MARCH 2014

Taro Airstrip, Choiseul Province

Climate Risk Assessment

Document Tracking

Document title: Taro Airstrip, Choiseul Province: Climate Risk Assessment

Document filepath: Taro Airstrip CCRA v1-0

Date: March 2014

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Approved by:

Document History and Status

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision Type

Distribution of Copies

Revision	Copy No	Quantity	Issued to

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1 Introduction

This climate change risk assessment has been prepared to consider the potential climate change impacts that may affect the operation of the existing Taro airstrip, located in Choiseul Province. The objectives of this report are to:

- Identify and consider the significance of potential climate change risks to the airstrip.
- Provide a discussion on the potential implications of these risks to the ongoing operation of the airstrip.
- Identify any relevant strategies that could be considered to manage any unacceptable risks in future maintenance and rehabilitation activities.

1.1 Description of the Taro Airstrip

Taro airstrip (the project) is located on Taro Island, the provincial headquarters of Choiseul Province. Figure 1 provides an indication of the project location.

Figure 1: Approximate location of the Taro Airstrip

The current airstrip is around 40 years old, and was last rehabilitated in 2011, when resurfacing was completed and minor extensions were undertaken. Currently the airstrip is 860 m in length and can accommodate only short take-off and landing aircraft, typically the Islander and the Twin Otter presently being used by Solomon Airlines. On account of strong passenger demand, consideration is being given to further extending the airstrip to a length of approximately 950 m such that the larger Dash-8 aircraft can use the airstrip and service the Province. Any upgrade to the airstrip to cater for the Dash-8 would also need to consider the airstrip base material, which would likely require strengthening in order to handle the heavier aircraft.

The airstrip is experiencing coastal erosion, at both the northern and southern ends of the airstrip, with active erosion observed behind existing coastal protection rip rap (see plates in Appendix B). The western side of the airstrip is protected by dense buffer of coastal vegetation including mangroves. To the east of the airstrip is the township of Taro, the provincial capital of the Province.

1.2 Approach and Limitations

No existing survey information of the airstrip was available to assist in the development of this risk assessment. For this reason, a site visit was completed on the 2nd and 3rd of December 2013 coinciding with one of the highest astronomical tides, to gauge the current impacts from coastal erosion.

This assessment has been prepared as part of routine asset management monitoring. There are no immediate plans for the upgrade or additional maintenance of the airstrip. As such the assessment is based on risks that could affect the current operations of the airstrip, over the short to medium term, to 2030. Any future plans for upgrading of the airstrip would need to undergo a separate risk assessment based on the plans for that upgrade.

2 Relevant climate considerations and natural hazards

2.1 Introduction

The words hazards and risks tend to be used interchangeably but refer to distinct (though closely related) aspects. Hazard can be defined as: "A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydro-meteorological and biological) or induced by human processes (environmental degradation and technological hazards)" (UN/ISDR 2004).

The occurrence of a given hazard results in a risk situation when assets, human life, socio-economic or environmental values are potentially exposed. The vulnerability of a given population can also influence the level of risk. In some circumstances, multiple hazards can occur simultaneously or as a chain of events (for example storm surge and flooding from extreme rainfall) and can lead to multi-risk situation; this tends to result in the highest damage but is also harder to identify, analyse and prepare for.

The following sections present information on observed and projected climate variables and natural hazards. The majority of weather observations are drawn from the closest weather station to the project area, located on Taro Island. This station unfortunately has only a patchy record from 1975 to 2013, and for some variables the data gaps are significant to the extent that meaningful trends cannot be established. The majority of climate projections and analysis has been drawn from the 2011 *Climate Change in the Pacific: Scientific Assessment and New Research* published by the Australian BOM and CSIRO.

2.2 Observations

Rainfall

Rainfall records from the Taro station do not show any marked seasonality. Records available show a maximum mean monthly rainfall of just over 340 mm in July to a minimum mean monthly rainfall in December of about 200 mm. The maximum one day rainfall at Taro Island was recorded as just over 250 mm in 1979, with an average of around 120 mm over the course of the observation record. As noted above, the record at Taro Island is relatively short, and contains numerous periods of no information, and as such should be read with some caution concerning reliability.

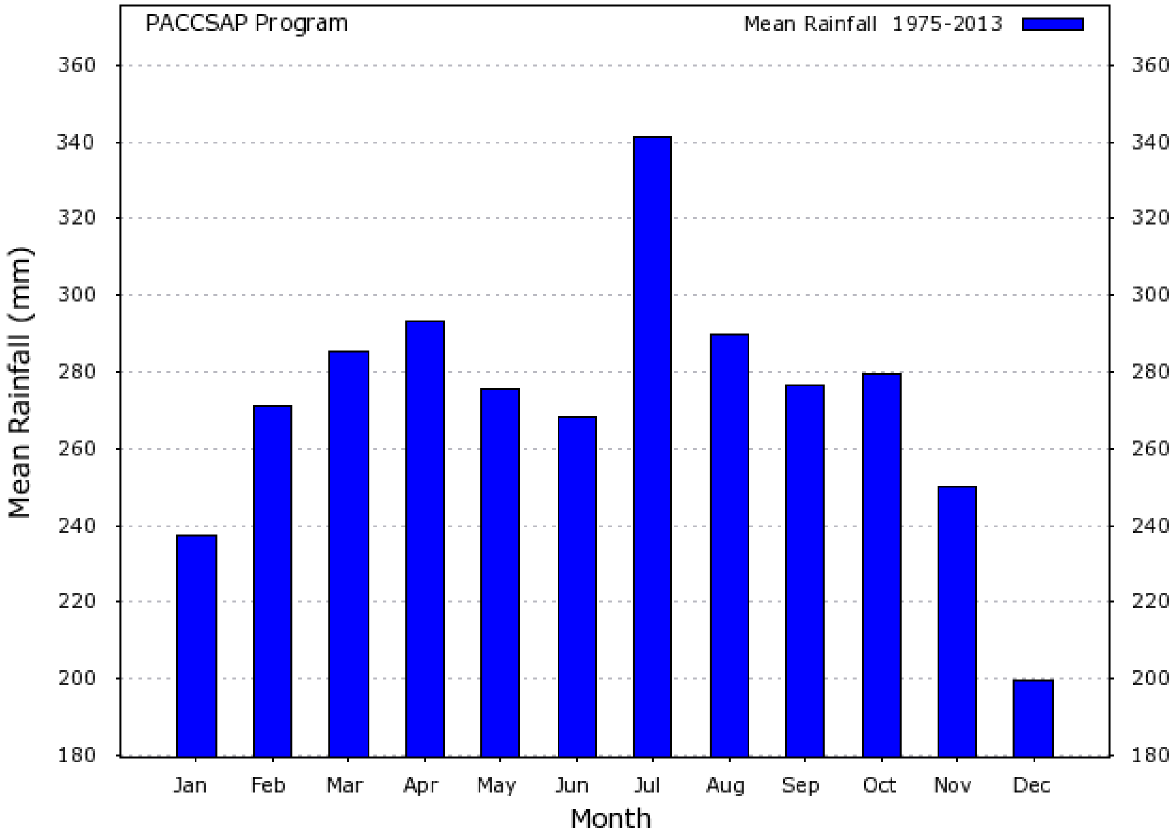

Figure 2: Monthly mean rainfall - Taro Island

Inter annual variability of rainfall is substantial due in large part to the influence of the El Nino-Southern Oscillation (ENSO), a natural climate pattern that occurs across the Pacific. ENSO is characterised by two extreme phases, La Nina and El Nino, as well as a neutral phase. In general terms El Nino events bring warmer, drier wet seasons, whereas La Nina is commonly associated with cooler wetter wet seasons.

Sea Level

The sea-level rise near Solomon Islands measured by satellite altimeters since 1993 is mostly over 8 mm per year (BOM and CSIRO, 2011).

Temperature

Based on observations from Taro Island the temperature is relatively uniform, with an average maximum of almost 31°C and an average diurnal temperature variation of about 6°C. Over the course of the observational record from 1975, a warming trend is evident for the Taro Island station. Daily maximum temperatures have increased at a rate of approximately 0.31°C per decade (BOM and CSIRO, 2013).

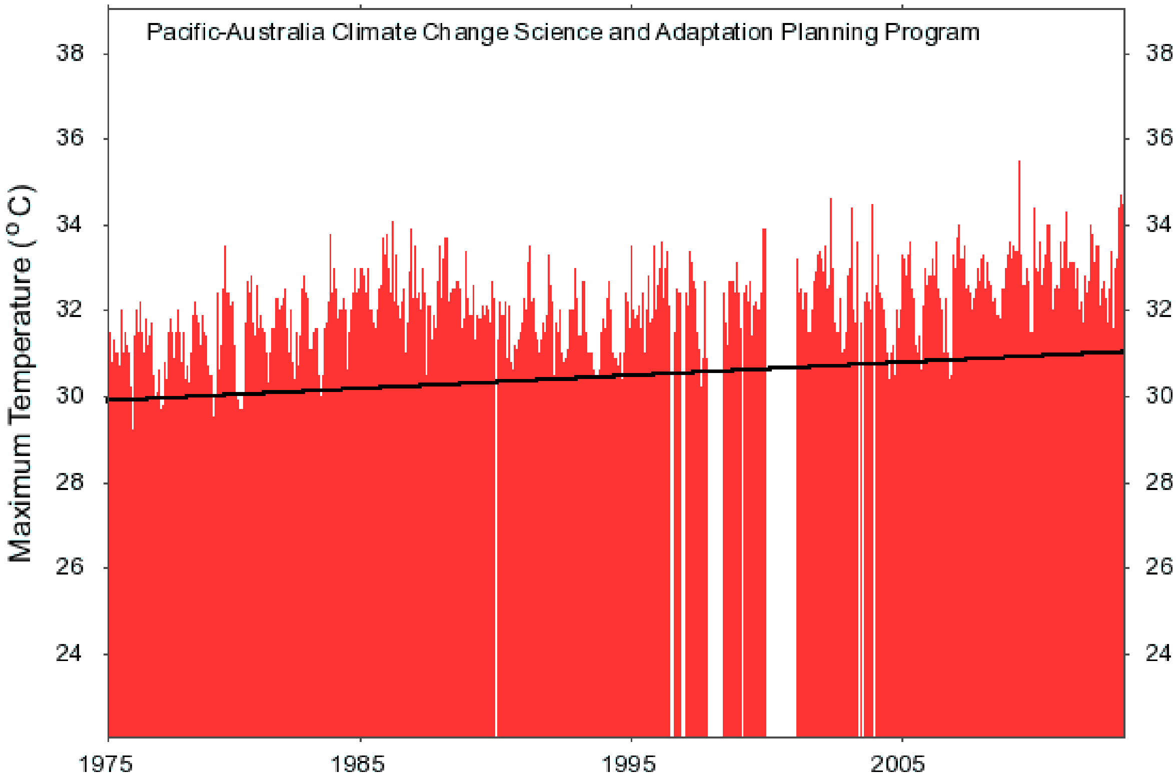

Figure 3: Daily maximum temperatures from Taro Island, showing a linear trend of 0.31℃ per decade

Tropical Cyclones

The window for tropical cyclones in the Solomon Islands is typically between November and April. In the period from 1969 to 2010, 16 tropical cyclones passed within 400 km of Taro Island (BOM and CSIRO, 2011). Historical tropical cyclone tracks to have passed in the vicinity of Taro are shown in Figure 4. Over the period of records, the number of events in any given year as varied from none to three, with a long term average of four cyclones per decade (see Figure 5). Tropical cyclones were most frequent in El Nino years, and least frequent during La Nina years.

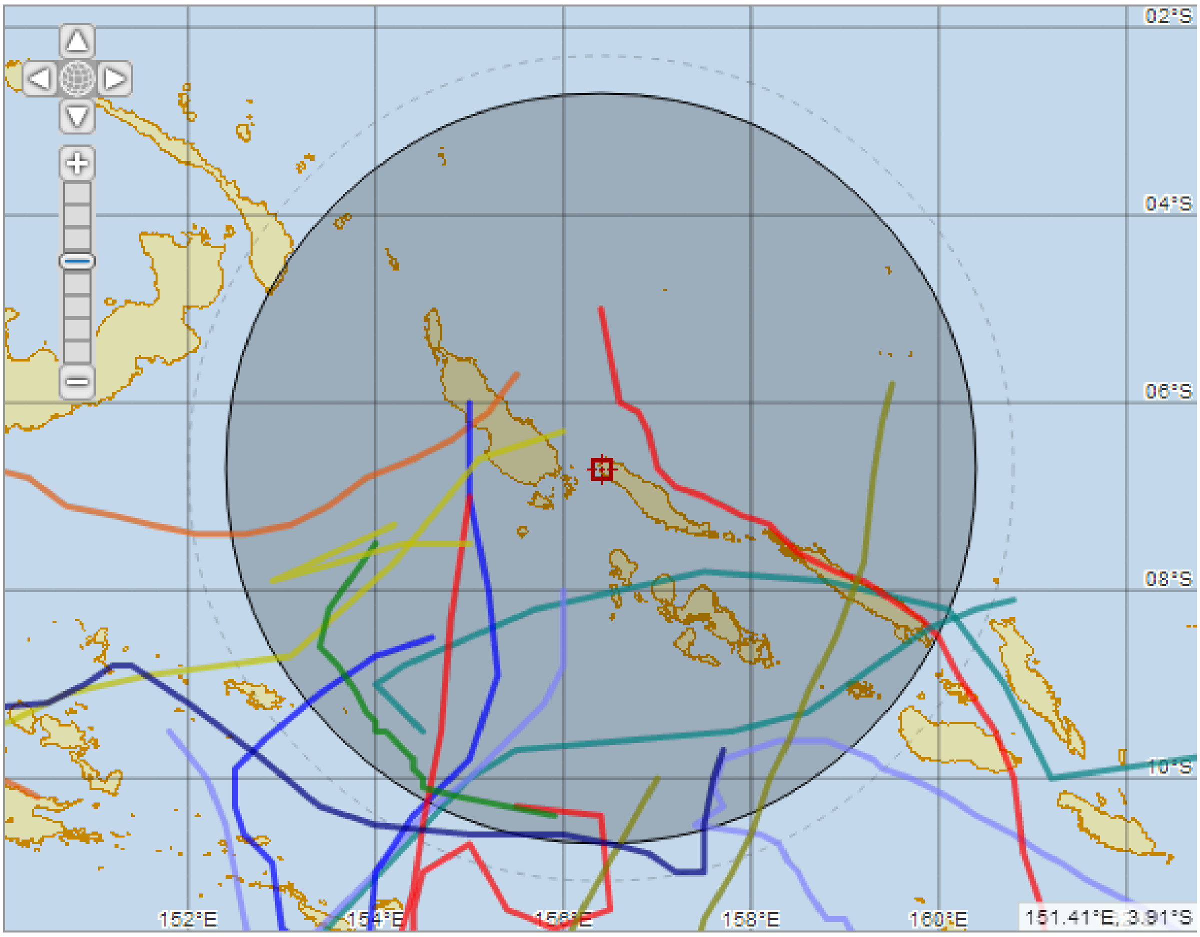

Figure 4: Historical tropical cyclone tracks within 400km of Taro recorded from 1969/70 - 2010/11 (BOM, 2013)

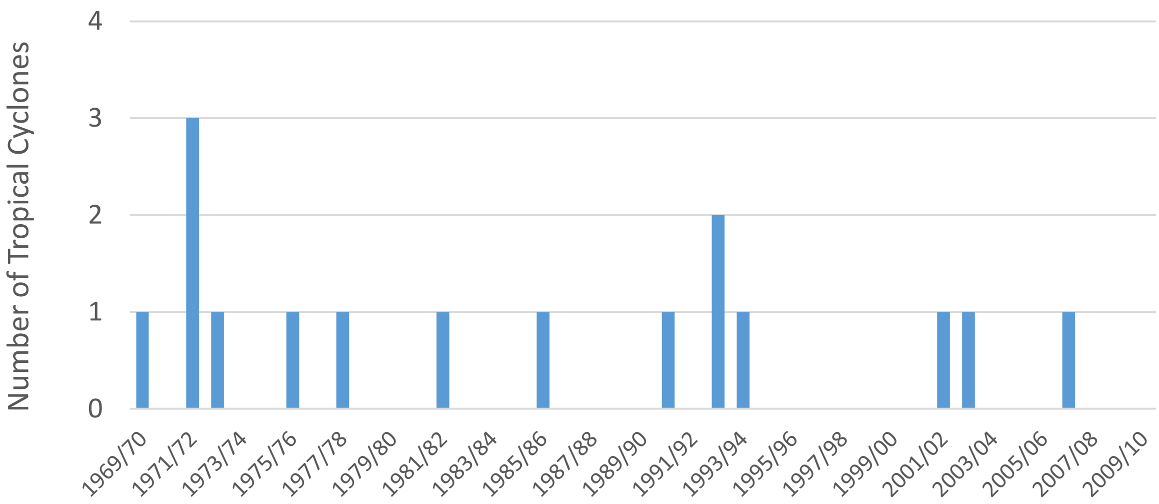

Figure 5: Number of tropical cyclones passing within 400 km of Taro (BOM, 2013)

Significant wave heights

Information on the wave dynamics in the vicinity of Taro Island was obtained from the Climate and Oceans Support Program in the Pacific (COSPPac) Oceans Portal. The wave information is derived from the WAVEWATCH III® wind-wave model. The Centre for Australian Weather and Climate Research ran the model over the period 1979 – 2009. Of relevance to this investigation is the magnitude of significant waves. Significant wave height is the average height (peak to trough) of the upper one third of all waves. For the study area, the mean significant wave height is measured as 1.1 m, with a maximum recorded wave height of 3.5 m. Figure 6 below presents a summary of the wave information obtained from COSPPac for the Taro Island area.

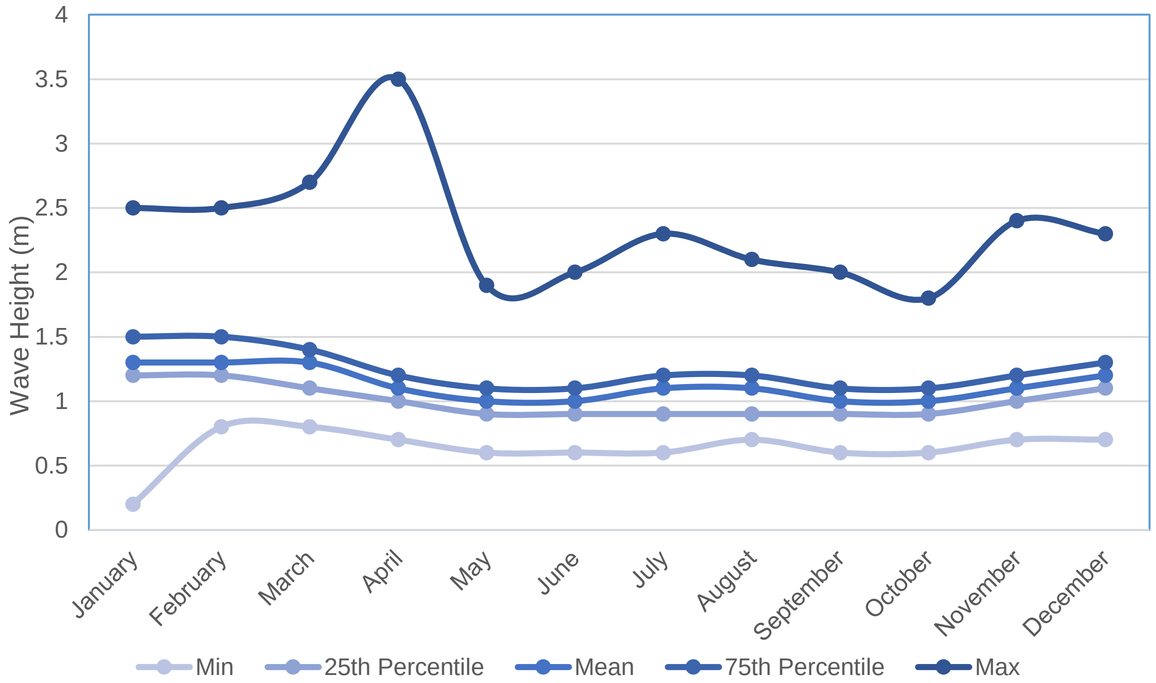

Figure 6: Summary of significant wave height information obtained from COSPPac

The term “storm tide” refers to coastal water levels resulting from the combined effects of astronomical tide and meteorological water level forcing. The meteorological component of the storm tide is commonly referred to as “storm surge” and collectively describes the variation in coastal water levels in response to atmospheric pressure fluctuations and wind setup.

Storm surge is a phenomenon which occurs only during severe weather events and results in a temporary raising of sea level caused by a combination of low atmospheric pressure and onshore wind. Reliable indications of storm surge are not available for the project area. It is known however that shelf conditions that favour high storm surges (wide gently sloping continental shelves) tend to attenuate the influence of waves, whereas the shelf conditions that attenuate storm surge (steep shelf margins) allow a larger contribution of waves (Walsh *et al*, 2012). Anecdotally, the bathymetry of this location would not facilitate large storm surge events, given the steep subsea topography, however surges of up to 1.5 m could reasonably be expected based on second hand observations from comparable locations (Radford and Blong, 1992).

Ocean acidification

Carbon dioxide released into the atmosphere as a result of human activities reacts with sea water to produce carbonic acid. The resulting increase in acidity (measured by lower pH values) reduces the availability of minerals such as aragonite that corals rely on to survive. Over the course of the observational record, aragonite levels have reduced to levels below what is considered optimal for coral growth and the development of healthy reef ecosystems (BOM and CSIRO, 2011). A reduction in the health of reef ecosystems could have implications for coastal erosion on account of a reduction in the ability of reefs to mitigate wave impacts, especially when combined with observed rises in sea level.

2.3 Climate Projections

Rainfall

Based on information from the 2011 BOM and CSIRO report, annual rainfall projections indicate an increase of 2% (+/- 6%)[1] by 2030, and 9% (+/- 12%) by 2090 under a high emissions scenario. Values for the wet season are also projected to increase by 2% (+/- 7%) for 2030 and 9% (+/- 11%) by 2090 under a high emissions (worst case) scenario. Similar increases are also projected for dry season rainfall. There is moderate confidence around these values.

The majority of models project that the current 1-in-20-year extreme rainfall event will occur, on average, three to four times per 20-year period by 2055 and five times per 20-year period by 2090. This means that the 1 in 20 year event is going to increase in incidence to on average 1 in every 4 years by 2090.

In its 2011 discussion paper for the Australian rainfall and runoff climate change workshop, Engineers Australia noted that a number of global-scale observational studies support this projection, showing that even in areas where mean precipitation is not changing, heavy precipitation events are becoming more common (Groisman, Knight *et al*. 2005; Alexander, Zhang *et al*. 2006; Trenberth, Jones *et al*. 2007). The discussion paper notes that much of the increase in extreme rainfall is likely to occur at much finer sub-daily timescales.

Sea Level

Sea levels are expected to continue to rise in the future. By 2030 sea levels are expected to rise by up to 15 cm. By 2090 under a high emissions scenario sea levels are expected to have risen by up to 60 cm (BOM and CSIRO, 2011). There is moderate confidence around these projections.

Ocean acidification

Projections show that ocean acidification will continue to increase over the course of the 21st century, on account of projected increases in atmospheric carbon dioxide. By about 2045 levels of aragonite are projected to be such that conditions for coral growth would be marginal. Projections show continued decline in levels of aragonite beyond this time (BOM and CSIRO, 2011).

Temperature

Annual average temperatures are projected to continue to increase over the course of the 21st century. By 2030 an increase in the annual average temperature of 0.7°C (+/- 0.3°C) is projected. By 2090 the increase is projected to be 2.7°C (+/- 0.6°C) under a high emissions scenario. There is high confidence around these projected values.

Projections of extreme temperatures are not available for 2030, however by 2090 under a high emissions scenario, the 1 in 20 year event is projected to increase by 2.5°C (+/- 1.8°C). There is low confidence around these projections.

Tropical Cyclones

Extreme events like tropical cyclones are rare, which means there is limited data available to make assessments regarding changes in their frequency or intensity. The more rare the event the more difficult it is to establish any long-term trends or changes. Notwithstanding,

[1] The error margin away from the indicated multi-model mean represents approximately 95% of the range of model projections.

drawing on information from a range of sources, the 2011 assessment by BOM and CSIRO indicated with moderate confidence that tropical cyclone numbers are projected to decline in the south-west Pacific Ocean basin during the 21st century. Although there is a projected reduction in total cyclone numbers, the majority of the climate simulations used show an increase in the proportion of the most severe cyclones over this period.

2.4 Summary

Based on the information presented in the previous sections, Table 1 below provides a summary of the key climate variables considered from the observational record, and projected for the future.

Table 1: Summary of observed and projected climate variables

	Historic trend	Projected (2030)	Projected (2090)
Total annual rainfall	Variable (no statistical trend)	↗ +2% (+/- 6%)	↗ +9% (+/- 12%)
Extreme rainfall (daily)	Variable (no statistical trend)	↗ (+15 mm for 1:20 year event)	↗ (+30 mm for 1:20 year event)
Sea level rise	↗ (about 0.8 cm/year)	↗ (up to 15 cm)	↗ (up to 60 cm)
Temperature	↗ (max temperatures up 0.31° C/ten years)	↗ +0.7° C (+/- 0.3° C)	↗ +2.7° C (+/- 0.6° C)
Tropical cyclones	On average, 4 cyclones each decade within 400kms of Taro	↘ (number of cyclones) ↗ (cyclone intensity	↘ (number of cyclones) ↗ (cyclone intensity)
Wave patterns	Historically, mean significant wave heights for the study area are 1.1 m, with a maximum recorded wave height of 3.5 m. There are no future projections of wave heights.		
Ocean acidity (Aragonite saturation[2])	↗ (currently about 3.9)	↗ (about 3.5)	↗ (between 3.2 and 2.8)

3 Sensitivity screening

In the context of climate change, risk sources are the potential impacts resulting from direct changes in the climate and natural hazards patterns (mean and extreme). These changes can be both direct and indirect. Direct changes may include more frequent floods or more intense cyclones. Indirect changes can include, for example, changes to biophysical or socio-economic systems such as environmental degradation leading to increased consequences of natural hazards (e.g. degradation in mangroves and coral reefs leading to more damaging storm surge). Prior to completing the risk assessment for the project, the climate variables and climate driven natural hazards (risk sources) that could impact the project were identified.

3.1 Methodology and results

An initial screening exercise was completed, to investigate the potential sensitivities of the project to climate related hazards. This process looked at the different physical components

[2] Aragonite saturation levels above 4 are considered optimal for coral growth and health reef ecosystems, between 3.5 and 4 adequate, and between 3 and 3.5 marginal. Coral reef ecosystems were not found at aragonite saturation levels below 3 (Guinotte et al, 2003, in CSIRO and BOM, 2011).

of the project, and the services they provide. In this way distinct project elements are established. For the project the following elements are relevant:

- Unsealed runway – The area where the aircraft lands and takes off consisting of a coronus base, which is grassed.
- Airside apron – The area where the aircraft parks after landing to receive cargo and passengers.
- Landside access – The area adjacent to the airstrip where passengers are processed prior to boarding the aircraft.

The results of the risk screening exercise are presented in Table 2, whereby climate driven risk sources are placed in the left hand column, and project elements are located along the top row. Relationships between these two elements were identified, and these relationships form the basis for the risk statements that are considered in the detailed risk assessment. Comprehensive identification is critical, because a risk that is not identified at this stage will not be included in further analysis. Identification should include all risks, whether or not MID can exercise any direct control over them.

Table 2: Risk screening matrix used for the project

		Unsealed Runway	Airside Apron	Landside Access
Sea	Sea level rise	Strong link	No clear link	No clear link
	Storm surge	Strong link	Uncertain or potential	Uncertain or potential
	Surface temperature	Uncertain or potential	No clear link	No clear link
	Ocean Acidity	Uncertain or potential	No clear link	No clear link
Rainfall	Annual average rainfall	No clear link	No clear link	No clear link
	Extreme rainfall events	Uncertain or potential	Uncertain or potential	Uncertain or potential
	Drought	No clear link	No clear link	No clear link
Temperature	Annual average temperature	No clear link	No clear link	No clear link
	Extreme temperature events	No clear link	No clear link	No clear link
Atmosphere	CO_2	No clear link	No clear link	No clear link
Wind	Cyclones	Strong link	Strong link	Uncertain or potential

3.2 Sensitive Project Elements

An initial screening exercise was completed, indicating that the following project elements may be sensitive to climate impacts and climate change:

1. Unsealed runway: Cyclones, extreme rainfall events, sea level rise and storm surge.
2. Airside apron: Cyclones, extreme rainfall events, and storm surge.
3. Landside access: Cyclones, extreme rainfall events, and storm surge.

3.3 Risk statements

Following the completion of the screening process a number of risk statements were developed to respond to the identified sensitivities associated with the project. These risk statements represent potential scenarios that could impact on key project activities, or ultimately the ability of the project to remain in effective service. These risk statements form the basis of the detailed risk assessment for the project.

1. Existing maintenance operations are unable to effectively respond to an increase in debris on the runway/airside apron from tropical cyclone events, including potential more severe tropical cyclones.
2. Continued rise in sea temperatures and increasing ocean acidity reduce the effectiveness of fringing reefs in reducing the impacts from waves on the airstrip.
3. Storm surges, combined with continued sea level rise causes temporary inundation of the runway and other airport facilities.
4. Increase in the frequency and intensity of extreme rainfall causes temporary inundation of the runway and other airport facilities.
5. Continued sea level rise exacerbates coastal erosion causing a reduction in the length of the runway.

4 Risk assessment

4.1 Overview

In its simplest form, probabilistic risk assessment defines risk as the product of the adverse consequences of an event and the probability or likelihood that the event will occur.

Risk = Consequence x Likelihood

For instance, the risk to a bridge from flooding might be calculated based on:

- The value placed on the economic disruption and access to services, and the cost to repair or replace the structure.

Multiplied by:

- The likelihood that the river floods above a certain design level, inflicting damage to the structure and disrupting the local community's economic livelihood, and access to key services.

Hazard, exposure, and vulnerability contribute to 'consequences.' Hazard and vulnerability also both contribute to the 'likelihood': Hazard to the likelihood of the physical event (e.g., the river flooding) and vulnerability to the likelihood of the consequence resulting from the event (e.g., economic disruption).

4.2 Results

For each risk assessed a level of likelihood and consequence is estimated, and the resultant risk level is established. It is important to note that the risk assessment for the project is based on a business as usual specification, or current operations. The complete risk assessment for the project, including the descriptors for determining the likelihood and consequences of the identified risk statements is presented in Appendix A.

The analysis indicated that there are no Extreme or High risks. The breakdown of the risk levels is identified in Table 3.

Table 3: Risk levels identified as a result of the risk assessment

Calculated Risk Level	Number of Risks
Extreme	0
High	0
Medium	4
Low	1

4.3 Risk Evaluation

The *MID Transport Sector Climate Adaptation Guidance Manual* stipulate different management actions depending on the level of risk identified. The level of risk and corresponding response are represented below:

Table 4: Levels of risk, and required responses

Level of Risk	Required Response
Low	- Low risks should be maintained under review but it is expected that existing controls should generally be sufficient and no further action should be required to treat them unless they become more severe. - These risks can be acceptable without treatment.
Medium	- Medium risks could be expected to form part of routine operations but they should be assigned to relevant managers for action, maintained under review and reported upon at middle management level. - These risks are possibly acceptable without treatment.
High	- High risks are the most severe that can be accepted as a part of routine operations without MID sanction but they should be the responsibility of the senior operational management and reported upon to the Director. - These risks are not acceptable without treatment.
Extreme	- Extreme risks demand urgent attention at the most senior level and cannot be simply accepted as a part of routine operations without MID sanction. - These risks are not acceptable without treatment.

There are no key issues to emerge from the risk assessment (high risk issues), although four risks were identified as Medium. Even though these risks are acceptable without treatment, it is recommended that ongoing monitoring of these risks, as part of the routine asset management activities be carried out. Furthermore consideration should be given to reviewing the results of this assessment periodically to ensure that the risk levels are still acceptable.

The airstrip is bordered on the western side by a dense vegetation buffer that provides some protection from coastal erosion. It is important that consideration be given to protecting this area in the future such that it can continue to offer protection to the airstrip. The risk assessment found that existing coastal erosion at the northern and southern ends of the airstrip are not adversely affecting the operation of the airstrip, however would likely have implications should the airstrip be upgraded to be able to cater for larger aircraft like the Dash-8. Were this to occur, coastal protection like that installed at the recently completed Nusatupe airstrip could be considered.

5 References

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Appendix A - Risk Assessment

Table 5: Risk matrix used as part of the MID climate risk assessment process

		Consequences				
		Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Likelihood	Almost certain (5)	Medium (5)	Medium (10)	High (15)	Extreme (20)	Extreme (25)
	Likely (4)	Low (4)	Medium (8)	High (12)	High (16)	Extreme (20)
	Possible (3)	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
	Unlikely (2)	Low (2)	Low (4)	Medium (6)	Medium (8)	Medium (10)
	Very Unlikely (1)	Low (1)	Low (2)	Low (3)	Low (4)	Medium (5)

Table 6: Details for different likelihoods used in the risk assessment

Descriptor	Recurrent risks / Single events
Very Unlikely	Recurrent Events: Unlikely during the next 25 years. Single Events: Negligible / Probability very low Probability: < 15%
Unlikely	Recurrent Events: May arise once in 10 years to 25 years. Single Events: Unlikely but not negligible / Probability low but noticeably greater than zero. Probability: 16%−35 %
Possible	Recurrent Events: May arise once in 10 years. Single Events: Less likely than not but still appreciable Probability: 36%−59%
Likely	Recurrent events: May arise about once per year. Single events: More likely than not Probability: 60%−84%
Almost Certain	Recurrent events: Could occur several times per year. Single events: Noticeably more likely than not Probability: > 85%

Table 7: Descriptions of different consequence levels utilised for the risk assessment

Consequence	Description
Insignificant	Infrastructure: No infrastructure damage. Financial Loss: Asset damage < $ 100K. Reputation: Some public awareness. Livelihoods: Negligible or no impact on the livelihood system. Health/Safety: Negligible or no changes to the public health profile or fatalities as a result of extreme events. Industry: Any impacts can be absorbed within existing systems.
Minor	Infrastructure: Localised infrastructure service disruption / No permanent damage / Some minor restoration work required. Financial Loss: Asset damage between $100K and $500K. Reputation: Some adverse news in the local media / Some adverse reactions in the community. Livelihoods: Isolated and temporary disruption to an element of the livelihood system. Health/Safety: Slight changes to the public health profile or isolated increases in fatalities as a result of extreme events. Industry: Isolated and temporary disruption to a key economic element.
Moderate	Infrastructure: Widespread infrastructure damage and loss of service / Damage recoverable by maintenance and minor repair / Partial loss of local infrastructure. Financial Loss: Asset damage between $500K and $2 million. Reputation: Adverse news in media / Significant community reaction. Livelihoods: Localised and temporary disruption to an element of the livelihood system, leading to the requirement of supplemental inputs. Health/Safety: Noticeable changes to the public health profile or localised increases in fatalities as a result of extreme events. Industry: Short-term and localised disruption to a key economic element.
Major	Infrastructure: Extensive infrastructure damage requiring extensive repair / Permanent loss of local infrastructure services. Financial Loss: Asset damage between $2 million and $5 million. Reputation: Damage to reputation at national level; adverse national media coverage; Government agency questions or enquiry; significant decrease in community support. Livelihoods: Widespread and reversible or localised and permanent impacts to core elements of the livelihood system. Health/Safety: Marked changes in the public health profile or widespread increases in fatalities as a result of extreme events. Industry: Widespread and reversible or localised and permanent disruption to a key economic element.
Catastrophic	Infrastructure: Permanent damage and/or loss of infrastructure service / Retreat of infrastructure. Financial Loss: Asset damage > $5 million. Reputation: Irreversible damages to reputation at the national and even international level / Public outrage. Livelihoods: Core elements of the livelihood system are permanently impacted. Health/Safety: Substantial changes to the public health profile or substantial increases in fatalities as a result of extreme events. Industry: Widespread and permanent disruption to a key economic element.

#	Risk Statement	Risk Level	Score	Consequence	Consequence Statement	Likelihood	Likelihood Statement
1	Existing maintenance operations are unable to effectively respond to an increase in debris on the runway/airside apron from tropical cyclone events, including potential more severe tropical cyclones	Medium	9	Moderate	Debris from cyclone events could temporarily disrupt the operation of the airstrip, and require maintenance and minor repair. Such maintenance is expected to be possible through existing equipment and maintenance arrangements. Disruptions would be expected to be temporary.	Possible	Historically four cyclones have passed within 400 km of Taro Island per decade. Substantial debris would likely only impact the airstrip from cyclones passing within closer proximity to the airstrip. On this basis, and noting that cyclones frequencies are projected to reduce, the likelihood of this risk is identified as possible.
2	Continued rise in sea temperatures and increasing ocean acidity reduce the effectiveness of fringing reefs in reducing the impacts from waves on the airstrip	Low	4	Minor	A reduction in the ability of fringing reefs to mitigate the impact of waves could worsen the rate of erosion, particularly at the northern and southern ends of the airstrip. Such impacts would likely require minor restoration work, but is not expected to impact on the ability of existing aircraft to use the airstrip.	Unlikely	Although observed trends and future projections indicate impacts on coral reefs can be expected, by 2030, these impacts are not expected to materially affect the wave dynamics affecting Taro Island.
3	Storm surges, combined with continued sea level rise causes temporary inundation of the runway and other airport facilities	Medium	9	Moderate	Temporary inundation of the airstrip as a result of storm surge would result in short term disruption to the operation of the airstrip while water recedes, and maintenance activities are carried out.	Possible	Historically four cyclones have passed within 400 km of Taro Island per decade. Storm surge would likely only impact the airstrip from cyclones passing within close proximity to the airstrip. On this basis, and noting that cyclones frequencies are projected to reduce, the likelihood of this risk is identified as possible.
4	Increase in the frequency and intensity of extreme rainfall causes temporary inundation of the runway and other airport facilities	Medium	8	Minor	The current airstrip has good cross fall and drainage characteristics. Heavier rainfall events projected would likely be accommodated by existing drainage facilities but could result in some localised service disruption.	Likely	Rainfall projections indicate an increase in the frequency and intensity of rainfall events. It is more likely than not that these events could result in temporary inundation of the airstrip.

#	Risk Statement	Risk Level	Score	Consequence	Consequence Statement	Likelihood	Likelihood Statement
5	Continued sea level rise exacerbates coastal erosion causing a reduction in the length of the runway	Medium	10	Minor	An increase in sea levels, worsening existing erosion impacts would likely require minor restoration work, but are not expected to impact on the ability of existing aircraft to use the airstrip.	Almost Certain	Given the historical trends in sea level rise and future projections it is almost certain that existing coastal erosion will worsen by 2030.

Appendix B - Plates

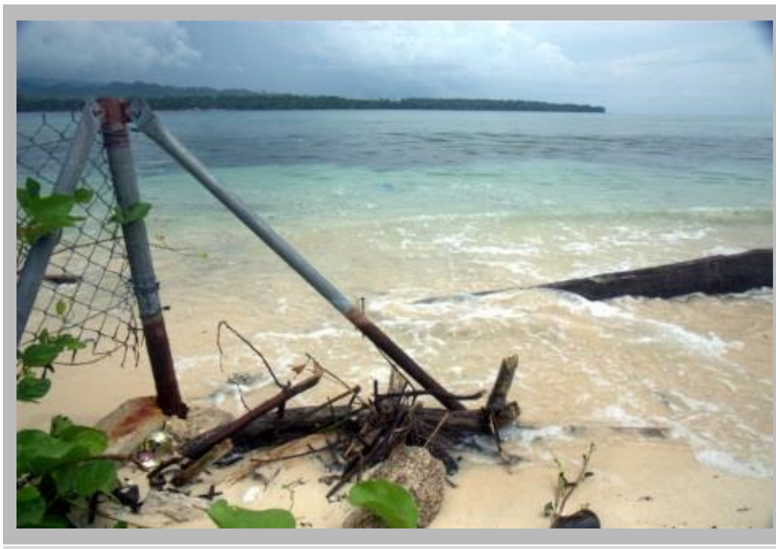

Plate 1: South eastern corner of Taro airstrip at high tide.

Plate 2: Looking south along the western side of Taro airstrip, in the foreground waves are breaking over existing coastal protection rip rap, and in the background the vegetated buffer along the western side of the airstrip can be seen.

Plate 3: Northern western corner of Taro airstrip at high tide. Note active erosion behind existing coastal protection rip rap.

Plate 4: Western side of Taro airstrip, showing an example of mangroves in sandy areas at low tide.

Plate 5: Northern end of Taro airstrip at low tide. Note active erosion behind existing coastal protection rip rap.

Plate 6: Northern end of Taro airstrip at low tide. Note active erosion behind existing coastal protection rip rap.

Plate 7: Southern end of Taro airstrip, at high tide

Plate 8: Taro airstrip looking north

Plate 9: Contextual example of newly installed coastal protection - geotextile bags filled with sand at the Nusatupe airstrip.