish a detailed and realistic project schedule that includes all tasks, milestones, and deadlines. Weekly update and review of the schedule are necessary to track progress and

address any deviations promptly. Utilize project management software or dashboards to facilitate schedule planning, monitoring, and reporting.

4. To ensure the effective implementation of the Cost Management Plan, the project manager must engage with the project team and stakeholders as early as possible to establish a detailed budget that encompasses all project expenses and contingencies. The project manager must be familiar with the budgeting and financial processes of the project management unit and, by extension, the Ministry of Finance; this detail is critical to ensure transparency. On a weekly basis, monitor and review financial performance against the budget to identify variances early and implement corrective actions. Utilize project management software and work with the project accountant to reconcile expenditures and balances, which will aid with reporting requirements.
5. To ensure the effective implementation of Quality Management, it is recommended that the project manager engage early on with PAHO, BVEC, and the Ministry of Health and Wellness Vector Control Technical Advisor to establish clear quality standards and criteria for all project deliverables. Engage stakeholders in defining quality requirements and reviewing quality outcomes to ensure their satisfaction; this process will aid in agreeing on the quality documents and defining the quality metrics and baseline.
6. To ensure the effective implementation of the Resource Management Plan, it is recommended that the director of the project management unit collaborate with the sponsor to allocate all necessary resources, including personnel, equipment, and materials as identified by the project team. Engage stakeholders in resource planning to align expectations and ensure adequate support. Regularly monitor resource utilization using project management software to track resource availability and forecast future needs.

7. To ensure the effective implementation of the Communication Management Plan, the project manager must establish clear communication channels and protocols for all project stakeholders. Since the project is a short-term endeavor, the project manager must furnish weekly updates to stakeholders on project progress, milestones, and changes through various media such as emails, meetings, and reports. Encourage open dialogue and feedback to address any concerns or issues promptly.
8. To ensure the effective implementation of the Risk Management Plan, the project manager must engage the project team by meeting to conduct a comprehensive risk assessment to identify potential threats and opportunities. The project manager must regularly monitor and review risks throughout the project to adapt strategies as needed. Foster a culture of risk awareness and accountability among team members to ensure timely identification and mitigation of risks.
9. To ensure the effective implementation of the Procurement Management Plan, it is recommended that the procurement manager clearly define the project management unit's procurement processes and guidelines to the project manager; this will align the project with regulatory requirements. Utilize a transparent and competitive bidding process to select suppliers and vendors. Develop strong contractual agreements that clearly define deliverables, timelines, and expectations. Regularly monitor vendor performance and promptly address any issues or deviations.
10. To ensure the effective implementation of Stakeholder Management, it is recommended that the project manager meet early with the project team to identify and engage stakeholders. Utilize stakeholder mapping techniques to identify key influencers and prioritize engagement efforts. The project manager should remain engaged, solicit

stakeholders' input, address concerns, and encourage open communication. Establish clear channels for stakeholder communication and feedback to maintain transparency and trust. The project manager must continuously assess stakeholder needs and expectations to ensure alignment with project goals.

11. To ensure the effective implementation of the Sustainable Development Plan, the project management unit (PMU) must organize a sensitization session for PMU staff, facilitated by a subject matter expert to build capacity in this area. This will enable the project team to prioritize environmentally friendly practices, such as reducing waste, conserving resources, and promoting renewable energy sources. It will also enable team members to identify areas to collaborate with local communities and stakeholders to incorporate social and economic sustainability initiatives into project planning and execution.

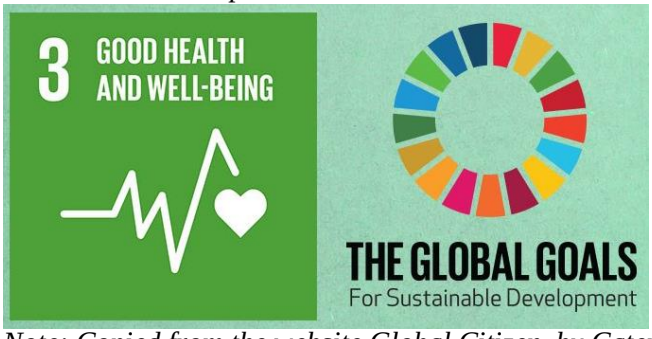
7 VALIDATION OF THE FGP IN THE FIELD OF REGENERATIVE AND SUSTAINABLE DEVELOPMENT

The Sustainable Development Goals (SDGs) are a universal set of 17 interlinked goals adopted by the United Nations in 2015, designed to be a blueprint for achieving a better and more sustainable future for all by 2030 (United Nations, n.d.). They address global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice. The goals range from eliminating hunger and poverty to ensuring access to clean water and affordable clean energy, promoting good health, quality education for all, gender equality, sustainable cities and communities, and fostering economic growth while tackling climate change and working to preserve our oceans and forests.

Adopting the Sustainable Development Goals (SDGs) in marginalized communities can elevate living standards and health outcomes for humans and animals by improving housing, urban environments, and sanitation; these collective enhancements lead to better health conditions and reduce vector-borne and infectious diseases (Fernandez & Funes, 2023, p. 1). This project aligns with international commitments, specifically, sustainable development goal 3.3, which seeks to fight communicable diseases, including malaria, neglected tropical diseases, and other communicable diseases (World Health Organization, 2024).

Figure 10

Sustainable Development Goal 3



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The Sustainable Development Goals (SDGs) and regenerative development are closely linked, aiming to foster a sustainable future. While the SDGs focus on global challenges across social, economic, and environmental dimensions, regenerative development seeks to rejuvenate ecosystems and communities beyond sustainability to enhance natural and social systems. This approach supports the SDGs by promoting practices that restore and revitalize the environment, thus ensuring that development not only sustains but also enriches our planet. Together, they offer a holistic path toward achieving a more resilient and thriving world for future generations. To address the damage and sustain life on our planet, it is imperative to adopt regenerative development, which relies on a comprehensive strategy encompassing six interconnected layers (Müller, 2017). Table 6 outlines the connection between the six layers of regenerative development and the FGP.

Table 6

FGP Regenerative Development Components

Processes of Regenerative Development	Application to FGP
Regeneration of functional landscapes, where we produce and conserve, maximizing ecosystem function (Müller, 2017).	• Scope management plan
Social strengthening by community organization and development is needed to cope with adaptation to climate change and reduce sumptuous consumption patterns (Müller, 2017).	• Stakeholder management plan • Risk management plan • Communication management plan
A new paradigm for economic development is one where people matter more than markets and money, measured according to the well-being of humans and all life forms (Müller, 2017).	• Cost management plan • Procurement management plan
Conservation and valuation of living culture are necessary for community life, where local knowledge, values, and traditions are shared with family, friends, and the community, giving meaning to these terms (Müller, 2017).	• Stakeholder management plan • Resource management plan • Communication management plan • Stakeholder management plan
Rethinking and redesigning current political structures to reflect true participatory	• Scope management plan • Stakeholder management plan

Processes of Regenerative Development	Application to FGP
democracy without the influence of money and power, especially fostering long-term vision and actions that seek increased livelihoods and happiness and not only gross income, and most importantly (Müller, 2017).	
Fostering deep spiritual and value structures based on ethics, transparency and global well-being to allow humanity to live in peace with itself and Mother Earth (Müller, 2017).	• Stakeholder management plan • Resource management plan • Communication management plan

(Source: Compiled by the Author)

The GPM P5 Standard for Sustainability in Project Management provides a comprehensive framework that enables project managers to deliver projects that are not only successful in traditional terms, but also contribute positively to social, environmental, and economic sustainability. The P5 Standard encapsulates a holistic approach to sustainability by focusing on five critical dimensions: People, Planet, Prosperity, Process, and Product. By integrating these five dimensions into project management practices, the GPM P5 Standard helps to ensure that projects contribute to a sustainable future.

According to the Green Project Management, the P5 Analysis links projects with sustainability by facilitating their assessment of impacts and encouraging actions in support of the United Nations' Sustainable Development Goals (Green Project Management, 2022). Furthermore, it helps organizations to harmonize their strategies with sustainable performance by employing project management techniques founded on principles.

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9 APPENDICES

Appendix 1: FGP Charter

CHARTER OF THE PROPOSED
FINAL GRADUATION PROJECT (FGP)

1. Student name

Kim Alvaro Bautista

2. FGP name

Project management plan for the establishment of a public health entomology laboratory in San Ignacio Town, Belize.

3. Application Area (Sector or activity)

Public Health

4. Student signature

5. Name of the Graduation Seminar facilitator

Professor Róger Valverde Jiménez

6. Signature of the facilitator

7. Date of charter approval

24 February, 2024

8. Project start and finish date

8 January 14, 2024	4 July, 2024

9. Research question

How can effective project management principles be applied to facilitate the successful establishment of a Public Health Entomology Laboratory, considering factors such as the ten knowledge areas of project management?

10. Research hypothesis

The implementation of a well-structured project management plan, incorporating key principles, such as stakeholder engagement, resource allocation, and risk management, will significantly contribute to the successful establishment and sustained operation of a Public Health Entomology Laboratory, enhancing its ability to effectively address vector-borne diseases and contribute to public health outcomes.

11. General objective

To develop a project management plan based on the project management institute's project management principles and best practices and to increase the ability to manage a project for the establishment of a Public Health Entomology Laboratory.

12. Specific objectives

1. To create an integration management plan to harmonize all project elements and allow for any possible change control that may be required.
2. To create a scope management plan detailing what is included and excluded from the project.
3. To create a schedule management plan whereby the project will be divided into scheduled tasks with well-defined start and finish dates and corresponding budgets.
4. To create a cost management plan to list the costs that are most likely to be incurred, and a timeframe for expenditure.
5. To create a quality management plan to meet stakeholders' expectations by identifying requirements.
6. To create a resource management plan to identify the physical resources required to complete the project.
7. To create a communications management plan to ensure that relevant information is managed and disseminated in a timely manner to appropriate stakeholders.
8. To create a risk management plan to identify and monitor predicted project risks and to plan appropriate actions to manage them.
9. To create a procurement management plan to purchase or acquire products and services required from outside the project team.
10. To create a stakeholder management plan which systematically identifies, analyses, and engages with relevant stakeholders, ensuring that their expectations are understood and addressed to promote positive relationships and contribute to the overall success of the project.

11. To create a regenerative development plan that aims to integrate sustainable practices, restore biodiversity, and create a regenerative ecosystem that not only mitigates environmental impacts, but also fosters community resilience and well-being through innovative and inclusive initiatives.

13. FGP purpose or justification

Through its Vector Control Program, the Belize Ministry of Health and Wellness is tasked with mitigating and controlling the population of disease-carrying vectors, such as mosquitoes, to safeguard public health. The establishment of a Public Health Entomology Laboratory will facilitate disease surveillance, research into vector biology and the effectiveness of control methods, and aid to foster the development of strategies to combat these diseases.

The establishment of a Public Health Entomology Laboratory requires the careful development of a robust project management plan, which includes documents that the project management team will utilize throughout the execution, monitoring, controlling, and closing stages. These documents are essential for guiding the team in managing and overseeing the project throughout its lifecycle.

Additionally, the plan plays a key role in educating healthcare professionals and the public about preventive measures while informing policy decisions and response strategies to emerging health threats. This holistic approach addresses current public health challenges and prepares for future scenarios in a rapidly changing global environment.

14. Work Breakdown Structure (WBS).

Name
Final Graduation Project
1 Graduation Seminar
1.1 FGP Deliverables
1.1.1 Charter
1.1.2 WBS
1.1.3 Chapter I. Introduction
1.1.4 Chapter II. Theoretical Framework
1.1.5 Chapter III. Methodological Framework
1.1.6 Annexes
1.1.6.1 Bibliography
1.1.6.2 Schedule
1.2 Graduation Seminar Approval
2 Tutoring Process
2.1 Tutor
2.1.1 Tutor Assignment
2.1.2 Communication
2.2 Adjustments of previous chapters (as required)
2.3 Chapter IV. Development
2.3.1 Signed Charter
2.3.2 Integration Management Plan
2.3.3 Scope Management Plan
2.3.4 Schedule Management Plan
2.3.5 Cost Management Plan
2.3.6 Quality Management Plan
2.3.7 Resource Management Plan
2.3.8 Communications Management Plan
2.3.9 Risk Management Plan
2.3.10 Procurement Management Plan
2.3.11 Stakeholder Management Plan
2.4 Chapter V. Conclusions
2.5 Chapter VI. Recommendations
2.6 Chapter VII. Regenerative Development
3 Reading by reviewers
3.1 Reviewers assignment request
3.1.1 Assignment of two reviewers
3.1.2 Communication
3.1.3 FGP submission to reviewers
3.2 Reviewers Work
3.2.1 Reviewer 1
3.2.1.1 FGP Reading
3.2.1.2 Reader 1 report
3.2.2 Reviewer 2
3.2.2.1 FGP Reading
3.2.2.2 Reader 2 report
4 Adjustments
4.1 Report to reviewers
4.2 FGP update
4.3 Second report to reviewers
5 Presentation to Board of Examiners
5.1 FGP grade report
5.2 Final review by board

15. FGP budget

The development of a Project Management Plan for the establishment of a Public Health Entomology Laboratory in San Ignacio, Belize.

This budget has the following breakdown:

- Philologist for document review - $150
- Printing and Binding - $150.00
- Shipping of document to Costa Rica - $100.00
- Total: $400.00 USD

16. FGP planning and development assumptions.

- Prior to the weekly webinars, feedback on project deliverables will be given, enabling the incorporation of modifications and the preparation of questions that aid discussion on past and current deliverables.
- Throughout the development of the FGP, the researcher will commit a minimum of 15 hours per week.
- The formulation and completion of the Project Management Plan will occur ahead of the specified deadline.
- The Project Manager possesses specialized expertise in overseeing project processes.
- Despite resource constraints, the project can be completed within the estimated timeframe.

17. FGP constraints

Time: The timeline for finalizing the Project Management Plan is tight, allowing a minimal error margin, which may result in delays.

Cost: The student covers the cost associated with completing the project management plan and is therefore limited.

Scope: The availability of updated reference materials and persons to use as sources of information required to complete the FGP.

Quality: The project should maintain a high standard to be a reliable reference or practical guide in future applications.

18. FGP development risks

- Limited dedicated resources can result in delays, impacting timely completion.
- Limited data sources may affect the research and development process, which is essential for the project management plan.
- Delays in receiving reviews and feedback, which are crucial for successful completion of the FGP (Final Graduation Project).
- The accelerated schedule poses a risk that some deliverables may not be submitted on time.
- There is a possibility that the Project Charter may not be accepted, requiring revisions to the proposed Project Management Plan.
- Unavailability of equipment and project management software may impact overall project efficiency.

19. FGP main milestones

WBS	Deliverable	Estimated Finish Date
1	**Graduation Seminar**	**14-Feb-2024**
1.1	**FGP Deliverables**	**5-Feb-2024**
1.1.1	Charter	11-Jan-2024
1.1.2	WBS	16-Jan-2024
1.1.3	Chapter I. Introduction	20-Jan-2024
1.1.4	Chapter II. Theoretical Framework	25-Jan-2024
1.1.5	Chapter III. Methodological Framework	30-Jan-2024
1.1.6	**Annexes**	**5-Feb-2024**
1.1.6.1	Bibliography	2-Feb-2024
1.1.6.2	Schedule	5-Feb-2024
1.2	Graduation Seminar Approval	14-Feb-2024
2	**Tutoring Process**	**18-May-2024**
2.1	**Tutor**	**17-Feb-2024**
2.1.1	Tutor Assignment	15-Feb-2024
2.1.2	Communication	17-Feb-2024
2.2	Adjustments of previous chapters (as required)	27-Feb-2024
2.3	**Chapter IV. Development**	**1-May-2024**
2.3.1	Signed Charter	4-Mar-2024
2.3.2	Integration Management Plan	9-Mar-2024
2.3.3	Scope Management Plan	15-Mar-2024
2.3.4	Schedule Management Plan	21-Mar-2024
2.3.5	Cost Management Plan	27-Mar-2024

WBS	Deliverable	Estimated Finish Date
2.3.6	Quality Management Plan	2-Apr-2024
2.3.7	Resource Management Plan	8-Apr-2024
2.3.8	Communications Management Plan	13-Apr-2024
2.3.9	Risk Management Plan	19-Apr-2024
2.3.10	Procurement Management Plan	25-Apr-2024
2.3.11	Stakeholder Management Plan	1-May-2024
2.4	Chapter V. Conclusions	7-May-2024
2.5	Chapter VI. Recommendations	13-May-2024
2.6	Chapter VII. Regenerative Development	18-May-2024
3	**Reading by reviewers**	**5-Jun-2024**
3.1	**Reviewers' assignment request**	**24-May-2024**
3.1.1	Assignment of two reviewers	21-May-2024
3.1.2	Communication	23-May-2024
3.1.3	FGP submission to reviewers	24-May-2024
3.2	**Reviewers Work**	**5-Jun-2024**
3.2.1	**Reviewer 1**	**5-Jun-2024**
3.2.1.1	FGP Reading	4-Jun-2024
3.2.1.2	Reader 1 report	5-Jun-2024
3.2.2	**Reviewer 2**	**5-Jun-2024**
3.2.2.1	FGP Reading	4-Jun-2024
3.2.2.2	Reader 2 report	5-Jun-2024
4	**Adjustments**	**28-Jun-2024**
4.1	Report to reviewers	15-Jun-2024
4.2	FGP update	17-Jun-2024
4.3	Second report to reviewers	28-Jun-2024
5	**Presentation to Board of Examiners**	**4-Jul-2024**
5.1	Final review by the board	4-Jul-2024
5.2	FGP grade report	2-Jul-2024

20. Theoretical framework

20.1 Estate of the "matter"

The Policy Analysis, Planning, and Project Management Unit (PPPMU) within the Ministry of Health and Wellness is the entity responsible for all aspects of project management. The PPPMU ensures that projects align with the Ministry's strategy and objectives, ultimately working towards its vision. The PPPMU is responsible for standardizing project-related governance processes and facilitating sharing resources, methodologies, tools, and techniques. The role and scope of the PPPMU vary from providing project management support functions to directly managing projects.

This entity within the Ministry is evolving at maturity with each subsequent project. However, there is a need to enforce adherence to industry standards and best practices, while project management documents require standardization. This FGP seeks to contribute not only to providing a project management plan for the project seeking to establish a Public Health Entomology Laboratory, but also to providing templates and documents that serve as a technical reference that may be applied to future projects.

The FGP plays a crucial role in contributing to a project that addresses an essential public health problem in Latin America and the Caribbean. It also aligns with efforts to safeguard public health against the escalating threats of vector-borne diseases across the region. The PAHO Action Plan on Entomology and Vector Control for 2018-2023 was crafted to boost the capabilities of countries in the Americas in managing diseases spread by vectors. This plan addresses the substantial threat to public health posed by illnesses like dengue, Zika, chikungunya, and malaria, which are widespread across the region. The strategy focuses on tackling these issues through holistic and integrated approaches to vector management, highlighting the importance of sustainable practices, community involvement, and interventions backed by scientific evidence (Pan American Health Organization, 2018).

Globally, and especially in the Americas, infectious diseases have a profound impact on public health. According to the World Health Organization (WHO), vector-borne diseases, such as dengue, yellow fever, other mosquito-related viruses, malaria, schistosomiasis, leishmaniasis, Chagas disease, and plague, represent more than 17% of all infectious diseases worldwide, resulting in upwards of 700,000 deaths every year (Pan American Health Organization, 2018).

This undertaking is also aligned with Sustainable Development Goal (SDG) 3, which aims to ensure healthy lives and promote well-being for all ages. Specifically, target 3.3 focuses on ending the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases and combating hepatitis, water-borne diseases, and other communicable diseases by 2030 (World Health Organization, 2024). This target emphasizes the importance of tackling infectious diseases that significantly impact global health, contributing to mortality and morbidity worldwide, especially in low- and middle-income countries.

20.2 Basic conceptual framework

List of the basic concepts to be included in the document.

- Project management
- Project management plan
- Project life cycle
- Project charter
- Project management knowledge areas
- Public Health
- Entomology
- Vector Borne Diseases
- Regenerative development

21. Methodological framework

Objective	Name of deliverable	Information sources	Research method	Tools	Restrictions
To create a project charter as part of the process in the development of an integration management plan that will define how the various process groups will work together.	A project charter formally acknowledges the initiation of a project and grants the project manager the authority to execute the project.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Interview with subject matter experts	Analytical research method: The PMBOK 6th and 7th editions are the primary sources of information.	• Microsoft Word • Microsoft Excel • UCI Charter Template • Expert judgment • Data gathering	All requisite information to complete the charter is not available within the scheduled timeframe for development.
To develop a scope management plan to ensure that the scope is well-defined and completed.	A scope management plan that includes: • scope statement • WBS • WBS dictionary traceability matrix	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	Analytical research method: Primary and secondary data sources will be utilized to define the scope baseline.	• Microsoft Word • Microsoft Excel • UCI Charter Template • Expert judgment • Data gathering	There is the possibility of the scope changing because of limited resources.
To develop the schedule management plan to ensure the project is completed on time.	A schedule management plan which includes: • activity list • sequence of activities • activity durations • schedule model • schedule baseline	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	Analytical research method: Secondary sources of data will be utilized to develop a schedule management plan.	• Microsoft Word • Microsoft Project • Expert judgment	The time allotted for completing the project is very limited, and the timeline set for completing tasks and deliverables must be met.

Objective	Name of deliverable	Information sources	Research method	Tools	Restrictions
To develop a cost management plan to ensure that the project is completed within the allotted budget.	A cost management plan which includes: • cost baseline • estimate of costs • project budget.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	Analytical research method: The PMBOK 6th editions, along with other secondary sources of information.	• Microsoft Word • Microsoft Project • Expert judgment • Analogous estimating • Parametric estimating	The budget set for the execution of the project must not be exceeded.
To develop a quality management plan to ensure that the project meets requirements and established quality standards.	A quality management plan that integrates quality assurance throughout the project.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Interview with subject matter experts	Analytical research method: Information received from various secondary sources, including the PMBOK 6th, will guide the development of a quality management plan.	• Microsoft Word • Expert judgment • Meetings and interviews with experts • Data gathering	The Ministry has no established norms or practices to measure project quality.
To develop a resource management plan to ensure that adequate resources are being allocated and managed to support project execution.	A resource management plan that guarantees the efficient use, oversight, and regulation of project resources to achieve project goals within set scope, deadlines, and quality criteria.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	Analytical research method: The PMBOK 6th edition will be used to determine the tools and techniques.	• Microsoft Word • Microsoft Project • Expert judgment	Some resources may not be available or too costly to include.

Objective	Name of deliverable	Information sources	Research method	Tools	Restrictions
To develop a risk management plan to help identify, evaluate, and plan responses to mitigate and monitor.	A risk management plan involves identifying risks, analyzing them qualitatively, and planning corresponding risk responses	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	Analytical research method: The PMBOK 6th, along with subject matter guidelines.	• Microsoft Word • Expert judgment • Risk identification • Meetings and interviews with experts	Unidentified risks may arise during execution, and risk plans may require routine updating.
To develop a procurement management plan to ensure that the purchasing or acquiring of goods and services outside the project team is within budget.	A procurement management plan that outlines procurement activities, ensuring they are monitored and controlled to keep the project on schedule and within budget.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Interview with technical officers at Belize Vector and Ecology Center • Other subject matter experts	Analytical research method: The PMBOK 6th edition will be the source of information to ensure that the procurement management plan is devised using appropriate tools and techniques.	• Microsoft Word • Expert judgment • Existing organizational policies, tools, etc.	Different types of projects and sponsors have various policies and requirements; this may have resulted in the Ministry not standardizing a set procurement policy.
To develop a stakeholder management plan to identify stakeholders and plan to manage their expectations effectively.	A stakeholder management plan involves identifying stakeholders and devising strategies to engage them effectively and meet their needs and expectations.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Interview with subject matter experts	Analytical research method: The PMBOK 6th edition and other sources identified on Chart 1 will be used to develop a stakeholder management plan.	• Microsoft Word • Expert judgment • Meetings and interviews with experts	Lack of participation or interest in the project from stakeholders.

Objective	Name of deliverable	Information sources	Research method	Tools	Restrictions
To develop a communications management plan to define how information will be communicated within the project team and to external stakeholders, including the methods, frequency, and channels used for communication.	A communication management plan that outlines a suitable strategy and plans for engaging stakeholders and addressing project requirements.	• Verbal and written communications with UCI Graduation Seminar Course lecturer and tutor • Subject matter experts	Analytical research method: The PMBOK 6th edition and other sources identified in Chart 1 will be used to develop a communications management plan.	• Microsoft Word • Expert judgment • Meetings and interviews with experts	There is only one week allocated to create the project charter.

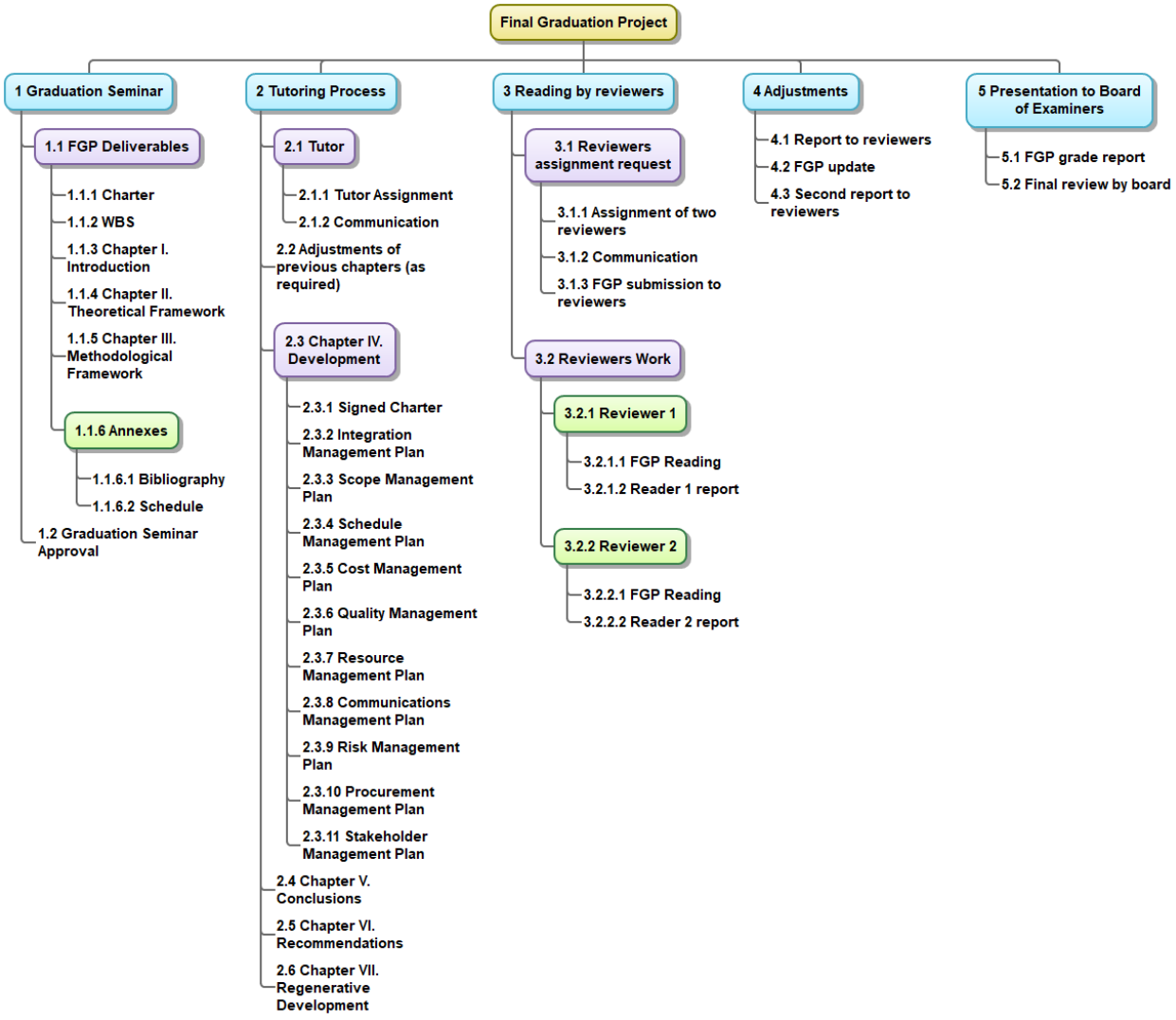
(Source: Compiled by the Author)

22. Validation of the work in the regenerative and sustainable development field.

There is an interconnection between the Sustainable Development Goals (SDGs) and regenerative development, both seeking to enable a sustainable future. The SDGs focus on global challenges across social, economic, and environmental dimensions; regenerative development seeks to rejuvenate ecosystems and communities beyond sustainability to enhance natural and social systems. The regenerative approach complements the SDGs by promoting practices that restore and revitalize the environment, ensuring that development is done sustainably in a manner that enriches our planet. Dr. Eduard Müller defines regenerative development as working toward addressing planetary damage and future development through a paradigm shift that seeks to sustain life for future generations (Müller, 2017).

This FGP seeks to support the Ministry of Health in meeting its international commitments to meeting sustainable development goal 3.3, which seeks to fight communicable diseases, including malaria, neglected tropical diseases, and other communicable diseases (World Health Organization, 2024). Adopting the sustainable development goals in impoverished communities through improved socioeconomic conditions will lead to better health conditions, reducing vector-borne and infectious diseases (Fernandez & Funes, 2023, p. 1).

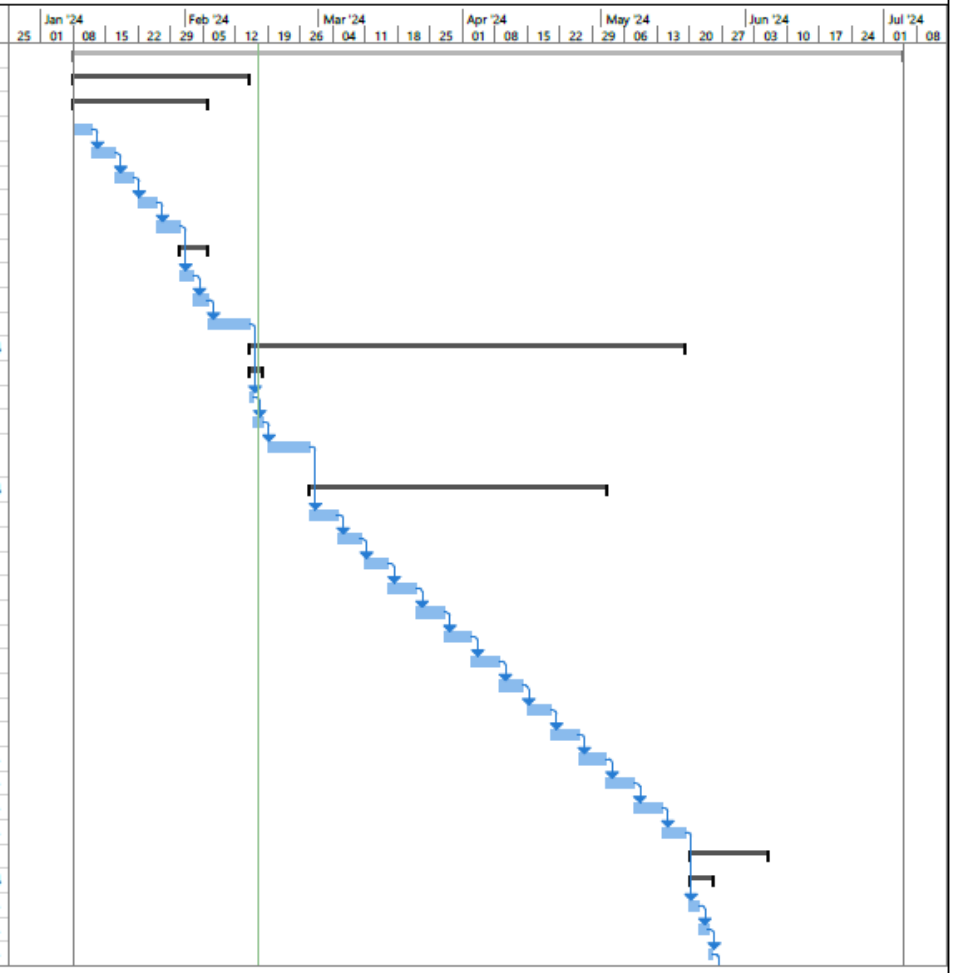
Appendix 2: FGP WBS



Appendix 3: FGP Schedule

Final Graduation Project

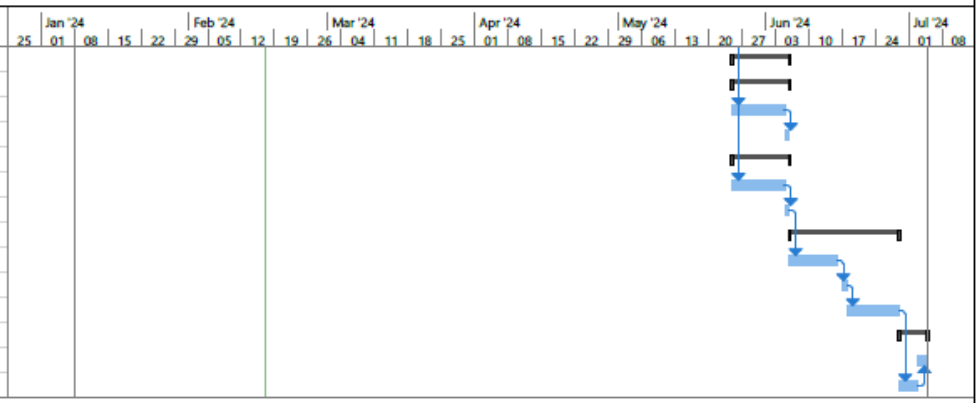
ID	Task Name	Duration	Start	Finish
0	**Final Graduation Project**	**154 days**	**08 Jan '24**	**04 Jul '24**
1	**1 Graduation Seminar**	**33 days**	**08 Jan '24**	**14 Feb '24**
2	**1.1 FGP Deliverables**	**25 days**	**08 Jan '24**	**05 Feb '24**
3	1.1.1 Charter	4 days	08 Jan '24	11 Jan '24
4	1.1.2 WBS	4 days	12 Jan '24	16 Jan '24
5	1.1.3 Chapter I. Introduction	4 days	17 Jan '24	20 Jan '24
6	1.1.4 Chapter II. Theoretical Framework	4 days	22 Jan '24	25 Jan '24
7	1.1.5 Chapter III. Methodological Framewor	4 days	26 Jan '24	30 Jan '24
8	**1.1.6 Annexes**	**5 days**	**31 Jan '24**	**05 Feb '24**
9	1.1.6.1 Bibliography	3 days	31 Jan '24	02 Feb '24
10	1.1.6.2 Schedule	2 days	03 Feb '24	05 Feb '24
11	1.2 Graduation Seminar Approval	8 days	06 Feb '24	14 Feb '24
12	**2 Tutoring Process**	**81 days**	**15 Feb '24**	**18 May '24**
13	**2.1 Tutor**	**3 days**	**15 Feb '24**	**17 Feb '24**
14	2.1.1 Tutor Assignment	1 day	15 Feb '24	15 Feb '24
15	2.1.2 Communication	2 days	16 Feb '24	17 Feb '24
16	2.2 Adjustments of previous chapters (as required)	8 days	19 Feb '24	27 Feb '24
17	**2.3 Chapter IV. Development**	**55 days**	**28 Feb '24**	**01 May '24**
18	2.3.1 Signed Charter	5 days	28 Feb '24	04 Mar '24
19	2.3.2 Integration Management Plan	5 days	05 Mar '24	09 Mar '24
20	2.3.3 Scope Management Plan	5 days	11 Mar '24	15 Mar '24
21	2.3.4 Schedule Management Plan	5 days	16 Mar '24	21 Mar '24
22	2.3.5 Cost Management Plan	5 days	22 Mar '24	27 Mar '24
23	2.3.6 Quality Management Plan	5 days	28 Mar '24	02 Apr '24
24	2.3.7 Resource Management Plan	5 days	03 Apr '24	08 Apr '24
25	2.3.8 Communications Management Plan	5 days	09 Apr '24	13 Apr '24
26	2.3.9 Risk Management Plan	5 days	15 Apr '24	19 Apr '24
27	2.3.10 Procurement Management Plan	5 days	20 Apr '24	25 Apr '24
28	2.3.11 Stakeholder Management Plan	5 days	26 Apr '24	01 May '24
29	2.4 Chapter V. Conclusions	5 days	02 May '24	07 May '24
30	2.5 Chapter VI. Recommendations	5 days	08 May '24	13 May '24
31	2.6 Chapter VII. Regenerative Development	5 days	14 May '24	18 May '24
32	**3 Reading by reviewers**	**15 days**	**20 May '24**	**05 Jun '24**
33	**3.1 Reviewers assignment request**	**5 days**	**20 May '24**	**24 May '24**
34	3.1.1 Assignment of two reviewers	2 days	20 May '24	21 May '24
35	3.1.2 Communication	2 days	22 May '24	23 May '24
36	3.1.3 FGP submission to reviewers	1 day	24 May '24	24 May '24



Page 1

Final Graduation Project

ID	Task Name	Duration	Start	Finish
37	**3.2 Reviewers Work**	**10 days**	**25 May '24**	**05 Jun '24**
38	**3.2.1 Reviewer 1**	**10 days**	**25 May '24**	**05 Jun '24**
39	3.2.1.1 FGP Reading	9 days	25 May '24	04 Jun '24
40	3.2.1.2 Reader 1 report	1 day	05 Jun '24	05 Jun '24
41	**3.2.2 Reviewer 2**	**10 days**	**25 May '24**	**05 Jun '24**
42	3.2.2.1 FGP Reading	9 days	25 May '24	04 Jun '24
43	3.2.2.2 Reader 2 report	1 day	05 Jun '24	05 Jun '24
44	**4 Adjustments**	**20 days**	**06 Jun '24**	**28 Jun '24**
45	4.1 Report to reviewers	9 days	06 Jun '24	15 Jun '24
46	4.2 FGP update	1 day	17 Jun '24	17 Jun '24
47	4.3 Second report to reviewers	10 days	18 Jun '24	28 Jun '24
48	**5 Presentation to Board of Examiners**	**5 days**	**29 Jun '24**	**04 Jul '24**
49	5.1 Final review by board	2 days	03 Jul '24	04 Jul '24
50	5.2 FGP grade report	3 days	29 Jun '24	02 Jul '24



Project: Final Graduation Projec
Date: 17 Feb '24

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

Appendix 4: Preliminary bibliographical research

Summary:

The publication discusses the importance of studying insects in the context of their importance to public health. Its contribution to the FGP is that it provides context to the project's importance.

Belluco, S., Bertola, M., Montarsi, F., Di Martino, G., Granato, A., Stella, R., Martinello, M., Bordin, F., & Mutinelli, F. (2023). Insects and public health: An overview. *Insects, 14*(3), 240. https://doi.org/10.3390/insects14030240

Summary:

The source is a blog with content from project management specialists. It discusses the ten knowledge areas of project management and how to integrate them into the formulation of a comprehensive and integrated project management plan.

Kulakov, M. (2023, November 4). *Project management knowledge areas: Establishing common framework for project management*. Everhour Blog. https://everhour.com/blog/project-management-knowledge-areas/

Summary:

The source is a blog from a professional project risk coach who provides project management strategies. The writer focuses on the 5 Ps of project management: proper planning prevents poor performance.

Hall, H. (2023, October 3). *How to actually develop a project management plan*. Project Risk Coach. https://projectriskcoach.com/develop-a-project-management-plan/

Summary:

The source is a scientific publication that discusses the importance of medical entomology, also referred to as public health entomology, in the context of the emergence of several mosquito-borne diseases over the past decade. The article discusses the importance of research in this field in addressing the increase in clinical cases of these diseases. This topic is of importance for Belize, along with Latin America and the Caribbean, which are plagued by these diseases on a continuous basis.

Laroche, M., Bérenger, J., Delaunay, P., Charrel, R., Pradines, B., Berger, F., Ranque, S., Bitam, I., Davoust, B., Raoult, D., & Parola, P. (2017). Medical entomology: A Reemerging Field of research to better understand vector-borne infectious diseases. *Clinical Infectious Diseases*, *65*(suppl_1), S30-S38. https://doi.org/10.1093/cid/cix463

Summary:

The source is a guideline from the Pan American Health Organization/World Health Organization and serves as a technical guide on all aspects of establishing a Public Health Entomology Laboratory. This source will ensure that the FGP is technically sound, as it will be guided by the foremost authority on public health matters.

Pan American Health Organization. (2019). *Guidelines for the Structure of Public Health Entomology Laboratories.*

Summary:

The PMBOK 6th edition is a comprehensive guide for project management. It offers a standardized framework with five pro cess groups and ten knowledge areas. It emphasizes the iterative nature of project management and urges tailoring to suit project specifics. This concise guide is a foundational resource for project professionals, fostering consistency and success in diverse projects and industries.

Project Management Institute. (2017). *A guide to the project management body of knowledge* (6th ed.). PMBOK Guides.

Summary:

The PMBOK 7th edition represents a significant shift in project management methodology. It focuses on principles rather than processes, acknowledging the dynamic nature of the profession. The guide introduces a flexible approach, emphasizing value delivery, collaboration, and adaptability. It integrates project management with organizational strategy, promoting a holistic perspective with a greater emphasis on tailoring practices to suit various project environments.

Project Management Institute. (2021). *The standard for project management and a guide to the project management body of knowledge (PMBOK guide)* (7th ed.).

Summary:

This source is part of a comprehensive online project management resource that provides products and solutions. It will contribute to the FGB by guiding the development of the project management plan.

Project Manager. (2023, August 11). *Project planning*. ProjectManager. https://www.projectmanager.com/guides/project-planning

Summary:

Forbes Advisor is a technical business source offering various guides, editorials, publications, etc., on relevant business topics. The source will contribute to the development of the FGP by providing technical guidance from actual business and project management professionals, specifically in developing a project plan.

Rudder, A. (2023, August 1). *What is a project management plan and how to create one*. Forbes. https://www.forbes.com/advisor/business/project-management-plan/

Summary:

This scientific publication will contribute to the development of the FGP through technical guidance on the best practices in medical entomology, also known as public health entomology. It will serve as a reference for technical matters related to the actual project for which the project management plan is being developed.

Sharma, S. (2022). Good medical entomology laboratories practices (GMELP) in India: A concept note. *Journal of Communicable Diseases*, *54*(1), 150–155. https://doi.org/10.24321/0019.5138.202261

Summary:
Wrike is an online project management resource offering tools and solutions for project managers, technical editorials, and resources on various project management topics. The specific reference provides professional guidance on creating a project management plan. The objective is to gain several perspectives outside of the PMBOK 6 and 7 based on experiences and industry best practices.

Wrike. (2023, September 27). *How to create a project management plan*. https://www.wrike.com/project-management-guide/faq/how-to-create-a-project-management-plan/

Appendix 5: Philological Dictum

AMADO MAURICIO CHAN
Master of Arts
English
Certified by The Board of Regents of the University System of Georgia
Upon Recommendation of the Faculty of Valdosta State University, 1997

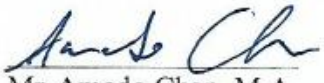
June 18, 2024

Academic Advisor
Masters Degree in Project Management (MPM)
Universidad para la Cooperación Internacional (UCI)

Dear Academic Advisor,

RE: Philological Review of Final Graduation Project by Kim Alvaro Bautista in partial fulfilment of the requirements for the Masters in Project Management (MPM) Degree

I hereby confirm that Kim Alvaro Bautista has made all corrections to the Final Graduation Project document entitled "Project Management Plan for The Establishment of a Public Health Entomology Laboratory in San Ignacio Town, Belize" as I have advised. In my opinion, the document now meets the literary and linguistic standards expected of a student for a degree at the Masters Level.



Mr. Amado Chan, M.A.
Philologist

Valdosta State University

This Certifies That
The Board of Regents of the University System of Georgia Upon Recommendation of the
Faculty of Valdosta State University
Has Conferred on

Amado Mauricio Cham

the Degree of

Master of Arts

English

with all the Rights, Privileges, and Honors thereunto appertaining.
In Witness Whereof the seal of the University and the signatures of its duly authorized officers are hereto affixed.

Given this fourteenth day of June, in the year of our Lord
nineteen hundred and ninety-seven

Chancellor of the University System of Georgia

Hugh C. Bailey
President of the University

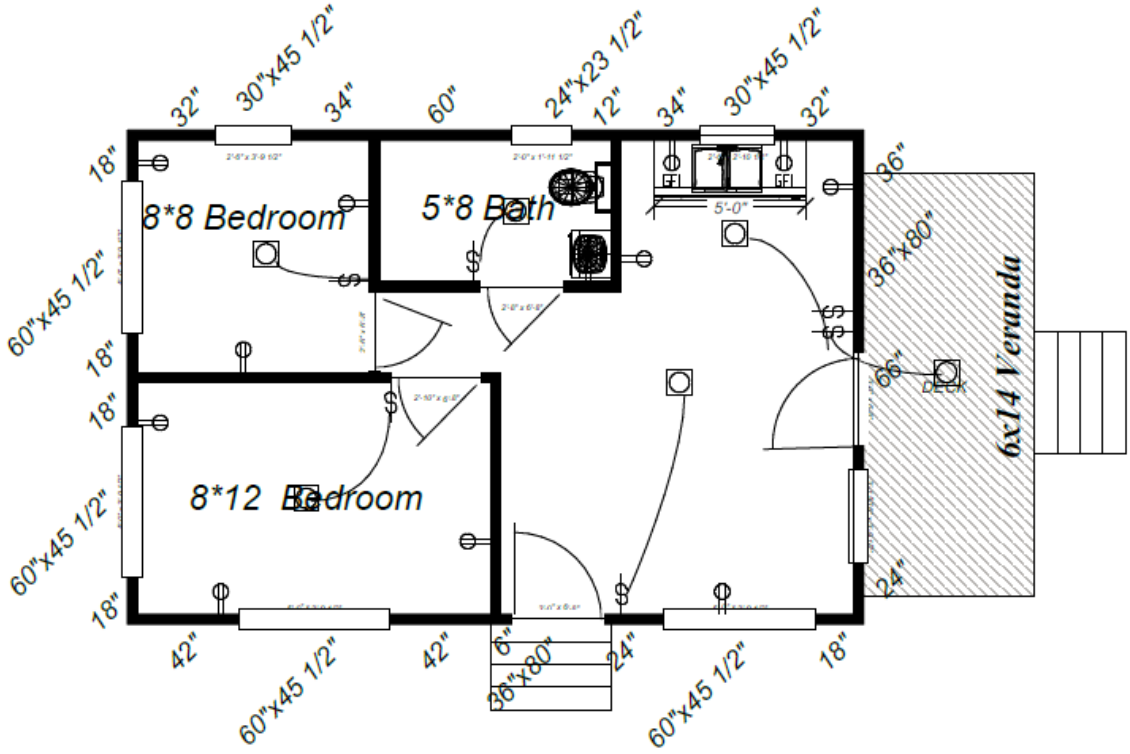
Ernestine H. Clark
Dean, Division of Graduate Studies

Marcia F. Reynolds
Registrar

Appendix 6: Other relevant information

Figure 11

Sample of Prefabricated Building

Figure 12

Architectural Layout of Prefabricated Building