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Pre-feasibility Study for a Cold Storage Design and Holding Facility at Cassidy Airport Including Design Recommendations




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Acronyms and abbreviations

AKA	Airport Kiribati Authority
CFD	MFMRD Coastal Fisheries Division
CPPL	Central Pacific Producers Ltd
HACCP	Hazard and critical control point
IRR	Internal Rate of Return
MAF	Marine aquarium fish
MEP	MacAlister Elliott & Partners
MFMRD	Ministry of Fisheries and Marine Resources Development
MLPID	Ministry of Line and Phoenix Island Development
NPV	Net Present Value
PROP	Pacific Islands Regional Oceanscape Program

Executive Summary

Background

Under the Pacific Islands Regional Oceanscape Program (PROP), the Ministry of Fisheries and Marine Resources Development (MFMRD) has enlisted the services of MacAlister Elliott & Partners (MEP) for a consultancy titled "Preparation of a Needs Assessment for a Central Pacific Producers Ltd (CPPL) Fisheries Centre on Kiritimati Island and Economic Assessment of Developing Sustainable Supply Chains in the Line Islands." As part of this consultancy, Task 2.3 involves creating a concept design for a cold storage and holding facility at Cassidy Airport.

This deliverable presents the findings of the pre-feasibility assessment for a cold storage, packaging, and holding facility at Cassidy Airport. It includes:

- Analysis of the current status and trends of Kiritimati's marine resource export sector.
- Identification of key stakeholders involved in the sector.
- Exploration of factors, issues, and considerations influencing the design, layout, and operation of the facility, including current and future needs.
- Presentation of proposed design options for the facility.
- Financial feasibility assessment of the proposed options.
- Recommendations for the subsequent steps in the business planning and development process.

Status and trends in Kiritimati's marine resource exports

Marine aquarium fish (MAF) are the primary marine resource commodity exported from Kiritimati, contributing approximately AUD 1 million annually to the economy. Over 90 percent of exports are destined for the US market. Exports are typically packed in polystyrene boxes with approximate external dimensions of 600 x 400 x 300 mm.

Finfish exports of up to 8,000 kg per year contribute around AUD 150,000 to the economy. Exports are destined for the US market, and are packed on ice in polystyrene boxes with approximate external dimensions of 600 x 400 x 300 mm.

Lobster exports of up 3,000 kg contribute just over AUD 85,000 to the economy. Exports are destined for the US market, and are packed in polystyrene boxes with approximate external dimensions of 600 x 400 x 300 mm.

Personal consignments range from 30,000 to 40,000 kg annually. They encompass a wide variety of marine resource commodities, dominated by milkfish and mixed finfish. While personal consignments are processed as passenger luggage rather than freight, they do serve to indicate the presence of substantial market demand in Fiji and Tarawa, and hence provide an indication of future cargo trends.

Design considerations

The following design considerations have influenced the recommendations about location, design

and operation of a marine commodity cargo facility at Cassidy Airport.

Users. Three primary user groups are (i) private sector exporters; (ii) Airport Kiribati Authority who has responsibility for site management, including aviation security; and (iii) Air Kiribati Ltd who, as the ground handler, has responsibility for cargo screening and movement.

Cargo storage facilities. Stakeholders indicated demand for climate-controlled warehouses (18°C) and chillers (5°C). However, there appears to be no demand for holding tanks or cold storage (18°C), with operators preferring to return consignments to their own facilities in the event of lengthy flight delays.

Cargo storage capacity. MAF exports are typically 5m^3 per uplift, while finfish and live lobster exports are typically 1.5m^3 each per uplift. The Boeing 737 Max 8 aircraft that typically serves Kiritimati has a maximum hold volume of 43.7m^3. Based on historical trends and projected future needs, the recommended minimum cargo storage facilities are a 10m^3 climate-controlled warehouse (18°C) and a 10m^3 chiller (5°C).

Landside operations. Adequate space is required for adequate space for parking, loading, and unloading of vehicles. Interactions between freight and passenger traffic should be considered to minimise present and future congestion.

Airside operations. Adequate space and facilities are required for aviation security requirements, including ready for carriage checks and security clearance. Air Kiribati Ltd as the ground handler has responsibility for security clearance, whilst export compliance inspections of marine commodities are carried out by the MFMRD.

Utilities. Electricity is essential for operating cooling systems. Stakeholders indicated low demand for holding tanks or facilities for breaking down and repacking, and consequently water and sewerage utilities are of lower priority.

Location and footprint. The footprint required for landside operations such as vehicle parking, loading, and unloading is typically around twice the footprint of the air cargo building itself. Consideration should also be given to future needs and potential expansion of the site.

Other issues. Due to the proximity of flight operations, stringent regulations, and safety considerations limit building hight to a single storey.

Design options

Two candidate **locations** are proposed:

1) Location A is adjacent to the perimeter fence surrounding the apron, positioned just southwest of the passenger terminal at Cassidy Airport.
2) Location B is adjacent to the perimeter fence surrounding the airport property, situated at the end of a currently disused service road to the east of the passenger terminal.

Two candidate **designs** are proposed:

1) Design A is purpose-built facility comprising a 10 m^3 climate-controlled warehouse, a 10 m^3 chiller, and a service area for security screening and export compliance inspections. The functional footprint of Design A is estimated to be 460 m^2, with an additional 750 m^2

of exterior space required landside for parking, loading, and unloading of vehicles.

2) Design B consists of two adjacent 20-foot shipping containers, one climate-controlled and the other refrigerated. The total functional footprint for this design is 30 m^2 with an additional 50 m^2 of exterior space required landside for parking, loading, and unloading of vehicle.

Financial feasibility analysis

Financial feasibility was evaluated with consideration to the existing MAF trade, and the hypothetical development of farmed giant clam trade. Feasibility assessments are provided for a wider range of marine commodities in the accompanying report Pre-feasibility Study for Supply Chain Development, Economic Viability and CPPL Production Centre Needs Assessment. In the Value Chain Analysis (VCA) process, we evaluate the financial viability of different segments by considering various scenarios that represent potential future economic conditions. Under the worst-case scenarios, characterized by pessimistic assumptions about future returns, the payback period for investments extends to five years. This means that it takes five years for the initial investment to be recovered through the net revenues generated annually. Conversely, under the best-case scenarios, which include optimistic assumptions about the economic outlook, the payback period shortens to three years. Thus, the financial analysis assists stakeholders understand potential payback periods and the associated risks with different investment segments. It allows for an informed decision-making based on an evaluation of both optimistic and pessimistic future scenarios.

Conclusions

The following conclusions have been made in this study:

Location A offers greater separation between passenger and cargo traffic and more room for future expansion but requires a greater initial investment in ground preparation and procurement of equipment. Location B provides for closer integration with existing facilities but may face challenges in the future if there is a need to expand.

Design A offers more integration and energy efficiency but requires a higher initial investment and time for development. Design B provides for rapid deployment at a lower cost but may face challenges with space and operational integration. Both layouts have their merits and limitations, and the choice between them is dependent on specific project requirements and constraints.

Given that navigating land permitting requirements can be complex, that the total volume of marine resource exports is projected to remain below 20 m^3 per uplift, and the desire to minimise development cost and duration, the combination of Location A and Design B appear to offer the best fit for needs in Kiritimati.

Priority next steps

The following priority actions are proposed to advance the development of a cargo holding facility at Cassidy Airport.

- **Extend the market demand analysis** presented in this report for priority commodities.
- **Conduct a detailed financial analysis** including include a detailed cost analysis covering

construction, operation, and maintenance.

- **Review regulatory and compliance needs** with special consideration to environmental impact assessments and international export standards.
- **Undertake a comprehensive risk assessment** to identify potential construction, operation, sustainability, and market risks.
- **Assess environmental impacts** associated with construction and operation phases.
- **Enhance community and stakeholder engagement** to maximise project support and understanding.
- **Define operational workflow and logistics** such as cargo handling, storage management, and transportation logistics to and from aircraft.
- **Define institutional arrangements** including the identification of a designated operator for the facility.
- **Engage with the airport authority**, including to finalize selection of the proposed location and design, and to review aviation security and access considerations.
- **Develop a comprehensive business plan**, including operation and maintenance budgets and potential cost recovery mechanisms.
- **Prepare the site** including clearing, levelling, and installing utilities.
- **Initiate installation or civil works** including preparing detailed designs and/or procuring, transporting, and installing temporary shipping containers.

1. Introduction

1.1. Outline of the assignment

Under the Pacific Islands Regional Oceanscape Program (PROP), the Ministry of Fisheries and Marine Resources Development (MFMRD) has enlisted the services of MacAlister Elliott & Partners (MEP) for a consultancy titled "Preparation of a Needs Assessment for a Central Pacific Producers Ltd (CPPL) Fisheries Centre on Kiritimati Island and Economic Assessment of Developing Sustainable Supply Chains in the Line Islands." As part of this consultancy, Task 2.3 involves creating a concept design for a cold storage and holding facility at Cassidy Airport.

Conducting proper feasibility assessments and economic cost-benefit analyses is crucial for advancing sustainable fisheries development in the Line Islands—a top priority for the PROP. The assignment's terms of reference specify the need for a pre-feasibility study of a cold storage and holding facility at Cassidy Airport. Unlike a full feasibility study, a pre-feasibility assessment provides a preliminary examination of the business (or its aspects) with less detail. It aims to determine, analyse, and select the best business scenario (or scenarios, if multiple options exist).

The terms of reference further outline six typical components of a pre-feasibility assessment:

- Introduction to the business.
- Market assessment.
- Technical assessment.
- Financial feasibility assessment.
- Organizational feasibility assessment.
- Recommendations for the next steps in the business planning and development process.

1.2. Overview of this report

This deliverable presents the findings of a pre-feasibility assessment for a cold storage, packaging, and holding facility at Cassidy Airport, as outlined in Task 2.3. A team from MEP conducted a one-week field mission to Kiritimati in January 2024. During this mission, key stakeholders were interviewed, and available data on marine commodity export composition, volumes, values, and trends were reviewed. Additionally, a needs assessment and costing exercise for the facility were conducted, with a detailed methodology provided in Annex 1.

The report covers the following aspects:

- Analysis of the current status and trends of Kiritimati's marine resource export sector.
- Identification of key stakeholders involved in the sector.
- Exploration of factors, issues, and considerations influencing the design, layout, and operation of the facility, including current and future needs.
- Presentation of proposed design options for the facility.
- Financial feasibility assessment of the proposed options.

- Recommendations for the subsequent steps in the business planning and development process.

2. Status and trends in Kiritimati's marine resource exports

2.1. Governance framework

Kiribati's National Coastal Fisheries Roadmap (2019-2036) articulates a vision of "a resilient, healthy, and prosperous nation through sustainable coastal fisheries, fostered by inclusive, collaborative, and innovative approaches between communities and the Government." Under the auspices of the MFMRD, the Coastal Fisheries Division (CFD) bears the responsibility for ensuring the sustainable management, development, and conservation of coastal fisheries resources across Kiribati, encompassing Kiritimati and the Line Islands group.

In 2019, MFMRD enacted the Fisheries (Conservation and Management of Coastal Marine Resources) Regulation, establishing a framework for the sustainable management of coastal fisheries aimed at securing the long-term viability of these resources. Building upon this foundation, key priorities include diversifying sustainable fisheries value chains within the Line Islands, alongside efforts to minimise waste, enhance product quality, and bolster market competitiveness.

2.2. Commodities

Marine aquarium fish constitute the primary marine resource commodity exported from Kiritimati, contributing approximately AUD 1 million annually to the economy (Figure 1). Roughly 90 percent of exports are destined for the United States market, and are dominated by three species: *Centropyge loricula*, *Pseudanthias bartlettorum*, and *C. flavissima*. In preparation for transport, individual fish are packaged in oxygenated polythene bags containing a small amount of water. These bags are then packed securely into lined polystyrene boxes, which typically have approximate external dimensions of 600 x 400 x 300 mm.

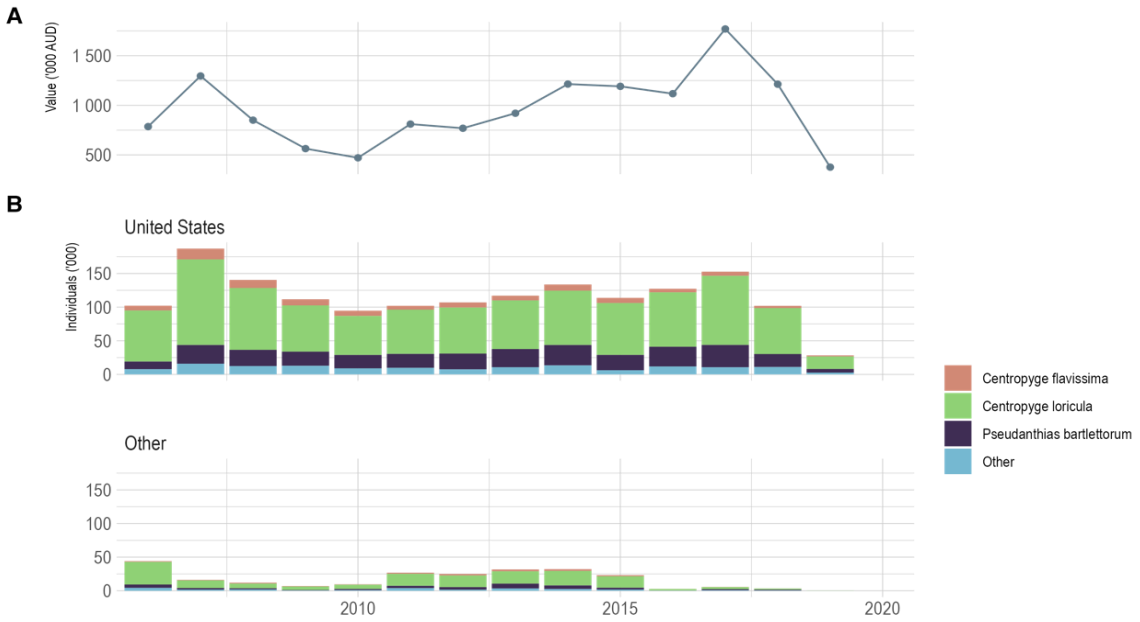


Figure 1: Trends in marine aquarium fish export values (A), volumes and destination markets (B) from 2006 to 2020, with the contribution of the top three exported species indicated. Source: MFMRD export data.

Data describing **finfish exports** are available only for the period 2016 to 2020 (Figure 2). Finfish exports increased during this period, reaching a pre-covid19 maximum of around 8,000 kg per year. These exports annually contribute around AUD 150,000 to the economy. Exports are destined exclusively for the US market and are comprised primarily of assorted grouper and snapper species. In preparation for transport, the fish are packed on ice, typically in 20 kg polystyrene boxes with approximate external dimensions of 600 x 400 x 300 mm.

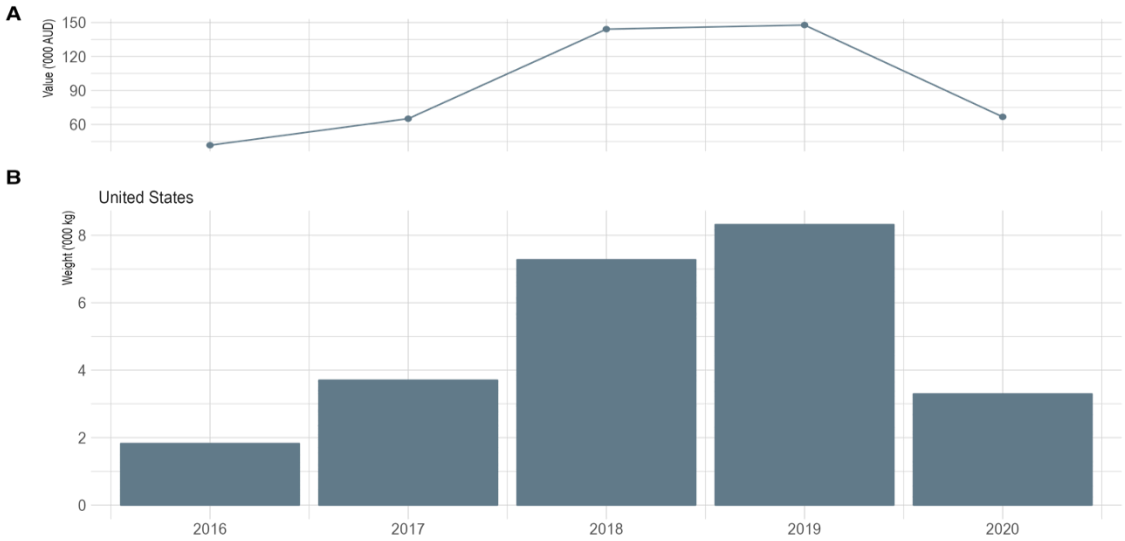


Figure 2: Trends in finfish export values (A), volumes and destination markets (B) from 2016 to 2020. Source: MFMRD export data.

Lobster exports peaked in 2015, totalling around 3,000 kg and making a contribution of just over AUD 85,000 to the economy (Figure 3). Negligible quantities of frozen lobster tails have been exported, with most lobsters exported live. Since 2015, lobster exports have been exclusively directed towards the US market. To prepare for transportation, live lobsters are carefully packed with damp packing material to preserve humidity within 20 kg polystyrene boxes, which have approximate external dimensions of 600 x 400 x 300 mm.

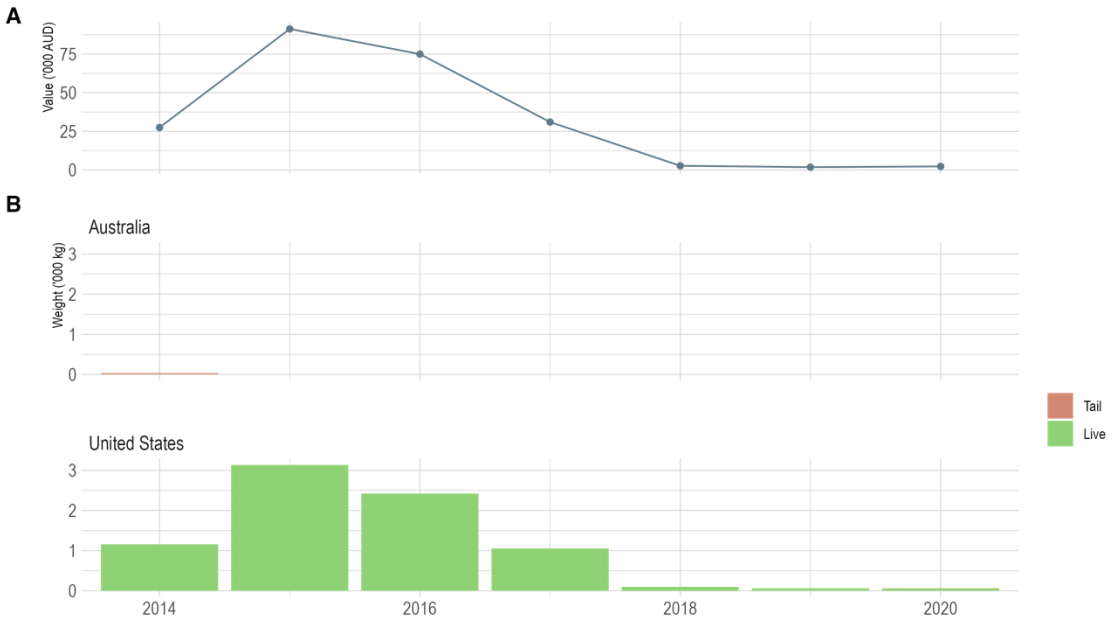


Figure 3: Trends in lobster export values (A), volumes and destination markets (B) from 2014 to 2020. Source: MFMRD export data.

Some **marine resource exports** also take the form of personal consignments, which typically range from 30,000 to 40,000 kg annually—significantly surpassing commercial exports (Figure 4). These personal consignments are primarily composed of milkfish and mixed finfish and are mainly destined for Fiji and Tarawa. Unlike commercial exports, personal consignments accompany individual passengers and are thus processed and handled as passenger luggage rather than freight. However, they do indicate the existence of market demand in Fiji and Tarawa that is currently unmet by commercial exports. As such, data on the quantity and destinations of personal consignments can offer insights into the future cargo trends and requirements necessary for designing a handling facility at Cassidy Airport.

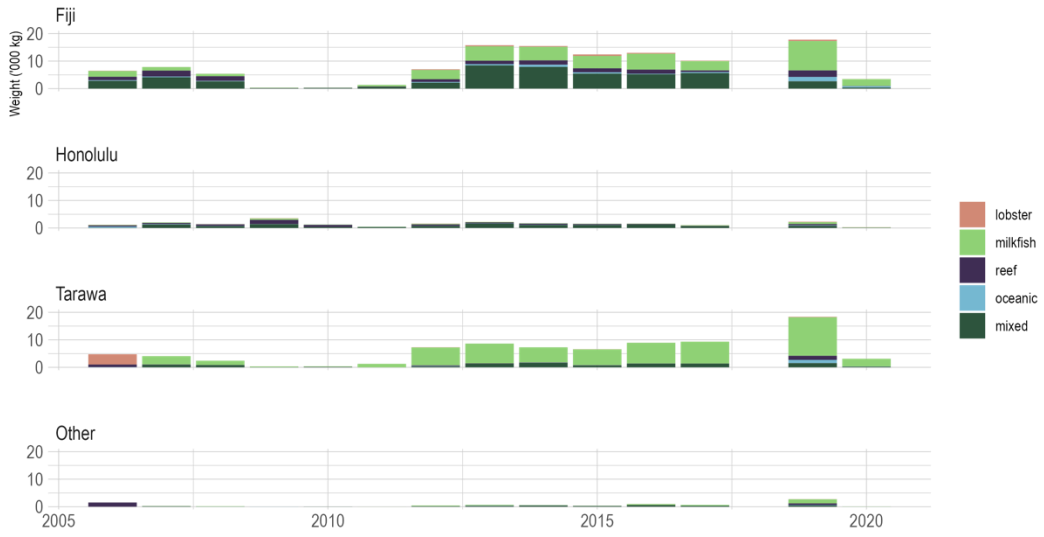


Figure 4: Trends in the volume, composition and destination of personal consignments of various marine resources from 2005 to 2020. Source: MFMRD quarantine data.

2.3. Export pathways

Export pathways from Kiritimati are notably limited. Surface freight is infrequent, with a container vessel visiting approximately every three months, primarily transporting dry goods. Refrigerated containers make up only about 1 percent of arrivals. Consequently, the majority of marine resource exports rely on airfreight. Fiji Airways operates one weekly flight to Hawaii and one to Fiji, while Nauru Air/Air Kiribati operates one codeshare flight to Tarawa each week.

Given this heavy reliance on airfreight, ensuring the availability of adequate facilities for cargo handling and storage is crucial. This ensures the quality, competitiveness, and compliance of marine resource commodities with export market requirements. Currently, Cassidy Airport lacks mechanical equipment, and all cargo handling is done manually. Moreover, available cargo capacity is limited, with priority given to passenger luggage in aircraft hold space.

In developing options for a cargo handling, packaging, and storage facility at Cassidy Airport, this report considers both present needs and future requirements. This includes potential changes resulting from factors such as improved ground handling equipment or increased flight capacity.

2.4. Key Stakeholders

The following are the key stakeholders that were identified:

MFMRD, through its Coastal Fisheries Division, is responsible for ensuring the sustainable management, development, and conservation of coastal fisheries resources in Kiribati, which

includes Kiritimati and the Line Islands group. Key functions include resource management, technical assistance for harvesting and post-harvest sectors, monitoring of fish harvests and exports, implementing quotas, and inspection and quarantine of fisheries exports.

The Ministry of Line and Phoenix Island Development (MLPID) oversees the development of the Line Islands and Phoenix Islands. All land on Kiritimati is state-owned, giving MLPID decision-making authority over development projects and land allocation for infrastructure projects on the island.

Airport Kiribati Authority (AKA) is a state-owned enterprise under the Ministry of Information, Communication, and Transport. Established in 2019 under the Airport Act 2019, AKA manages two international airports—Bonriki International Airport in Tarawa and Cassidy Airport in Kiritimati—as well as several domestic airports nationwide. AKA is responsible for site management of Cassidy Airport, overseeing infrastructure and implementing the aviation security standards mandated by the Civil Aviation Authority of Kiribati.

Air Kiribati Ltd (AKL), a state-owned enterprise founded in 1995, serves Kiribati's domestic air service needs with its fleet of two twin otter aircraft. Alongside air operations, AKL handles ground handling operations at Cassidy Airport, including cargo security screening and compliance with destination import obligations.

Central Pacific Producers Ltd (CPPL) is a wholly government-owned fishing industry services company operating in Tarawa and Kiritimati. While it previously exported lobsters to Hawaii from its small processing centre on Kiritimati, it now exclusively serves the domestic market, mainly due to lacking the Hazard and Critical Control Point (HACCP) certification required for export markets.

Private sector operators, including the 13 member companies of Kiritimati's Petfish Operators Association and Skylight Fisheries, which exports lobster and finfish products, are the main users anticipated for a holding and storage facility at Cassidy Airport.

3. Design considerations

This chapter lays out the critical factors, issues, and considerations that will influence the location, design and operation of a marine commodity cargo facility at Cassidy Airport.

3.1. Users

Three primary groups have been identified as main users of a cold storage, packing, and holding facility at Cassidy Airport. These are: (i) the private sector operators that are exporting commodities (e.g., members of the Petfish Operators Association, Skylight Ltd, and CPPL) and who have responsibility for the landside movement of cargo; (ii) Airport Kiribati Authority who has responsibility for site management, including the security of airside operations; and (iii) ground

handlers (e.g., AKL) who have responsibility for cargo screening[1] and the airside movement, loading and unloading of cargo.

3.2. Facilities

Cassidy Airport does not currently receive any cargo flights, and hence all airfreight can be considered to be belly cargo—that is cargo that is carried on passenger aircraft. Best practice guidelines[2] specify that belly cargo facilities typically include (i) a landside area for the loading/unloading of cargo from trucks or vehicles; (ii) a warehouse and office area for processing, inspection, consolidation, and storage of cargo; and (iii) a staging area where cargo is organised for the loading/unloading to aircraft.

3.3. Cargo storage facilities

Cargo facilities should be designed with user needs in mind. During the field mission, interviews with private sector operators revealed their preference to return consignments to their own facilities for storage and repacking if flights are delayed by more than six hours. Various cargo storage options were discussed with stakeholders (see Annex 2):

- **Holding Tanks:** These tanks could enable temporary storage and repacking of marine aquarium fish and live lobsters, including oxygenation for the fish. However, operators expressed reluctance to use holding tanks at Cassidy Airport, preferring to return consignments to their own facilities, which are just 45 minutes away. Hence, there is limited demand for holding tanks at the airport.
- **Climate-controlled warehouses (18°C):** These warehouses could store marine aquarium fish, live lobsters, and fresh finfish packed on ice. Stakeholders unanimously expressed a strong demand for climate-controlled warehouse facilities at Cassidy Airport. These warehouses could also facilitate security screening and export compliance inspections (see Section 3.6).
- **Chillers (5°C):** Chillers offer better storage for fresh finfish packed on ice, maintaining low temperatures to preserve quality. However, consignments would need to be temporarily moved to a climate-controlled warehouse for security screening and export compliance inspections. Exporters of fresh and frozen seafood products expressed demand for chillers at Cassidy Airport.
- **Cold storage (-18°C):** While this option enables long-term storage of frozen finfish or lobster tails, private sector operators indicated no requirement for cold storage at Cassidy

[1] Cargo screening is the process of analysing the contents of a shipment before it is taken onboard a plane, to ensure it is compliant with safety and security regulations. It may take the form of visual inspections or x-ray screening.

[2] ACI. (2021). Developing cargo at airports: How airport operators can develop successful cargo strategies. Prepared by Royal Haskoning DHV for Airports Council International, Montreal, Canada.

Airport. They prefer to move consignments to their own facilities if flights are delayed. However, the potential need to receive and store imported consignments of frozen goods should be considered, along with the potential for future increases in frozen lobster tail production. Nonetheless, there is currently limited demand for cold storage facilities at Cassidy Airport, and chillers are likely to be sufficient for the temporary storage of frozen marine export commodities.

Table 1: Private sector operators' preferences for various cargo storage facilities at Cassidy Airport.

	MAF	Live lobster	Fresh finfish	Frozen seafood
Holding tanks	No	No	No	No
Climate controlled warehouse	Yes	Yes	Yes	Yes
Chiller	No	No	Yes	Yes
Cold storage	No	No	No	No

3.4. Cargo storage capacity

Careful planning and consideration of historical data are crucial to ensure that cargo handling facilities at Cassidy Airport meet both current and future demands. Historical export records obtained from MFMRD were analysed to calculate the mean volume of marine commodity consignments uplifted per flight (Figure 5, see Annex 1 for details on the calculation of consignment volume).

Historically, MAF have constituted the largest volume of marine commodity exports from Kiritimati. While occasional extreme outliers indicate total MAF export volumes reaching 20m^3 on single flights, the typical uplifts have been below 10m^3, with most below 5m^3. Exports of finfish and live lobsters have been even smaller, typically less than 1.5m^3 each per uplift. It is noteworthy that these volumes compete with passenger luggage and other cargo for hold space, particularly given that the Boeing 737 Max 8 aircraft typically operated by Fiji Airways has a maximum hold volume of 43.7m^3.[3]

Personal consignments, though treated as passenger luggage, indicate that market demand for Kiritimati's marine commodities exists, especially in Fiji and Tarawa. Historical quarantine data obtained from MFMRD indicate that, for the majority of fights, the total volume of personal consignments has been below 5m^3. Most commercial exports were destined for Honolulu, while the majority of personal consignments were destined for Fiji and Tarawa, and thus did not compete for cargo space. Instead, these personal consignment data indicate the potential for additional utilisation of Cassidy Airport's proposed cargo facility, beyond the weekly flight to Hawaii.

[3] *Boeing 737 Detailed Technical Data. http://www.b737.org.uk/techspecsdetailed.htm*

Considering historical trends, climate-controlled warehouse facilities of at least 10m^3 would accommodate all marine resource exports from Cassidy Airport. However, to accommodate future production expansion, this volume should be increased. Therefore, based on the historical composition of marine commodity exports, it is recommended to, as a minimum, have a 10m^3 climate-controlled warehouse along with a 10m^3 chiller.

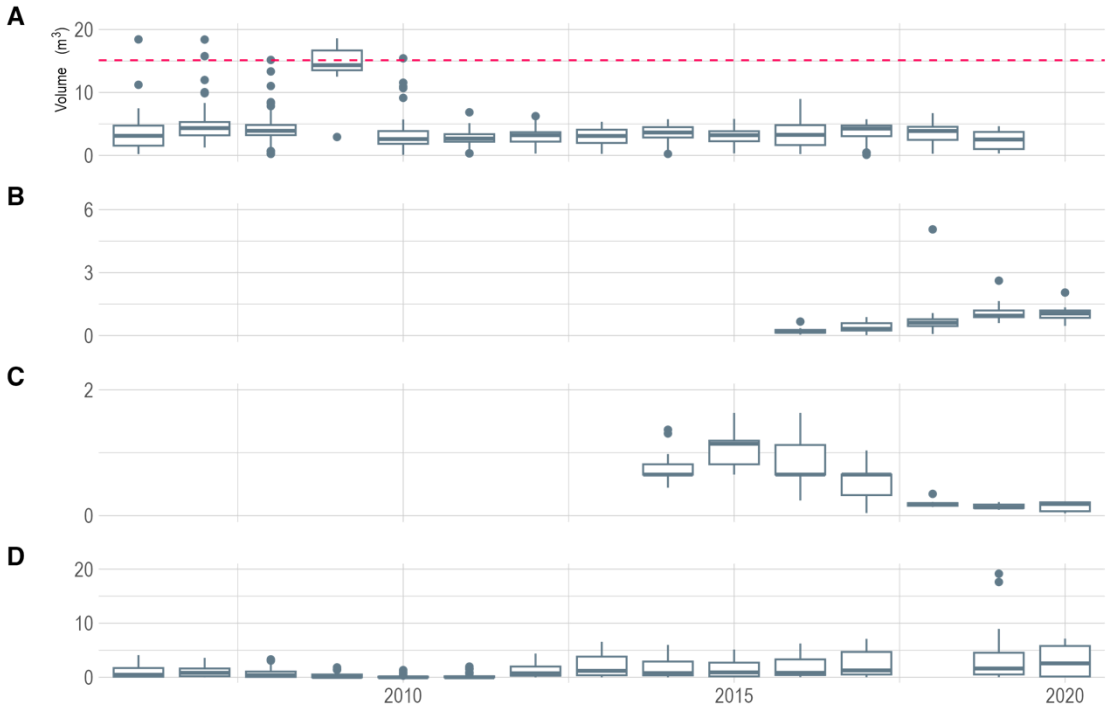


Figure 5: Boxplots illustrating annual trends in the estimated per-uplift volume of consignments for four categories: (A) marine aquarium fish; (B) fresh finfish; (C) live lobsters; and (D) personal consignments. In each plot, horizontal bars represent the mean volume, boxes depict the interquartile range (i.e., 25th and 75th percentiles), whiskers extend to 1.5 times the interquartile range, and individual points denote outliers. For reference, the red horizontal line in chart A signifies the estimated per-uplift consignment volume if all marine aquarium fish operators were to fully utilise an export quota of 1,500 flame angels.

3.5. Landside operations

When planning for a cargo facility at Cassidy Airport, it is crucial to account for exterior requirements on the landside. This includes allocating adequate space for parking, loading, and unloading of vehicles. The allocated space should accommodate the expected number and size of vehicles that will be making deliveries to the facility. Additionally, it is advisable to consider the interaction between freight and passenger traffic, addressing potential congestion issues and implementing effective traffic control measures where feasible.

3.6. Airside operations

The integration of airside operations into a cargo facility at Cassidy Airport would streamline aircraft loading processes and mitigate potential bottlenecks. Ground handling personnel are tasked with several critical steps to ensure compliance with air shipment regulations. This begins with verifying security clearance for the shipments, followed by conducting a thorough ready-for-carriage check. This entails confirming that all shipment details align with the actual goods and ensuring adherence to embargoes and operational restrictions. The overarching aim is to ensure compliance with aviation security protocols, carrier requirements, local export regulations, and destination country import regulations. In Kiritimati, this responsibility primarily falls on AKL, the ground operator at Cassidy Airport, with certain functions, such as export compliance inspections of marine commodities, managed by MFMRD.

Security clearance procedures involve meticulous inspection and screening of consignments. This may entail manual inspection, where individual shipments are opened and examined, or screening via x-ray, metal detectors, chemical trace detectors, or detection dogs.

Presently, Cassidy Airport houses only one x-ray scanner for hold cargo, situated within the passenger terminal building. Therefore, a cargo handling facility at the airport should ideally be situated in close proximity to the terminal to leverage existing screening equipment. Alternatively, additional screening equipment could be acquired and installed within the cargo facility, allowing for streamlined cargo processing while enhancing screening capacity and providing redundancy in case of equipment failures.

Following screening, consignments must be securely stored to prevent tampering or the introduction of restricted materials prior to loading onto aircraft. Hence, secure doorways and physical separation of landside and airside areas is required.

3.7. Utilities

Ensuring the availability of utilities is crucial for the efficient operation of a cargo holding facility. When selecting and evaluating potential locations, it's important to consider the availability of these utilities, as extending utility supplies to new locations can significantly increase development costs. Among the utilities, electricity stands out as the most vital for a cargo holding facility at Cassidy Airport. It is indispensable for powering cooling systems necessary to maintain climate-controlled areas and chillers. Since holding tanks or facilities for breaking down and repacking consignments are not required, the need for water and sewerage utilities is unlikely unless additional amenities such as canteens or washrooms are integrated into the facility design.

3.8. Location and footprint

When preparing a master plan for developing a cargo holding facility at Cassidy Airport, understanding the total land area required is paramount. Total land area encompasses all

functional areas associated with operating an air cargo facility, such as the cargo building itself, vehicle parking and loading areas, and airside marshalling of cargo. Understanding space requirements aids in identifying potential locations that can meet operational needs.

Applying functional area space metrics can be useful in determining the space needed within the total site to achieve a balanced air cargo facility. This can help in determining whether a potential site can accommodate a cargo facility. Best practice guidelines[4] indicate that the total space required for an airfreight cargo facility is comprised of:

- 15 percent for the air cargo building;
- 25 percent for landside operations; and
- 60 percent for airside operations.

It is essential to note that belly cargo facilities, such as those at Cassidy Airport, do not require an airside apron and instead only need airside connectivity to the passenger terminal. Consequently, a ratio of 1.5:2.5 can provide a useful rule of thumb when considering the allocation of space for the facility building and associated landside operations.

From a landside traffic circulation perspective, clear differentiation between vehicles heading to the passenger terminal and those serving the air cargo complex is crucial. This differentiation minimises conflicts and congestion.

When considering potential locations for a cargo facility at Cassidy Airport, the footprint must encompass functional area space requirements, along with additional needs contributing to the total land area. This includes adequate landside space for vehicle parking, loading, and unloading. Consideration should also be given to future needs, including potential expansion of the site.

3.9. Operation and maintenance

Operation and maintenance must be considered when planning for a cargo facility at Cassidy Airport. This includes identifying a designated authority who will manage the facility and ensuring that appropriate institutional mandates are in place. A staffing plan should be drawn up, identifying the personnel and competencies required to operate the facility effectively, and staff recruited and trained as needed. Operational budgets should be prepared, addressing expenditures such as staffing, utilities, and land rent. Consideration could be given to recovering these operational costs, for example via freight fees.

3.10. Other issues

Special considerations must be considered concerning the location of the cargo facility at Cassidy Airport. This is primarily due to its close proximity to flight operations and the associated building

[4] *ACI. (2021). Developing cargo at airports: How airport operators can develop successful cargo strategies. Prepared by Royal Haskoning DHV for Airports Council International, Montreal, Canada.*

regulations governing such areas. Notably, stringent regulations limit the height of any new structures to ensure they do not exceed the height of the existing passenger terminal building.

4. Design options

4.1. Location

Based on the field assessment of the design considerations outlined above, two potential locations for a cargo facility at Cassidy Airport have been identified (Figure 6). Both sites fall within the airport premises and are managed by AKA.

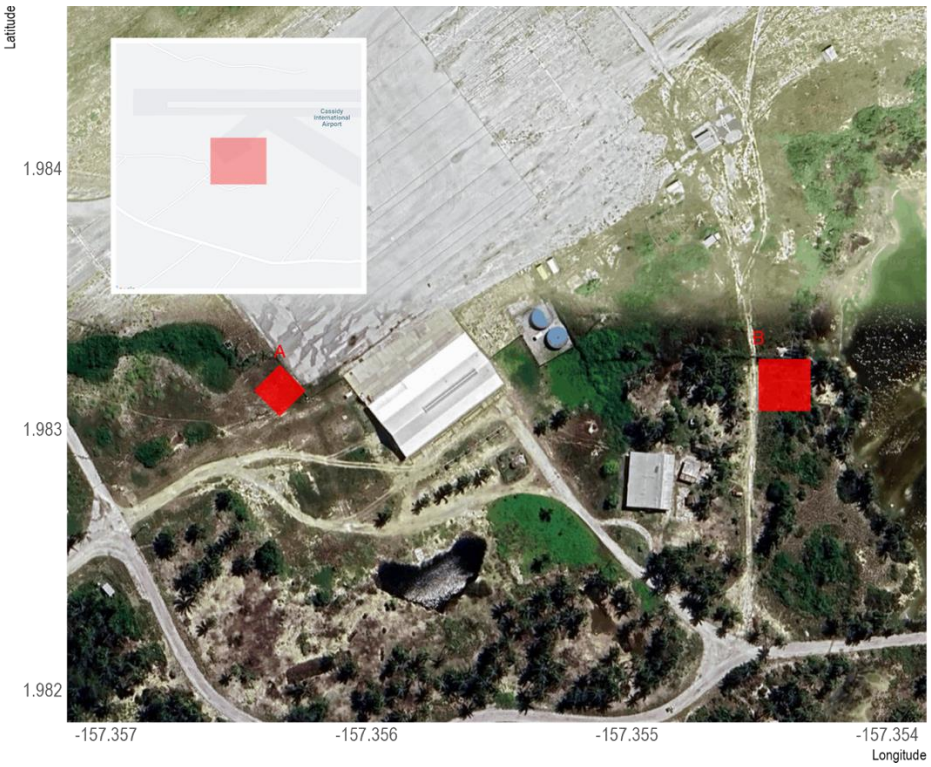


Figure 6: Map of the Cassidy Airport passenger terminal and its surrounding area, indicating the location of proposed cargo facility locations A and B.

Location A

Location A is a proposed site adjacent to the perimeter fence surrounding the apron, positioned just southwest of the passenger terminal at Cassidy Airport. This location presents several advantages:

- **Integration of landside and airside operations:** Situated adjacent to the security fence surrounding the apron, Location A facilitates groundside unloading/loading of cargo in non-secure areas. Incorporating secure doorways into the facility design would allow the passage of cargo from non-secure landside areas to secure airside areas and facilitate

required security screening and inspection processes.

- **Proximity to aircraft and existing screening areas:** Aircraft are loaded/unloaded on the apron just behind the terminal building. With the absence of mechanised ground handling equipment at Cassidy Airport, this location allows for easy transport of cargo to existing x-ray screening equipment within the passenger terminal as well as to the aircraft.
- **Existing access infrastructure:** Location A is adjacent to existing access roads to Cassidy Airport, obviating the need for extending or upgrading road networks. Minimal upgrades and surfacing of the loading/unloading area outside the facility would suffice.

However, Location A also presents some disadvantages:

- **Potential conflict with passenger traffic:** Its proximity to the passenger terminal and public car park areas raises the risk of congestion and conflict with passenger traffic, particularly if high volumes of cargo traffic and deliveries occur.
- **Constrained airside operations:** The limited space inside the security fence impedes marshalling and consolidating cargo in the airside area. This constraint could be alleviated by incorporating dedicated space for airside operations into the facility's design.
- **Limited space for expansion:** While Location A offers current advantages in terms of accessibility and proximity to the terminal, these factors also introduce constraints on future expansion due to restricted space on both landside and airside areas.

Location B

Location B is a proposed site adjacent to the perimeter fence surrounding the airport property, situated at the end of a currently disused service road to the east of the passenger terminal. This location offers several advantages:

- **Separation of passenger and cargo traffic:** Location B segregates passenger and cargo traffic on roads immediately adjacent to the airport, minimising risks of conflict and congestion.
- **Space for future expansion:** Surrounded by large areas of unused land, both inside and outside the perimeter fence, Location B provides opportunities for expansion of both landside and airside operations to accommodate future needs.

However, Location B has its disadvantages:

- **Inadequate access roads:** Developing this location would necessitate resurfacing and widening access roads to accommodate cargo traffic. Land clearing and surfacing would also be required for parking, loading, and unloading of vehicles.
- **Distance to the apron:** Cargo would need to be transported approximately 250 meters

from this location to the apron for aircraft loading. Manual transport of cargo is likely to be inefficient, necessitating the procurement of mechanised ground handling equipment. Additionally, installing x-ray screening equipment within the facility would enable direct movement of cargo to the aircraft for loading, bypassing the terminal building and improving loading efficiency.

4.2. Design

Based on the field assessment conducted, two distinct design layouts are proposed for the cargo facility at Cassidy Airport.

Design A

Design A involves the construction of a purpose-built facility comprising a 10 m^3 climate-controlled warehouse, a 10 m^3 chiller, and a service area for security screening and export compliance inspections (Figure 7). It allows for potential expansion to accommodate additional amenities such as offices, a canteen, and washrooms. The layout features a through-flow design, ensuring clear separation between airside and landside operations to comply with aviation security standards. Ample space is allocated for security screening infrastructure (e.g., x-ray scanners, metal detectors, chemical trace detectors, etc.) as needed.

The advantages of this design include:

- **Integration of airside and landside operations:** Security screenings and export inspections can all be carried inside the facility, and within a climate-controlled environment, while secure doorways ensure a clear separation between air- and landside operations.
- **Energy efficiency:** As a purpose-built structure, insulation and other energy-saving design features can be incorporated into the design, minimising the energy demand for cooling.

However, the design comes with some disadvantages:

- **Development time and cost:** As a permanent structure, land ownership and licensing issues would require careful consideration. Furthermore, the preparation of detailed designs, the sourcing of labour, and the procurement and shipping of construction materials will also influence development time and cost.

The functional footprint of this design is estimated to be 460 m^2, with an additional 750 m^2 of exterior space required landside for parking, loading, and unloading of vehicles.

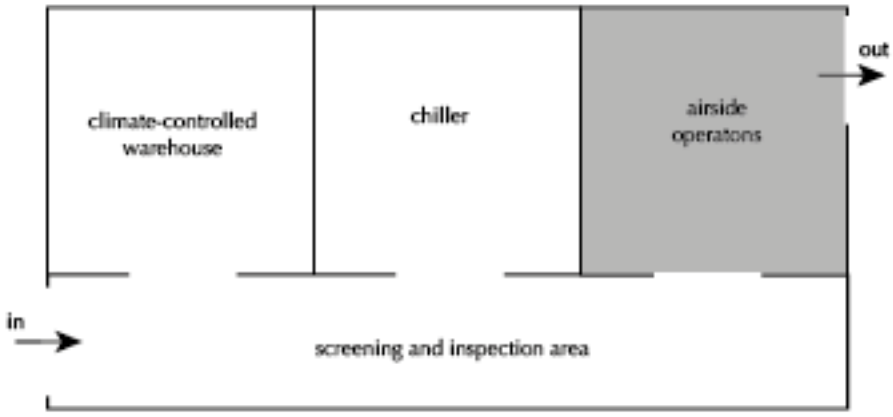


Figure 7: Floor plan of Design A, with grey areas indicating secure airside operations.

Design B

Design B consists of two adjacent 20-foot shipping containers, one climate-controlled and the other refrigerated. Electricity supply is already available near both of the proposed locations (Locations A and B), and water or other utilities would not be required with this design. Each container provides 30 m^3 of internal volume, offering sufficient space for current and projected needs.

The advantages of this design include:

- **Simplified land permitting issues:** As a temporary structure, the development is subject to less stringent environmental permitting and land ownership considerations.
- **Low cost and rapid development:** A temporary structure can be deployed rapidly, with little ground preparation or development cost. Furthermore, layouts can be adapted and/or expanded over time to meet changing needs.

However, the design also brings some disadvantages:

- **Low energy efficiency:** While containers have some built insulation, they work most efficiently when they remain closed for prolonged periods. In contrast, a cargo facility is likely to experience regular traffic, especially just before flights as cargo is delivered, requiring doors to be opened and closed regularly. Cooling efficiency will be affected as doors open directly to the exterior.
- **No integration of airside operations:** Containers do not readily provide for secure separation of airside operations. Consequently, cargo would likely need to be moved to the passenger terminal for screening and transition to the airside.
- **Limited space for inspection and screening:** While it may be possible to conduct security screenings and inspections inside a 20-foot shipping container, careful planning

and optimisation of space would be required to ensure that both tasks can be carried out effectively without compromising cargo storage capacity. Depending on the specific requirements and constraints, alternative arrangements such as using larger containers or separate facilities for screenings and inspections may also be considered. Inspections may also require dedicated areas for examining individual items or packages, as well as space for inspectors to work efficiently. Factors such as lighting, ventilation, and accessibility will also need to be considered to ensure a safe and effective inspection process.

The total functional footprint for this design is 30 m^2,[5] with an additional 50 m^2 of exterior space required landside for parking, loading, and unloading of vehicles.

5. Financial feasibility assessment

The following table summarises the financial feasibility of the Pet fish trade and potentially the farmed giant clam (*T. Maxima*) exporting from Kiritimati using the Cassidy airport proposed facility.

For a detailed explanation on how to interpret the results, please refer to the "Pre-feasibility Study for Supply Chain Development, Economic Viability and CPPL Production Centre Needs Assessment" Report by MEP.

Both the pet fish and giant clam segment exhibit fairly high Internal Rate of Return (IRR)[6] with 20% for the status quo and as high as 26% for the optimistic scenario and with the investment paid back in 4 years and as quick as 3 years under the optimistic scenario. The Pet Fish segment's Net Present Value (NPV)[7] was estimated as a bit more than AUD3 Million while the Giant clam segment show an NPV of AUD140,000 over the same 10-year period. So, in short both prospects look optimistic for opening a new facility at the airport to accommodate those two segments. We observed that in the Pre-Feasibility Study for Supply Chain Development, Economic Viability, and CPPL Production Centre Needs Assessment (Report 1) submitted by MEP, various other potential segments were investigated. At least five segments were identified that target international markets and could potentially utilize the proposed facilities at Cassidy Airport, thus enhancing its management value.

[5] *Assuming two 20-foot containers with external dimensions of 6.10 m x 2.44 m.*

[6] *Internal Rate of Return is a discount rate that makes the Net Present Value of all cash flows equal to zero in a discounted cash flow analysis.*

[7] *Net Present Value determines whether or not an investment, project or business will be profitable down the line. It projects all future cash inflows and outflows associated with investment.*

5.1. Pet fish and other aquarium marine life (export market) - Segment C4.

Table 5-1: Pivot table summarising initial Investments, annual running costs and outputs for the main actors, Harvesters/ Fishers and Processors/ Distributors for the product segment, Pet fish and other aquarium marine life (export market)

Australian Dollar (AUD)	over 10 years	Values in Australian Dollar (AUD)								Output in kg	
Main Centre/ Activity	Nbr of Units	Investment per unit over project dur.	Total Investment over project dur.	Annual cost per unit	Total Annual Cost	Value of cost per kg	Annual Revenue per unit	Total Annual revenue	Value of output per kg	Annual Output per unit (kg/ year)	Annual Output (kg/ year)
Harvest											
Recap	**39**	**20,000**	**780,000**	**12,243**	**477,458**	**765.157**	**16,000**	**624,000**	**1,000.000**	**16**	**624**
Recap	39	20,000	780,000	12,243	477,458	765.157	16,000	624,000	1,000.000	16	624
Investment	**39**	**20,000**	**780,000**	**2,000**	**78,000**	**125.000**					
Equipment	39	16,000	624,000	1,600	62,400	100.000					
Gears	39	4,000	156,000	400	15,600	25.000					
Operating Cost	**39**			**10,243**	**399,458**	**640.157**					
Fuel	39			5,000	195,000	312.500					
Ice	39			168	6,548	10.494					
Oil	39			75	2,910	4.663					
Repairs & Maintenance	39			1,000	39,000	62.500					
Licence	39			1,000	39,000	62.500					
Diving Equipment	39			2,000	78,000	125.000					
Packaging (cartons, bags)	39			1,000	39,000	62.500					
Landings	**39**						**16,000**	**624,000**	**1,000.000**	**16**	**624**
Pet Fish	39						16,000	624,000	1,000.000	16	624
TBA	**39**										
TBA	39										
Processing											
Recap	**13**	**240,000**	**3,120,000**	**1,810,936**	**23,542,163**	**2,902.140**	**1,872,000**	**24,336,000**	**3,000.000**	**624**	**8,112**
Recap	13	240,000	3,120,000	1,810,936	23,542,163	2,902.140	1,872,000	24,336,000	3,000.000	624	8,112
Investment	**13**	**200,000**	**2,600,000**	**20,000**	**260,000**	**32.051**					
Building & machinery	13	200,000	2,600,000	20,000	260,000	32.051					
Operating Cost	**13**			**205,200**	**2,667,600**	**328.846**					
Repairs & Maintenance	13			5,000	65,000	8.013					
Rental	13			5,200	67,600	8.333					
Packaging (cartons, bags)	13			195,000	2,535,000	312.500					
Equipment	**13**	**40,000**	**520,000**	**4,000**	**52,000**	**6.410**					
Pomps, equipment, etc..	13	40,000	520,000	4,000	52,000	6.410					
Admin	**13**			**10,916**	**141,903**	**17.493**					
KIC Insurance	13			1,610	20,930	2.580					
Licence	13			2,173	28,243	3.482					
Taxes	13			7,133	92,730	11.431					
Finance	**13**			**26,000**	**338,000**	**41.667**					
Petty Cash	13			26,000	338,000	41.667					
Labour	**13**			**554,220**	**7,204,860**	**888.173**					
Allowance	13			52,000	676,000	83.333					
Bonus	13			39,000	507,000	62.500					
Entertainment	13			6,500	84,500	10.417					
House Rent	13			13,000	169,000	20.833					
Leave Grant	13			130,000	1,690,000	208.333					
Local Imprest (DSA)	13			1,720	22,360	2.756					
Salaries	13			182,000	2,366,000	291.667					
Packers	13			130,000	1,690,000	208.333					
Supply of raw material	**13**			**624,000**	**8,112,000**	**1,000.000**					
Pet Fish Purchase	13			624,000	8,112,000	1,000.000					
Utility	**13**			**143,000**	**1,859,000**	**229.167**					
Fuel	13			26,000	338,000	41.667					
Electricity	13			52,000	676,000	83.333					
Telecommunication	13			65,000	845,000	104.167					
Office	**13**			**28,600**	**371,800**	**45.833**					
Office Equipment	13			19,500	253,500	31.250					
Office Supplies	13			2,600	33,800	4.167					
Other Expenses	13			6,500	84,500	10.417					
Output Production	**13**						**1,872,000**	**24,336,000**	**3,000.000**	**624**	**8,112**
Pet Fish	13						1,872,000	24,336,000	3,000.000	624	8,112
Logistic	**13**			**130,000**	**1,690,000**	**208.333**					
Transport	13			130,000	1,690,000	208.333					
Marketing	**13**			**65,000**	**845,000**	**104.167**					
Trade Certification	13			65,000	845,000	104.167					

Segment's Financial indicators under 3 Scenarios (Status quo, Pessimistic and Optimistic)

Financial Indicator	Pessimistic Scenario	Status Quo	Optimistic Scenario
IRR over 10 years	14%	20%	26%
NPV over 10 years	1,909,084	3,361,354	4,813,625
Payback period	5 years	4 years	3 years

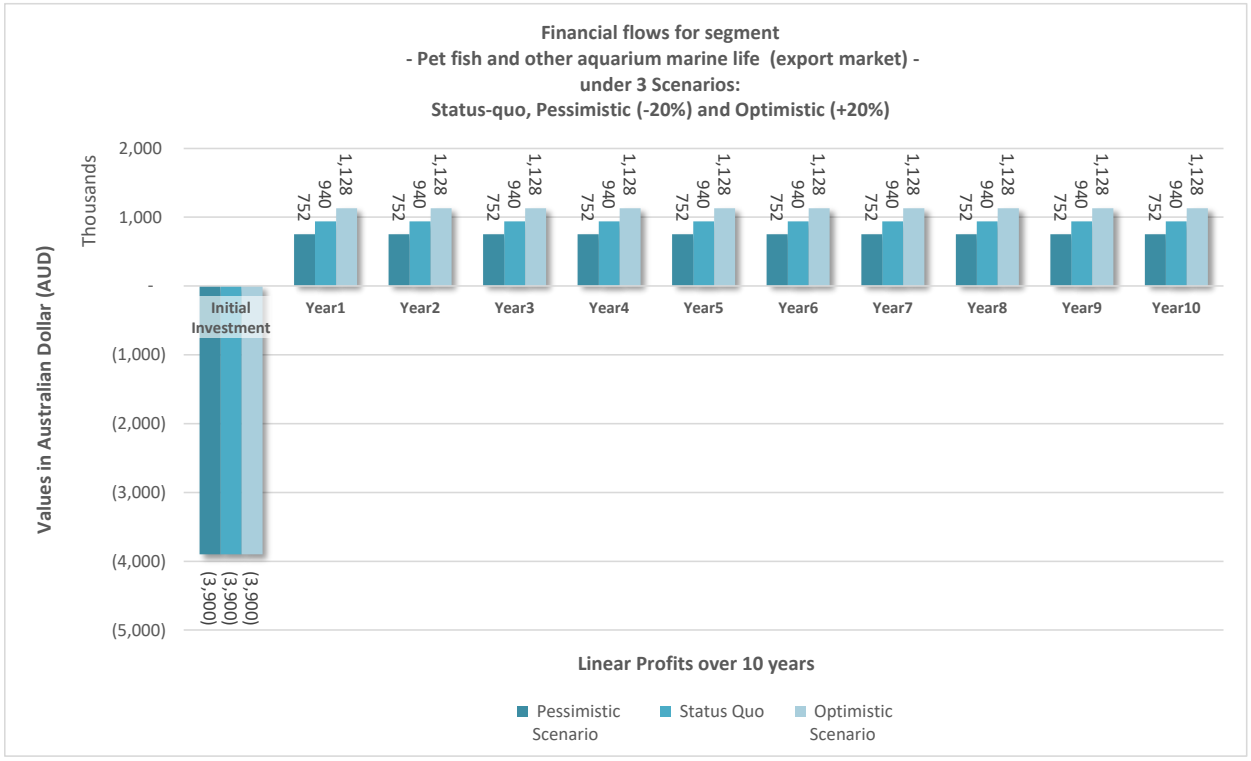


Figure 5-1: Recap of the 3 financial indicators and trend in the financial flows i.e., initial investment and estimated future stream of net revenues under the 3 scenarios (Status quo, Pessimistic and Optimistic) for the segment Pet fish and other aquarium marine life (export market)

5.2. Farmed Giant clam (export market) - Segment C5.

Table 5-2: Pivot table summarising initial Investments, annual running costs and outputs for the main actors, Harvesters/ Fishers and Processors/ Distributors for the product segment, Farmed Giant clam (export market)

Australian Dollar (AUD)

	over 10 years	Values in Australian Dollar (AUD)								Output in kg	
Main Centre/ Activity	Nbr of Units	Investment per unit over project dur.	Total Investment over project dur.	Annual cost per unit	Total Annual Cost	Value of cost per kg	Annual Revenue per unit	Total Annual revenue	Value of output per kg	Annual Output per unit (kg/ year)	Annual Output (kg/ year)
Harvest											
Recap	**10**	**4,400**	**44,000**	**4,231**	**42,310**	**1,952.953**	**4,333**	**43,329**	**2,000.000**	**2**	**22**
Recap	10	4,400	44,000	4,231	42,310	1,952.953	4,333	43,329	2,000.000	2	22
Investment	**10**	**4,400**	**44,000**	**440**	**4,400**	**203.097**					
Equipment	10	4,000	40,000	400	4,000	184.634					
Gears	10	400	4,000	40	400	18.463					
Operating Cost	**10**			**3,291**	**32,910**	**1,519.063**					
Diving Equipment	10			2,000	20,000	923.169					
Fuel	10			1,000	10,000	461.585					
Hook	10										
Cooler/ Ice Box	10										
Oil	10			291	2,910	134.309					
Sinker	10										
Trolling	10										
Wire	10										
Repairs & Maintenance	10										
Landings	**10**						**4,333**	**43,329**	**2,000.000**	**2**	**22**
Giant Clams Juvenile (T.Maxima)	10						4,333	43,329	2,000.000	2	22
Licences/ Permits	**10**			**500**	**5,000**	**230.792**					
Licence	10			500	5,000	230.792					
Processing											
Recap	**1**	**120,000**	**120,000**	**340,559**	**340,559**	**3,143.934**	**379,129**	**379,129**	**3,500.000**	**108**	**108**
Recap	1	120,000	120,000	340,559	340,559	3,143.934	379,129	379,129	3,500.000	108	108
Investment	**1**	**100,000**	**100,000**	**40,183**	**40,183**	**370.956**					
Building & machinery	1	100,000	100,000	40,183	40,183	370.956					
Operating Cost	**1**			**34,885**	**34,885**	**322.048**					
Agency	1			257	257	2.374					
Packaging (cartons, bags)	1			30,000	30,000	276.951					
Rental	1			430	430	3.972					
Repairs & Maintenance	1			4,198	4,198	38.751					
Equipment	**1**	**20,000**	**20,000**	**914**	**914**	**8.440**					
Pomps, equipment, etc..	1	20,000	20,000	914	914	8.440					
Admin	**1**			**10,916**	**10,916**	**100.770**					
KIC Insurance	1			1,610	1,610	14.863					
Licence	1			2,173	2,173	20.056					
Taxes	1			7,133	7,133	65.850					
Finance	**1**			**5,156**	**5,156**	**47.603**					
Bank Loan	1										
DBK Loan	1										
KPF Contribution	1										
KPF Loan	1										
Petty Cash	1			5,156	5,156	47.603					
Labour	**1**			**119,476**	**119,476**	**1,102.963**					
Allowance	1			4,602	4,602	42.481					
Bonus	1			15,330	15,330	141.525					
Crewing	1			41,825	41,825	386.112					
Entertainment	1			1,632	1,632	15.067					
House Rent	1			1,055	1,055	9.744					
Leave Grant	1			22,502	22,502	207.729					
Local Imprest (DSA)	1			1,720	1,720	15.879					
Salaries	1			30,000	30,000	276.951					
Seafare	1			810	810	7.475					
Supply of raw material	**1**			**43,329**	**43,329**	**400.000**					
Giant Clams Juvenile purchase	1			43,329	43,329	400.000					
Utility	**1**			**68,000**	**68,000**	**627.755**					
Electricity	1			30,000	30,000	276.951					
Fuel	1			30,000	30,000	276.951					
Telecommunication	1			8,000	8,000	73.854					
Office	**1**			**2,700**	**2,700**	**24.926**					
Office Equipment	1			1,500	1,500	13.848					
Office Supplies	1			200	200	1.846					
Other Expenses	1			1,000	1,000	9.232					
Output Production	**1**						**379,129**	**379,129**	**3,500.000**	**108**	**108**
Giant Clams (T. Maxima)	1						379,129	379,129	3,500.000	108	108
Logistic	**1**			**10,000**	**10,000**	**92.317**					
Transport	1			10,000	10,000	92.317					
Marketing	**1**			**5,000**	**5,000**	**46.158**					
Trade Certification	1			5,000	5,000	46.158					

Segment's Financial indicators under 3 Scenarios (Status quo, Pessimistic and Optimistic)

Financial Indicator	Pessimistic Scenario	Status Quo	Optimistic Scenario
IRR over 10 years	14%	20%	26%
NPV over 10 years	80,558	141,697	202,836
Payback period	5 years	4 years	3 years

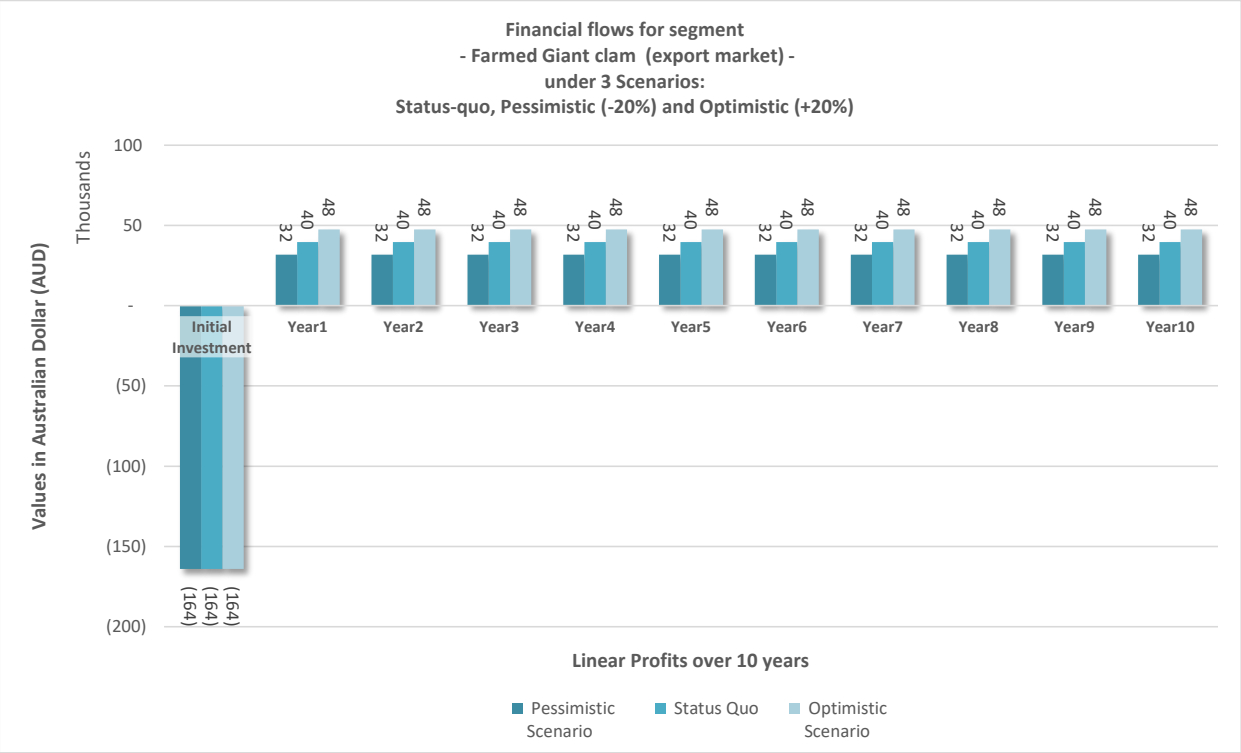


Figure 5-2: Recap of the 3 financial indicators and trend in the financial flows i.e., initial investment and estimated future stream of net revenues under the 3 scenarios (Status quo, Pessimistic and Optimistic) for the segment Farmed Giant clam (export market)

6. Conclusions

6.1. Optimal design

Location A offers greater separation between passenger and cargo traffic and more room for future expansion but requires a greater initial investment in ground preparation and procurement of equipment. Location B provides for closer integration with existing facilities but may face challenges in the future if there is a need to expand.

Design A offers more integration and energy efficiency but requires a higher initial investment and time for development. Design B provides for rapid deployment at a lower cost but may face challenges with space and operational integration. Both layouts have their merits and limitations, and the choice between them is dependent on specific project requirements and constraints.

Given that navigating land permitting requirements can be complex, that the total volume of marine resource exports is projected to remain below 20 m^3 per uplift, and the desire to minimise development cost and duration, the combination of Location A and Design B (Figure 3) appear to offer the best fit for needs in Kiritimati. This combination would allow for cargo facilities to be deployed rapidly while minimising sunk costs. Facilities could be readily adapted over time to accommodate lessons learned and emerging requirements. However, a comprehensive feasibility assessment should be undertaken to confirm these preliminary findings and inform development strategies.

Figure 3: Artist's renderings of the proposed marine commodity holding facility at Cassidy Airport, consisting of two 20-foot shipping containers (Design B) situated to the west of the passenger terminal (Location A).

6.2. Priority actions for developing a cargo facility at Cassidy Airport

This report outlines a pre-feasibility assessment for developing a marine commodity cargo handling facility at Cassidy Airport, identifying possible development avenues and evaluating operational scenarios briefly. To advance the development process, a comprehensive feasibility study is essential. It will validate the development options presented in this report and address outstanding considerations. We recommend the following actions to ensure thorough planning and implementation:

1. **Extend market demand analysis:** While this report bases its market demand analysis on historical data, a forward-looking approach is crucial. Analysing potential growth in marine exports and global market trends will solidify the feasibility analysis presented in this report, ensuring the facility's relevance to future needs.

2. **Conduct a detailed financial analysis:** The preliminary financial assessment presented in this report should be expanded to include a detailed cost analysis covering construction, operation, and maintenance. A comprehensive breakdown of these costs and potential funding sources will clarify the project's financial sustainability.

3. **Review regulatory and compliance needs:** Although this report highlights compliance with export market requirements and local regulations, specific regulatory challenges during development and operation require clarification. A thorough regulatory review, especially concerning environmental impact assessments and international export standards, is

imperative for the facility's compliance.

4. **Undertake a comprehensive risk assessment:** Identifying potential construction, operation, and sustainability risks, alongside environmental, operational, and market-related threats, is vital. This assessment should also propose mitigation strategies to manage these risks effectively.

5. **Assess environmental impact:** The construction and operation of the facility should proceed with a detailed understanding of its potential environmental impact. An environmental impact assessment should be conducted to identify and mitigate any adverse effects on local ecosystems.

6. **Enhance community and stakeholder engagement:** Building on preliminary consultations undertaken during this assessment, a more inclusive stakeholder engagement process is necessary. This will ensure that the views and concerns of local communities and stakeholders are considered, enhancing project support, and understanding.

7. **Detail operational workflow and logistics:** The preliminary facility design considerations presented in this report should be expanded to include an operational plan that outlines internal logistics and workflows, including cargo handling, storage management, and transportation logistics to and from aircraft.

8. **Define institutional arrangements:** Identifying a designated operator for the facility is crucial for assigning responsibility for its operation and maintenance. Ensuring that appropriate institutional mandates are in place will aid in efficiently deploying financial and human resources. A thorough management review should be undertaken to define these needs.

9. **Engage with the airport authority:** Close coordination with AKL is crucial, given its overarching authority over airport operations. Discussions with AKL should initially aim to finalize the proposed location and design of the facility, addressing aviation security and access concerns.

10. **Develop a comprehensive business plan:** Operational and maintenance budgets need formulation, alongside an analysis of cost recovery mechanisms. This will help minimize the commercial facility's financial impact on state budgets.

11. **Prepare the site:** Site preparation, including minor clearing and levelling, is required to facilitate the installation of the facility and to ready parking and unloading areas. This stage may also involve extending utilities such as electricity.

12. **Initiate installation or civil works:** Depending on the chosen design, this step may involve detailed design preparation and civil works for permanent structures or the supply, delivery and installation of shipping containers for a temporary setup.

Given that the development, operation, and maintenance of a cargo facility at Cassidy Airport are secondary to the core mandate of MFMRD, exploring an efficient operating model, possibly a public-private partnership, should be considered to leverage expertise and resources effectively and accelerate the facility development process.

Annex 1. Methodology

To achieve the objectives outlined in the terms of reference, strategies and methodologies were developed in collaboration with the PROP team during the inception phase of the assignment. The MEP team of experts conducted a one-week mission to Kiritimati from January 17th to January 24th, 2024.

Semi-structured interviews were conducted with key stakeholders (see Annex 2), representing the private sector, national and sub-national government agencies, and development partners. These interviews aimed to gain insights into stakeholder perceptions regarding the types and quantities of marine commodity exports from Kiritimati, future trends in marine commodity production, relevant regulatory frameworks, and logistical constraints and opportunities pertaining to exports.

Historical data on the composition and quantity of marine commodity exports were obtained from MFMRD. Additionally, data on the composition and quantity of personal consignments of marine resources exported from Kiritimati were acquired from MFMRD's quarantine division. These datasets were analysed to discern long-term trends in export weights and values for various commodities.

Average export volumes (measured in cubic meters) per uplift were estimated based on the following assumptions:

- **Packaging:** Interviews with private sector operators indicated that 20 kg polystyrene boxes were the most commonly used packaging for exports. Further investigation of packaging suppliers[8] revealed that these boxes have maximum external dimensions of 600 x 400 x 300 mm.
- **Marine aquarium fish:** Based on best practice guidelines,[9] volume estimates assumed (conservatively) that 50 individual fish are packed per 20 kg polystyrene packing container, resulting in a packing density of 695 individuals per cubic meter.
- **Fresh finfish:** Volume estimates assumed (conservatively) that 10 kg of finfish are packed per 20 kg polystyrene packing case, allowing the addition of 10 kg of ice. This equates to a packing density of 139 kg per cubic meter.
- **Lobster:** Based on best practice guidelines, [10] volume estimates assumed (conservatively) that 5 kg of live lobster are packed per 20 kg polystyrene packing

[8] *Examples include packaging sourced from jbpackaging.co.uk (600 x 400 x 290 mm); davpack.co.uk (600 x 400 x 280 mm); and hydropac.co.uk (600 x 400 x 290 mm).*

9 *Wabnitz, C. & Nahacky, T. (2019). Best practices for the collection, transport, holding and export of fish and corals in the aquarium trade. Pacific Community, Noumea, New Caledonia.*

[10] *Jacklin, M. & Combes, J. (2007) The Good Practice Guide to Handling and Storing Live Crustacea. Seafish and Seafood Scotland.*

container, resulting in a packing density of 70 kg per cubic meter.

Site visits were conducted at the Cassidy Airport site to identify and evaluate potential locations for a cargo facility. Preliminary discussions were held with the Kiribati Airport Authority to review proposed options and identify potential constraints.

In this section outlines the methodology for the financial analysis using the VCA model. There are three key financial indicators utilized:

Key Financial Indicators

Pay-Back Period: The time required to recover the initial investment from the net revenue generated.

Net Present Value (NPV): The value of future net revenues in today's terms, considering the investment risk.

Internal Rate of Return (IRR): The rate at which the investment breaks even over time.

Data Collection and Analysis

Data Entry: Costs and revenues for each segment (for fisheries activities) were compiled into Microsoft Excel tables.

Using Templates: Standard templates were used for each segment to ensure consistent data analysis.

Pivot Tables: Excel PivotTables were created to reorganize and summarize the data interactively, facilitating quick understanding of large datasets.

Financial Indicators Explained

Pay-Back Period: Calculated by dividing the initial investment by the annual net revenue. For instance, an initial investment of $100,000 with an annual net revenue of $20,000 results in a pay-back period of 5 years.

Net Present Value (NPV): Determines the present value of future net revenues, incorporating a discount rate that reflects investment risk. Higher discount rates indicate higher risk, reducing the present value of future revenues, while lower rates indicate lower risk, increasing the present value.

Internal Rate of Return (IRR): Represents the annual percentage return expected from the investment, considering both annual net revenues and the initial investment.

Scenarios for Uncertainty

Three scenarios were considered to address uncertainty in future returns:

Status-Quo: Reflects current conditions.

Optimistic: Assumes better-than-expected future returns.

Pessimistic: Assumes worse-than-expected future returns. These scenarios help evaluate the potential range of outcomes and associated risks.

Internal Rate of Return (IRR): Represents the annual percentage return expected from the investment, considering both annual net revenues and the initial investment.

Example Analysis

Analysing the financial performance of a specific fishery segment over ten years involves:

Pay-Back Period: Under the status-quo scenario, the pay-back period might be 5 years; it could be 4 years under the optimistic scenario and 6 years under the pessimistic scenario.

NPV: Higher under the optimistic scenario (lower discount rate) and lower under the pessimistic scenario (higher discount rate).

IRR: Shows a higher return percentage in the optimistic scenario and a lower return percentage in the pessimistic scenario.

Comprehensive Analysis

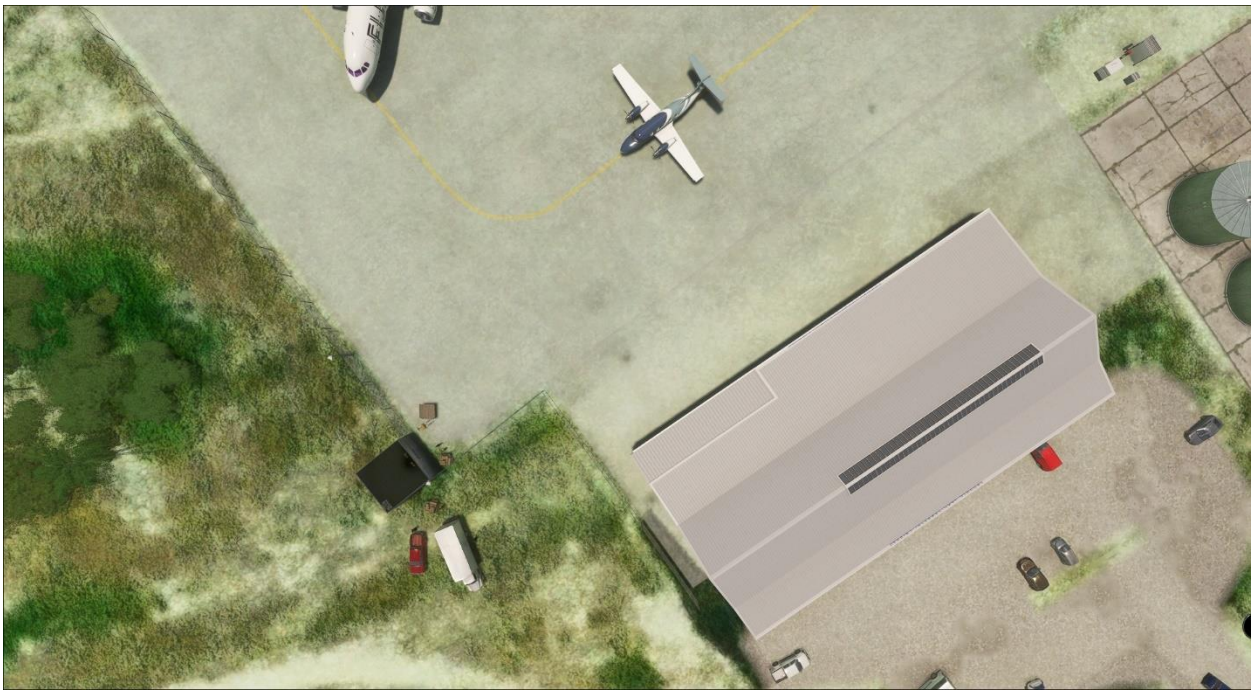
This methodology provides an analysis of each fishery segment's financial performance, considering both risks and uncertainties. Detailed information and results for each segment are provided in Annexe 6 of the Pre-Feasibility Study for Supply Chain Development, Economic Viability, and CPPL Production Centre Needs report.

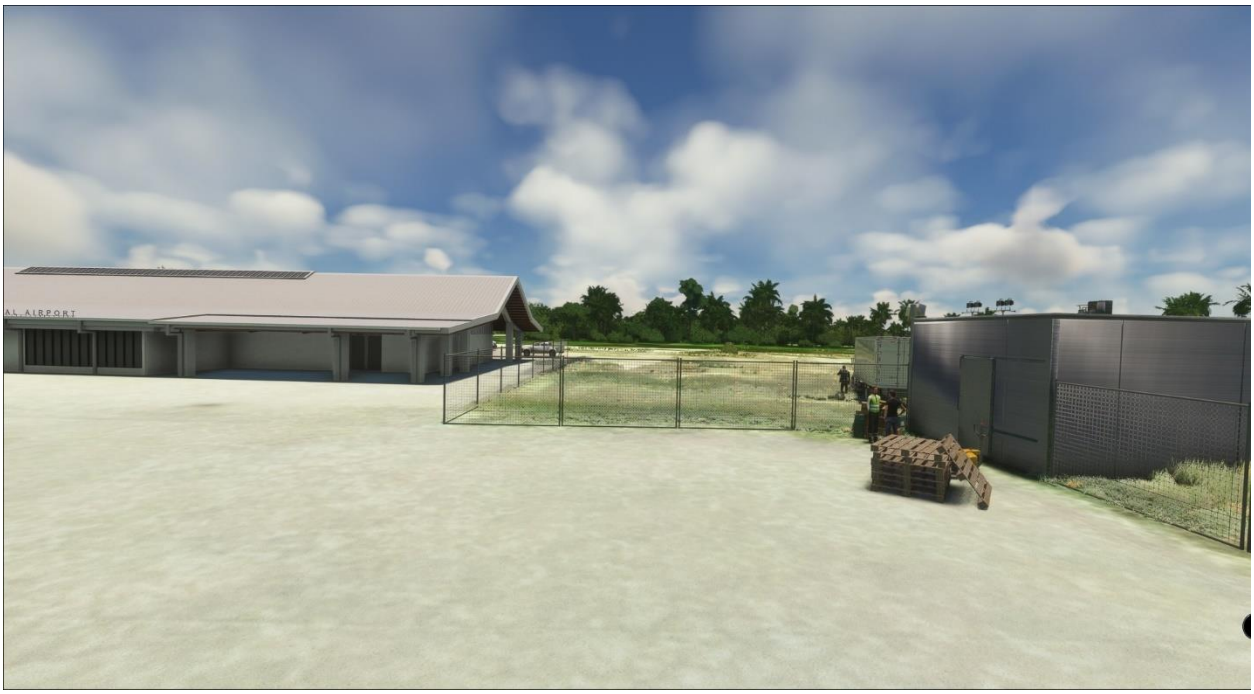
Annex 2. Stakeholders

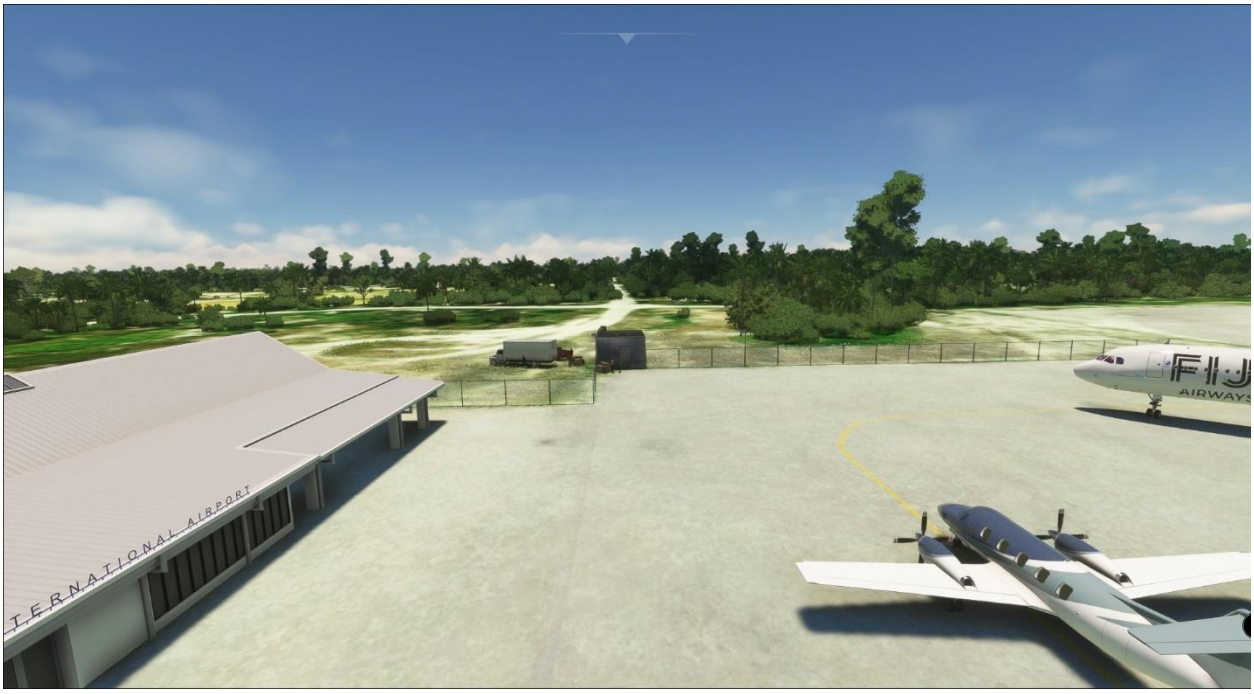
The following table lists the stakeholders that were consulted during the course of this feasibility study, together with an overview of their respective interests in or relationship to the proposed cargo facility at Cassidy Airport.

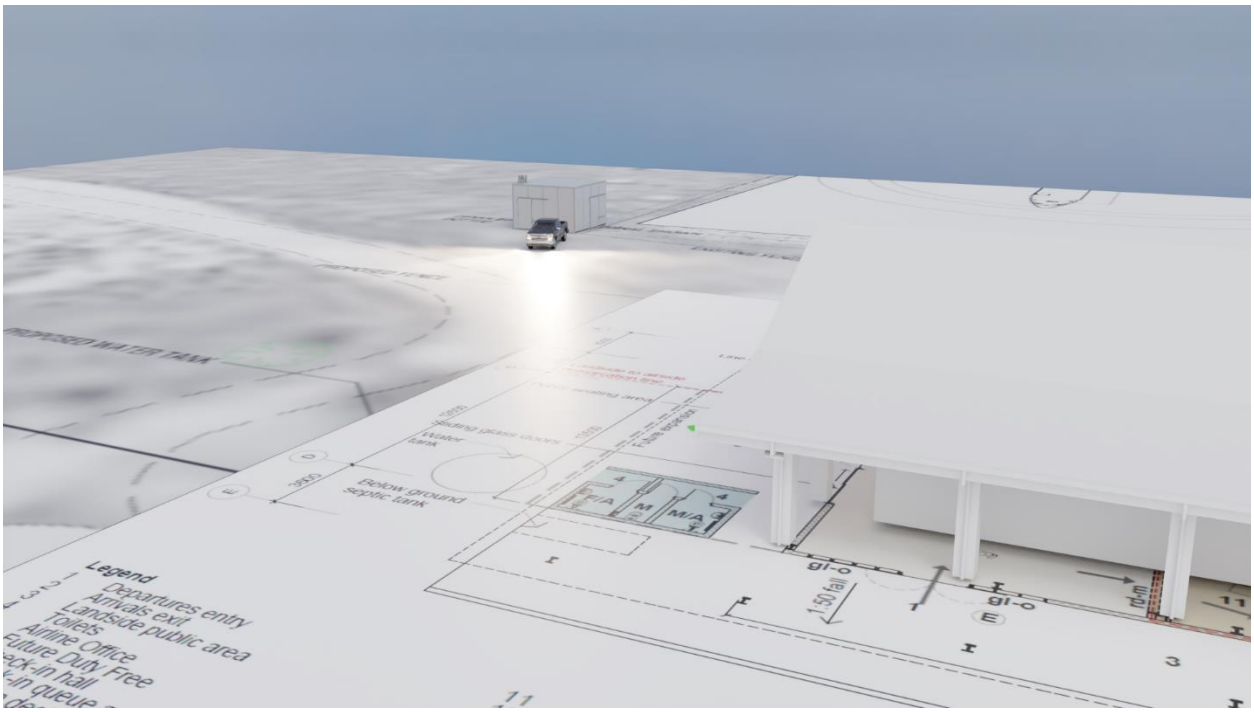
Stakeholder	Interests
Island Council	Responsible for the operation of some public infrastructure (e.g., ice, fuel, etc.); implementation of bylaws (including those related to fishery management and processing); community support; and implementation of business licences.
Marine aquarium fish operators	Direct user of the proposed facility
Skylight Ltd	Direct user of the proposed facility
MELAD	Responsible for environmental impact assessments and the issuance of land permits
Kiribati Airport Authority	Responsible for the operation and maintenance of the Cassidy Airport property, including issues related to aviation security.
Kiribati Port Authority	Responsible for the operation of Ronton marine port and holds information on surface freight trends.
Ministry of Commerce	Responsibilities include industry development, trade promotion, and promotion of product quality and standards
MFMRD	Responsibilities include monitoring and inspection of marine commodity exports.
CPPL	Direct user of the proposed facility
Air Kiribati Ltd	Responsibilities include ground handling and security screening of airfreight
MLPID	Responsibilities include development of the Line Islands and Phoenix Islands

Annex 3. Artist rendering of the proposed cold chamber facilities at Cassidy Airport





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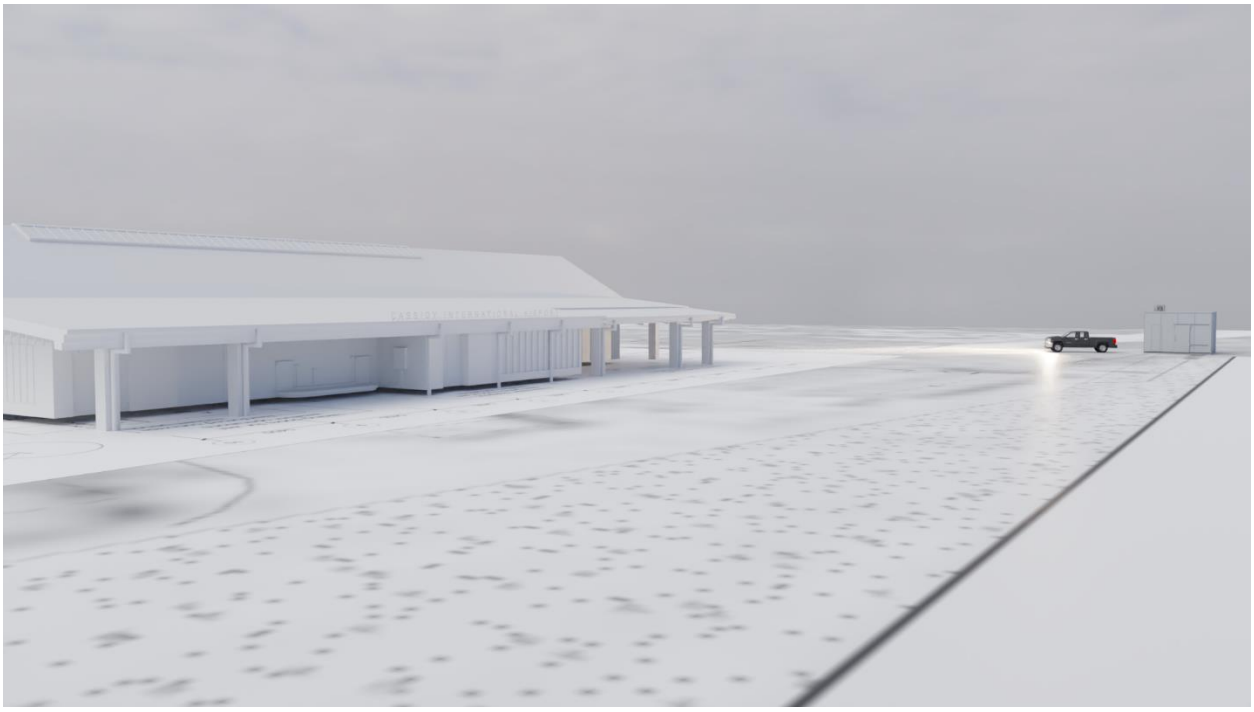
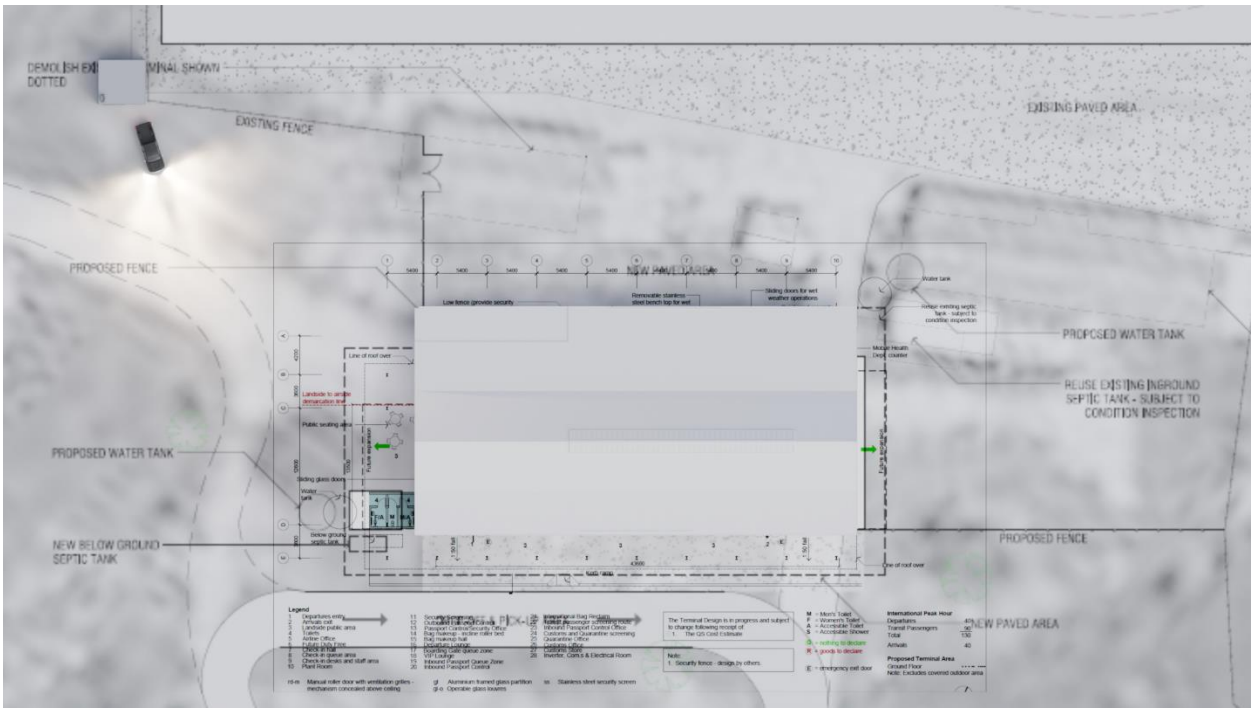
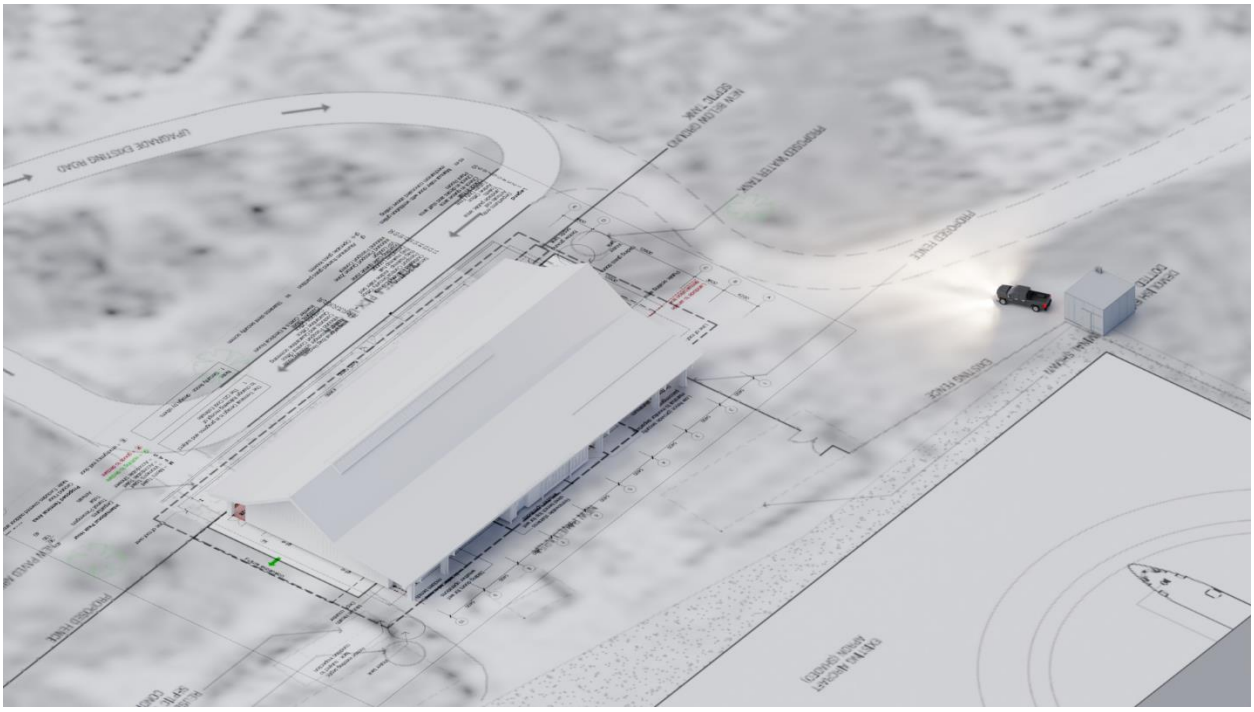
Departures entry
Arrivals exit
Landside public area
Toilets
Airline Office
Future Duty Free
Check-in hall
Check-in queue
Below ground
Septic tank
Water
tank
gl-o
gl-o




DEMOLISH EXISTING TERMINAL SHOWN DOTTED
EXISTING FENCE
EXISTING PAVED AREA
PROPOSED FENCE
PROPOSED WATER TANK
NEW BELOW GROUND SEPTIC TANK
REUSE EXISTING INGROUND SEPTIC TANK - SUBJECT TO CONDITION INSPECTION
PROPOSED FENCE
NEW PAVED AREA

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AIRWAYS


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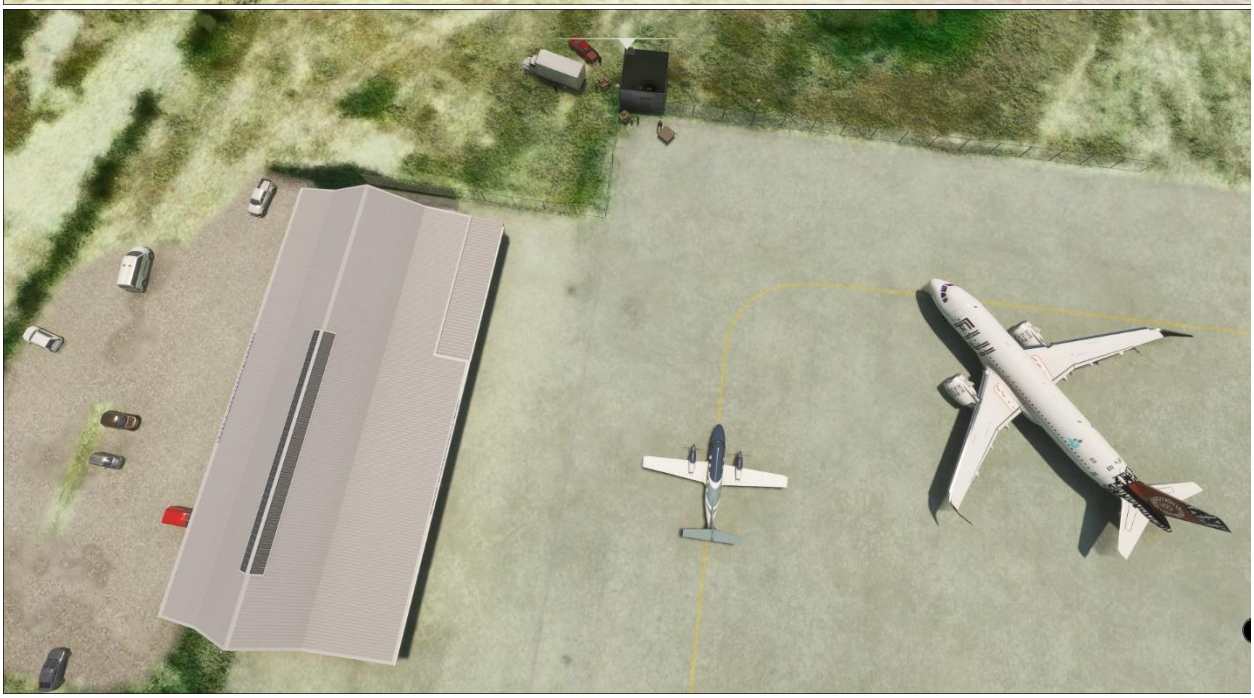

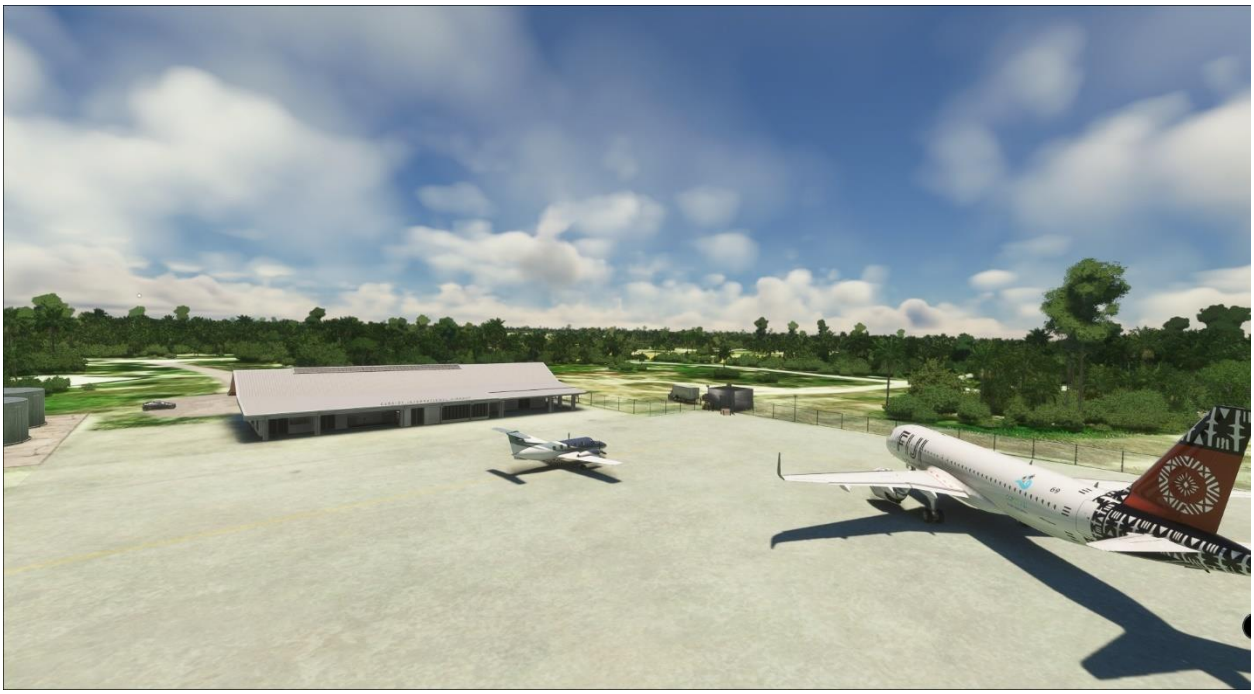


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