Initial Environment Examination Report

Project Number: 48271-001
July 2015

PHI: Mactan Cebu International Passenger Terminal Project
(Philippines)

Prepared by Woodfields Consultants, Inc for GMR-Megawide Cebu Airport Corporation and the Asian Development Bank.

Initial Environmental Examination

Executive Summary

Mactan-Cebu International Airport Rehabilitation, Expansion and Operation (Philippines)

July 2015

Prepared for: GMR-MEGAWIDE CEBU AIRPORT CORPORATION

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ISO 9001 : 2008 QUALITY MANAGEMENT SYSTEM

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EXECUTIVE SUMMARY

1. Introduction

The Government of the Philippines through the Department of Transport and Communication (DOTC), in conjunction with Mactan Cebu International Airport Authority (MCIAA) has awarded the Project, titled "Mactan Cebu International Airport Project" to a consortium comprising of GMR Infrastructure Limited and Megawide Construction Corporation, by way of Public Private Partnership (PPP) model on 22 April 2014. To this effect, a 25 year Concession Agreement (CA) has been granted to GMR Megawide Cebu Airport Corporation (GMCAC) a company incorporated by the consortium and registered within the Philippines.

The development works are planned to be executed in two phases: Phase 1 is for the forecasted demand up to the design year 2024, and Phase 2 is for the forecasted demand of up to the design year 2039.

The operations and maintenance of the airport shall be turned over by MCIAA to GMCAC beginning November 2014. Part of the agreement stipulates that the concessionaire shall expand the capacity of the existing airport by building a new passenger terminal (T2) within 3 years and renovating the existing terminal (T1) within 4 years.

2. Brief Description of the Project

The existing airport consists of a passenger terminal building with six aerobridges (serves both the domestic and international flights), a parking bay (425 x 295 m), a parking ramp, two (2) aprons: south apron (250 x 100 m) and north east apron (220 x 95 m), a single runway, and General Aviation.

The increasing trends on the movements of passengers, both domestic and international, provide merits for the expansion of the current capacity of the existing airport by building a new passenger terminal.

By 2024, the domestic flight frequency will increase by 196.5% based on 2014 projections, and by 2039 will further increase to 276.2% based on 2024 projections.

The new passenger terminal will eventually be devoted to international flights while the renovated passenger terminal will serve the domestic flights.

3. Planned improvements for the MCIA

The general plan for the expansion and improvement of the existing airport is summarized as follows:

- Construction of T2, along with all Associated Facilities (such as car park, road network, Commercial Assets, Meeter Greeter Area)
- Renovation and expansion, but not the demolition of T1 and Associated Facilities;
- Complete reconstruction of T2 Apron;
- Capacity Augmentation in accordance with Concession Agreement;
- Development of adequate customer vehicle parking;
- Development of Commercial Assets;

Installation of all required information technology and other equipment for the proper operation and maintenance of the above facilities.

The renovation of the existing terminal (T1) will be completed in 4 years, while the new terminal (T2), will be finished in 3 years, along with the completion of the landside development. The new apron will be completed in 18 months. The development of the project will be spread into two phases: Phase 1 (2014 – 2024) and Phase 2 (2024 – 2039). Phase 1 pertains to all the developments based on the 2024 forecasted demands while Phase 2 is for all further developments based on the 2039 forecasted needs.

The master development plan of the concession is considerably anchored on the air traffic demand forecast. In 2024, the estimated annual passengers for the International and Domestic flights are 4.127 million and 11.654 million passengers, respectively. For year 2039, around 8.068 million passengers in the International flights, and about 20.244 million, for the Domestic flights.

The new terminal building shall be using state of the art technology in three levels keeping in mind the segregation of arriving and departing passengers. Other considerations in the design of the new terminal include, among others: building heights and levels, landside connectivity, passenger flows, baggage flows, provisions for the disabled/ or passengers with reduced mobility and nursing women, as well as baby changing rooms.

The landside development shall comprise of Road network, Car Park, Commercial Assets, Airport Village (Meeter-Greeter Area). Access to the airport shall be enhanced by developing the surrounding road network. For the carpark, the demand is estimated to be at 550 car park slots for design year 2024 and 650 Car park slots for design year 2039.The car parking slots will be completed and commissioned along with New Terminal T2.

4. Environmental and Social Standards, Policies and Regulatory Framework

A review of applicable legal and regulatory standards, both local and international, for environmental and social safeguards, was carried out for the existing terminal. The review also included an audit of the existing terminal's performance in accordance with the 2009 Safeguard Policy Statement (SPS) and social requirements of the Asian Development Bank (ADB), and the performance standards of the International Finance Corporation (IFC).

The operations and maintenance of the airport terminal shall be turned over by the Mactan-Cebu International Airport Authority (MCIAA) to GMCAC, beginning in November 2014, while MCIAA will continue to have responsibility for air side operations.

5. Existing Conditions

Land use. On the north and on the southwest of the airport are two Special Economic Zones. The west side MCIA is dominated by urban/commercial area. On the east and south east side, low level residential land use dominates. A few hundred meters distance on the northeast side of MCIA is the Magellan Bay Area.

Geomorphology. The entire island displays a terrain with elevations ranging from 0 to less than 10 meters above mean sea level (amsl). The whole island is made-up

mainly of hard coralline rocks. The entire landmass belongs to a one-slope category that ranges from 0 to 3%. The entire island has no notable surface water domains that serve as the natural drainage system of the area. The shoreline is generally indicated by numerous raised corals, which makes the tidal inundated area moderately rugged in terrains.

Geology. Only two (2) rock types have been identified in the entire landmass of Mactan Island – the Alluvial deposit and the Coralline Limestone. The relatively porous characteristics of the soil make the runoff smaller around the island as the water more often seeps into the ground surface. While the whole island is basically flat, the ground slopes and its geologic topography are not susceptible to erosion.

Hydrogeology. The main aquifer or water-bearing formation in the entire Mactan Island consists mainly of the limestone unit of the Carcar Formation in a relatively flatter coastal slope. The increasing demand in the water requirements apparently calls for an effective management of the still available groundwater resources in the island as the on-going changes in the groundwater storage of the aquifer has already lead to the apparent deterioration in the quality (saline intrusion) of pumped water because of the reported localized over-abstraction of groundwater in some areas, particularly in the southern section of the island. The main current source for domestic and industrial supply of the island is groundwater through wells and from desalination plants (coastal wells) by private owners for bulk selling. The rest comes from importation of water from the mainland Cebu. Water in MCIA is both being provided by Metro Cebu Water District (MCWD) and Mactan Rock. Groundwater withdrawal had been used by MCWD as early as 1959 but has gradually shifted to surface water lately due to saltwater intrusion. Mactan Rock, the other water provider, uses Reverse Osmosis technology in processing its raw water.

Seismicity. In Cebu Province, most parts of the mainland are seismically quiescent compared to the rest of the Visayas and entire Philippine Archipelago. Existing seismicity records show no sizable earthquake (magnitude $\geq$5) originating within Cebu from 1907 to present. There is no major active earthquake faults have, heretofore been identified in the island.

Terrestrial Ecology. Generally, the Project area is highly built-up with sparse vegetation, primarily for ornamental and/or orchard purposes. The vegetation present is a combination of shrubs, herbs, palms, vines, ferns, and scattered trees. Open spaces are mostly paved for access roads and parking areas with some occupied by grasses and shrubs.

Leading in the list of terrestrial flora species, in terms of their population, include Big-Leaf Mahogany, Neem Tree, Ipil-ipil, Gmelina, and Agoho. Trees are dominant in the study area primarily to provide shade for humans working in the area as well as to important structural and transportation facilities inside MCIA concession. Palms, shrubs, ferns, and other grasses are planted for their aesthetic values. There is no endemic species in the study area since most of the species recorded are common types of species and can be found all over the country.

In the study area, 2 of the species found were listed under DENR DAO 2007-01 or the "National List of Philippine Plants". It is also noteworthy that these 2 species are included in the IUCN or CITE Appendix II. The two species are Smooth Narra (*Pterocarpusindicus spp. Indicus*) and Manila Palm (*Adonidiamerrilii*). Narra and Manila Palm are considered to be Vulnerable and Near Threatened, respectively.

Oceanography. The nearest water body to MCIA, which also receives the storm drains from the airport, is the Mactan Bay. The current patterns along the coastal region of Mactan Bay are influenced by the tidal force and wind direction with wind speed ranging 2-3 m/s. Current patterns can also be influenced by the temperature gradient through convection below sea surface.

Water Quality. The storm water and STP effluent discharges of MCIA go mainly to Mactan Bay, fronting Barangay Ibo. Baseline analysis of the water quality at Mactan Bay reveals that most of the parameters are within the standard limits for Class SC water of DENR, except for Total Coliform, Phosphate and Copper.

Climate and Meteorology. The climate of Mactan Island belongs to the Type IV of the Modified Coronas Classification of Philippine Climate, which is relatively dry from November to April and relatively wet for the rest of the year. Relying on information from the PAG-ASA and the MCIA, Mactan's average annual rainfall is 1,547 millimeters. The entire island is generally remote from the normal and usual path of tropical cyclones originating from the Pacific Ocean.

Wind Data. Based on meteorological data from PAG-ASA, there are two prevailing wind directions in the area. One direction is the northeast monsoon, which generally blows from November to February. The other is the southwest monsoon, from May to September.

Ambient Air Quality. The results of the baseline ambient air quality survey show that the air quality level (in terms of PM_{10}, TSP, NO_2, SO_2 and CO), in all sampled areas, are within the permissible levels of the DENR standards.

Ambient Noise. Results of the baseline data survey reveal that all of the background noise around the vicinity of MCIA are within the NPCC noise level standards assuming the green/parks and recreation buffer zone surrounding the airport is Class C.

Land area. The area of Lapu-Lapu City is around 6,400 hectares. Lapu-Lapu City is a first class and a highly urbanized city in the province of Cebu. It occupies most of the Mactan Island, and also covers the Olango Island group and a few islets. The city is also part of the Cebu Metropolitan Area.

Population. Lapu-Lapu city has a population of 350,467 (in 2010). The increase in the population count from 2000 to 2010 is translated to an average annual population growth rate (PGR) of 4.91 percent.

Economic Situation of the City. Lapu-Lapu City is a first class and highly urbanized city. Its income is derived from local and external sources. The local sources comprise of tax revenues such as property transfer tax, real property tax, and local taxes and non-tax revenues from regulatory fees, business and service income, and other income/receipts. The external sources of income are share from national tax collection (IRA), other share from national tax collection such as share from economic zones and share from national wealth, and share from government owned and controlled corporations (GOCCs) like PAGCOR and PCSO.

Labor force. Lapu-Lapu City recorded an estimated labor force of 184,232 equivalent to 63% of the total population. By the end of the planning period of City's labor force is projected to reach 334,844.

Livelihood. The main industries serving as a source of livelihood in the area include farming, fishing and manufacturing industries. Lapu-Lapu City also takes pride in its crafts and cottage Industries such as guitar making, lime manufacturing, metal works, furniture making, shell crafts and others.

Indigenous People. Lapu-Lapu City is a highly urbanized area and there are no indigenous peoples, ethnic groups or tribal groups in the project area that fall under the category of indigenous peoples as described in ADB
's SPS Safeguards Requirement 3: Indigenous Peoples.

Health. Based on the Lapu-Lapu City Profile of 2013, there are two government-run hospitals in Lapu-Lapu City. The Lapu-Lapu City Hospital, located at Barangay Gun-ob which is secondary that provides definitive care in the four (4) basic specialties, namely: medicine, surgery, obstetrics, gynecology and pediatrics.
Transportation/Traffic Situation. Based on the Lapu-Lapu City Profile, the total road length of Lapu-Lapu City is 115.757 kilometers and almost 72% are barangay roads. However, most of its roads (52%) are still paved with gravel and only about 7% are concrete. The short Mactan-Mandaue Bridge connects Lapu-Lapu and the rest of Mactan Island with Mandaue on Cebu Island.

6. Environmental and Social Audit Findings and Areas of Concerns

Environmental, health and safety policy. As far as operation and maintenance of the passenger terminals are concerned, there are no expected overlaps in responsibilities between MCIAA and GMCAC. Availability of management plans and system manuals are discussed in the following sections.

a. *Environmental management plan*. MCIA did not have an environmental management plan (EMP) since the start of its operation. As part of the commitment of GMCAC to ensure that the operation of the terminals will not cause any significant environmental issues, a third party contractor (SGS Philippines) was commissioned GMCAC to prepare the EMP which will be implemented at the start of the concession.

b. *Safety management system (SMS) manual*. MCIAA has prepared a SMS manual in January 2011 for the existing terminal, which contains MCIAA's safety policies and objectives, including the company's safety commitment, corporate roles in the SMS, and documentation of aspects concerning safety. The manual provides guidelines on Safety Risk Management, which includes a process on hazard identification, and documentation of hazards and incidents. The manual also details the promotion of safety within the organization. In July 2014, GMCAC issued a new SMS manual, which has minor differences with the earlier SMS (e.g. safety risk management for Aprons). The new SMS ensures conformity with the Civil Aviation Act of 2007 and Doc. 9859 AN/474 Safety Management Manual (SMM) of ICAO.

Emergency preparedness and response plan. MCIAA has an emergency response manual that is maintained by the Crash Fire and Rescue Division, and the Medical Division. The emergency plan contains detailed emergency response procedures on various emergency cases.

Environmental clearance and other pertinent clearances. The existing facility does not have an environmental compliance certificate (ECC) since the project was established prior to the implementation of the Environmental Impact Statement System in the Philippines. The STP of MCIA was issued an ECC by the Environmental Management

Bureau (EMB) Region 7, and is kept and maintained by the Environment Management and Safety Office of MCIAA. Other pertinent clearances that are being maintained are as follows: 1) Discharge permit for the Sewage Treatment Plant (STP), and 2) Permit to Operate Air Pollution Source Equipment.

Environmental Monitoring. A quarterly self-monitoring report (QSMR) for the STP is regularly prepared by MCIAA in compliance to the requirements of EMB based on the STP's ECC terms and conditions.

The existing terminal does not have an environmental monitoring plan, but upon the start of the Concession, GMCAC shall apply the environmental monitoring plan detailed in as stipulated in the new EMP.

Water quality. Water discharge from the sewage treatment plant is being monitored on a regular basis, at least once every month. Previous laboratory analyses show that all parameters monitored are within the DENR permissible level except for COD, which sometimes exceed the effluent standard. To ensure that COD will comply in future monitoring, MCIAA will make sure that all the equipment are well maintained.

Ambient Air Quality. MCIAA, at present, does not have an ambient air quality monitoring plan for the existing terminal, since an EMP was not prepared since the beginning of the terminal's operation.

For the purpose of obtaining a baseline for the ambient air quality, sampling stations were established within MCIA (2 stations), and along the airport's immediate vicinity (3 sampling stations were situated within the nearby residential, commercial, and institutional facilities.

Ecology. There are no critical habitats within the Project area. The Project site has been well developed to cater to the busy activity of incoming and outgoing traffic of planes and passengers. Trees on the landside are managed and maintained for aesthetic purposes.

Solid wastes management (non-hazardous wastes). In the existing terminal, it is the responsibility of each concessionaire to regularly bring their own segregated solid wastes (garbage, trash etc.) directly to the airport's solid wastes staging area. From the staging area, a private hauler collects all the solid wastes, and then transferred to a Materials Recovery Facility. Recyclable materials are recovered and sold to recycling facilities, while materials with high calorific values (such as petroleum-based products) are sent to a cement- processing plant as refuse-derived-fuels (RDF). Biodegradable materials are sent to a composting facility owned by the hauler.

Upon the start of the GMCAC-MCIAA Concession, the management of solid wastes shall be under GMCAC's responsibility.

Hazardous wastes management. Training and awareness campaign on hazardous waste management has been provided to all concerned employees of MCIAA. A temporary storage area for hazardous wastes has been established, but plans for disposal and treatment of stored hazardous wastes (e.g. busted fluorescent lamps) are already under way.

Ambient noise level monitoring. The monitoring of ambient noise level has never been carried out outside the premises of the existing terminal. The environmental monitoring plan for the airport was not available since the start of its operation. Based on the scoping meeting with DENR-EMB Region 7 (for the proposed expansion and

rehabilitation of MCIA), the environmental management and monitoring plans for the existing airport must be prepared as part of the EIA Study for ECC application.

Land acquisition and involuntary resettlement. The new terminal and other facilities will be built within the project boundary given to GMCAC by MCIAA. As of today, encroachments or claims by private individuals on these lands are not found. Also as of now no outstanding issues or claims on land on which existing facilities to be renovated are located exist. There are no other project facilities which will require any further land acquisition, land purchase or ROW acquisition or clearance.

Indigenous peoples. The Project is located in Lapu-Lapu City, a highly urbanized city where there are no indigenous peoples, ethnic groups or tribal groups that fall under the category of indigenous peoples as described in ADB's SPS Safeguards Requirement 3: Indigenous Peoples.

Labor, working conditions and occupational health and safety. There are 94 MCIAA ground operations employees who are directly affected by the privatization of the terminal operations and have been offered positions at GMCAC. Out of 94, 46 accepted the offer. Those who did not accept will continue to be employed by MCIAA, hence, there are no retrenchment associated with GMCAC taking over ground operations of the airport. The HR Policies of GMCAC are compliant with the IFC Performance Standard 2 on Labor and Working Conditions. The GMCAC HR policies promote sound worker-management relationship by implementing its grievance mechanism, regular coordination meetings, performance recognition through awards system, healthy working conditions as embodied in the Work Environment Policy and protection of the right of employees. Performance incentives are very well laid out with the objective of increasing employees' efficiency levels. Capability upgrading programs are also lined up to help the employees attain their career goals. Furthermore, the benefits for employees extend to their family members, particularly education benefits for their children.

On Occupational Health and Safety -- The Occupational Safety and Health Policy of GMCAC shall demonstrate its commitment to promote high standard of safety and health to prevent personal injury or ill health resulting from work activities for the duration of the project. The project aims at zero dangerous occurrences. The existing health and safety management procedures are contained in the MCIA Safety Management System Manual.

Work Environment Measurement (WEM). WEM is performed regularly in various areas of the existing terminal as a means to monitor the safety of employees against the potential health hazards in their work place. A sample WEM report performed in July 2012, shows six (6) parameters (i.e. dust, carbon dioxide, noise measurement, illumination, heat and general ventilation) measured in six (6) different locations within the vicinity of MCIA. The methods used in the measurement and analysis of these parameters conform to the Occupational, Safety and Health Standards of the Department of Labor and Employment (DOLE).

Gender and Development. There is a difference in the distribution of employees in terms of gender. Of the 94 employees nominated by MCIAA for transfer to GMCAC, only 20% are female. Of the 46 employees who accepted the job offer, only 11% are female. Recent data on employees' gender obtained from GMCAC indicates that 42% of its total manpower requirement are females, showing a significant increase in the female-male ratio of employees as compared to the MCIAA records on female-male ratio. This is aligned with GMCAC's goal of providing "equal opportunities for employment" of men and women.

Pertaining to gender and development, it is noted that HR Policy of GMCAC covers procedures dealing with sexual harassment.
Concerning Concessionaire's design of the airport facilities, the following features are deemed beneficial to women, children and persons with disability.

- Covered walkways from car park to terminal buildings
- Expansion of terminal areas to facilitate movement of disabled persons especially those who move in wheelchairs
- Increase in number of toilet facilities in strategic location and expansion of toilet floor area, and assigning separate toilets for women and disabled persons.
- Increase in seating facilities in check-in halls
- Expansion and improvement of welcome and send-off areas to accommodate non-passengers

While the detailed design of airport facilities is in progress, the following gender sensitive features shall be considered during detailed design stage:

- Special facilities that cater to sensitive needs of women such as baby changing room, breastfeeding room, rest area suitable to persons with disability
- Separate queue and security screening for male and female
- Screening of female passengers by female security personnel only
- Provision for anti-trafficking office for women and children

Cultural heritage. There is no existing cultural heritage site in the project area. As confirmed with the Lapu-Lapu City Tourism Office, none of the affected military installations inside the Benito Ebuen airbase are considered cultural property, or declared as built heritage by the National Museum or National Historical Institute as defined in Republic Act No. 10066.

Security arrangements. MCIAA, through its Emergency and Security Services Department ESSD, is responsible for the general airport security such as airside security, security for anti-sabotage, security for anti-hijacking, and maintenance of law and order.

Consultation with stakeholders.

Table 1 Summary of the preliminary consultation meeting

Stakeholder Participants	Issues Raised	GMCAC Reaction/ Action to Take
MCIAA officials	Narrow vehicular lanes for T1 arrival passengers.	Preliminary calculations show that capacity is adequate, but GMCAC shall validate during the Detailed Design.
	Door Frame Metal Detector (DFMDs) at T2 entrance might obstruct passenger movement with trolleys.	Requirements for DFMDs in T2 when the terminal is equipped with in-line screening will be discussed with OTS during the Detailed Design phase.
	Adequacy of GSE area availability	Adequate area is being planned.
	There is a requirement for baby care room at	GMCAC shall consider this requirement in the Detailed Design.

Stakeholder Participants	Issues Raised	GMCAC Reaction/ Action to Take
	departure level of T2.	
Customs Officials	For T2, a quarantine counter facility is required in the check-in hall to enable the passengers to declare forex even before they check-in. Provision for an Exclusion Room and Inter-Line baggage room in their offices at T2. Need for CCTV cameras at the Customs Zone	GMCAC confirmed that a space will be provided in the form of a cubicle. GMCAC clarified that the office space provided is large and internal partitions created can be used to divide the space as required. GMCAC has clarified that this has been noted and will be taken up during Detailed Design stage.
Immigration Officials	The immigration counters are in a bad condition including the hardware/ software. Overall the immigration facility has only 6 passport readers in both arrival and departure levels. Additional Immigration manpower at Cebu airport is being requested. Immigration officials have expressed need for a few CCTV cameras at the Immigrations ZoneatT2toprofilethepassengers. Immigration rep has requested for Suspect Holding Rooms at Departure and Arrival levels.	GMCAC clarified that they will be provided with hardware to improve the passenger processing rate. Immigration confirmed that the average processing time achievable is 45seconds. GMCAC clarified that this has been noted and will be d iscussed with them during Detailed Design stage. GMCAC clarified that this can be accommodated in the areas assigned to them.
Security Officials	On the issue of exemption from security screening in the VIP lounge, OTS clarified that only the President and Vice-President are exempted from screening.	

Table 2 Summary of the First small group consultation meeting

Topic	Issues/Remarks	Recommendations
1. Project Awareness	• The participants disclosed that they did not get a clear picture of the Project from the management of MCIAA. It was a simple announcement that a new management shall take over in the operations of MCIA. • They obtained more thorough information from the orientation seminars conducted by GMCAC • Other sources of information they identified were co-employees; newspaper; and internet.	• The participants recommended a continuing project orientation among the MCIA staff including those who are not transferring to the new management outfit for better understanding of delineation of tasks and responsibilities in the entire airport operations.
2. Perceived Impacts of the Project	• The top-ranking perceived impact of the project is improvement in the airport operations and management towards achieving international standards. • The expansion or airport operations shall contribute to the city's economic growth. • A direct positive impact on the employees who accepted GMCAC job offer is the waiver of probationary status under the new management/ employer. • Also for those who will transfer, they anticipate more exposure, training, and professional growth to achieve better performance level in their respective jobs. They claimed that in the present set up, they are performing beyond their respective position and job description. • A "negative" impact mentioned by the participants is the potential increase in terminal fees. Mr. Sridhar Jayati expressed that GMCAC shall focus first on the necessary improvement in services and facilities before gradually increasing the terminal fees. • For those who accepted the job offer, a direct negative impact is their waiver of government employment benefits.	• Recommendation to change INFORMATION counter to CUSTOMER SERVICE. • Provide more informative materials especially for tourist passengers. • GMCAC to re-classify positions and clarify respective job description. • GMCAC to study the feasibility of terminal fees charged to credit cards. They indicated frequent cases of foreign passengers who are not aware of terminal fees requirement and have no ready cash upon leaving.

Second meeting

A meeting was held with the Chief Reinvention Officer of District 32, the holder of master franchise of commercial operations in the domestic and international airports. In the domestic airport, District 32 operates 65% of the stalls while 35% are allocated to sub-lessees. In the international airport, they operate almost 80% of the stalls and only 20% are operated by sub-lessees.

The following were mentioned as some advantages of having a master franchise holder as follows:

- Zoning and classification of business stalls prevent unnecessary competition among stall operators. Stalls of the same category are limited and located strategically to avoid over supply of similar items scattered in different business areas. This strategy enables the passengers to find easily what they want to buy given their limited time for shopping.
- Price control among sub-lessees can attract passengers to spend more.
- The master franchise holder, District 32, aims to showcase Cebu culture and promote products of community or local producers in the different stalls that they operate.

Highlights of the Key Informants' Interview. Those interviewed have heard about the Project less than six months ago. The leading sources of information about the Project are local media/news and unofficial sources like friends, neighbors, and relatives. Their most common concern is getting updates and transparent information about the Project. Generally perceived beneficial impacts are a) employment opportunities for local residents; b) increase in city's revenue from tourist influx, local and foreign; and c) taking pride in having a world-class airport.

Another consultation was held last 26 November 2014 at Waterfront Hotel. There were 48 participants/ representatives from the local government offices, both city and barangay levels, homeowners' association, women and elderly, and educational institutions.

The consultation discussed the Project details and status, environmental and social impacts and the corresponding mitigation measures, disclosure of grievance mechanism, and Corporate Social Responsibility Action Plan. After the presentations, an ample time was provided for an Open Forum. The issues highlighted in the Open Forum are as follows:

- Residential area to be affected by the construction of Terminal 2
- Management of the potential increase in the volume of wastes
- Clearance procedures for cutting of the trees in the PAF area
- Management of increase in traffic flow and disturbance resulting from the transport of construction materials into the terminal site
- Priority of local residents for employment
- Transport route of construction trucks going in and out of the airport
- Livelihood opportunities particularly open to women's associations
- Building permit procedures
- Possibility of runway expansion

- Possible restrictions or land use considerations that should guide the city's land use planning

7. Gaps analysis and Corrective Action Plans

Environment Component

Based on the documented procedures, policies and records that were provided by GMCAC and MCIAA, and the information obtained from site inspection of MCIA facilities, the following gaps have been identified, and appropriate corrective actions are recommended.

a) There is no environmental management plan and environmental compliance certificate for the existing terminal.

   Corrective Action: GMCAC will prepare and EIA report and apply for an ECC that will cover both the existing and the new terminals.

b) The effluent water quality of the STP exceeds the water quality standards (for Class SC marine water) in terms of the Chemical Oxygen Demand (COD).

   Corrective Action: The damaged aerator must be fixed or replaced, and proper maintenance of all the equipment in STP must be regularly monitored. GMCAC will assist MCIA in the monitoring of the STP operations and maintenance, and independently monitor the water quality parameters of the STP effluent to ensure the facility's compliance to the ECC.

c) There is no clear procedure or guideline in the disposal of hazardous wastes.

   Corrective Action: GMCAC shall provide for the temporary storage of future hazardous wastes that will come from both Terminals 1 and 2. Accredited third party contractor(s) shall be engaged to regularly collect hazardous wastes generated by the two terminals. An environmental officer shall be assigned to monitor the treatment and disposal of these wastes.

d) There is no monitoring of ambient noise levels in the communities near the airport.

   Corrective Action: ambient noise monitoring stations shall be established by MCIAA in joint support with GMCAC. Creation of airport policies to regulate the noises coming from arriving and departing planes may be established by MCIAA upon recommendation of the MCIA Noise Management Committee. Trees planted along the perimeter of the airport may buffer some of the noise that could affect the nearby communities. Awareness program on the impacts of noise may be carried out in heavily affected areas to encourage the development of noise reducing measures, e.g. PPEs, sound proofing walls and windows.

e) Solid Wastes are exposed to weather elements and domestic animals at the staging area.

   Corrective Action: Immediate replacement of the compartment gates and installation of roofs at the staging area will help prevent the exposure of the disposed garbage/ trash. Separate secured (with enclosure) containers may also

be used for certain types of recyclable wastes (e.g. papers, cans, petroleum-based food containers etc.)

f) GMCAC does not have a Grievance Redress Mechanism to cater to communities' grievances and complaints that are directly related to the project.

Corrective Action: GMCAC needs to immediately put in place a grievance mechanism prior to start of project construction. It is proposed that GMCAC set up an office to function as a Grievance Redress Committee (GRC). The GRC shall be composed of GMCAC officers and technical staff, and MCIAA officer-representative.

Social Component.

a) Insufficiency of information campaign about the Project particularly within the city where the Project is located.

Corrective Action Plan: There should be an effective information, education, and communication (IEC) plan to be formulated by GMCAC and disseminated to the various sectors of the city like LGUs at the city and barangay levels. There are several effective ways of disseminating information that can reach the institutions concerned as well as the barangay constituents: a) press releases; b) local TV news and occasional talk shows; c) memorandum circulars to concerned offices of the government and private sector.

b) GMCAC's Human Resource Policy Manual lacks the section that specifically pertains to wages, salaries and other compensation benefits. Although their Human Resources Policies are generally employees' welfare oriented, there are no concrete information on employees' description of duties and responsibilities, salary classification and detailed employee benefits that will be provided within the scope of private employment under the rules and regulations of the Social Security System. This gap particularly surfaced during the small consultation with MCIAA employees who did not accept the job offer from GMCAC. There is an element of uncertainty in their decision making process because of the absence of more specific policies pertaining to wages, salaries and benefits of employees.

Corrective Action Plan: GMCAC should hasten the market compensation study assigned to an independent consultant Tower Watson and align remuneration and benefit- schemes with the mandates of the national labor law, requirements of the Social Security System and the Department of Labor and Employment. The market compensation study is expected to be completed prior to start of construction.

8. Environmental Impact Assessment and Mitigation Measures

Noise Impact

a. Construction Phase

The greatest noise impact of construction activities in the airport will most likely be associated with the movements of heavy equipment and the transport of construction materials. Since the construction activities in T2, apron, and landside facilities will happen simultaneously with the renovation and operation of T1, the current baseline

levels are expected to further increase. Impacts of the construction noise however are anticipated to be low in magnitude, localized and temporary.

Noise impacts will be mitigated by minimizing the construction activities between 10PM to 5AM and by requiring construction equipment and trucks to be well maintained, including the appropriate use of mufflers.The noise generated from the use of heavy equipment and high noise producing operation will be restricted within the project boundary. During the renovation of T1, passenger traffic inside the building will be designed in such a way that intense noise generating activities will be far from the people in transit.

b. Operational Phase

During the operational phase, the major source of noise will be due to the take-off and landing of aircrafts at the runway.It is expected that additional aircraft flights will further increase the noise levels within the area. In addition, ground service equipment (GSE), auxiliary power units (APU), and landside vehicles will all contribute to the ground noise of the airport.

Using INM Version 7.0 to compute for the noise contours surrounding the MCIA, it was found that a small number of communities within Barangay Basak are exposed to 65 and higher DNL values. The Federal Aviation Administration (FAA) has issued a guideline setting 65 DNL as the maximum threshold noise level compatible with residential land use. During noise monitoring conducted, it was found out that the areas projected to be within 65 to 70 DNL contour lines have measured values below 60 DNL. Since the noise model considered flight frequencies within the peak season as the annual daily average, and the monitoring was conducted at the onset of the peak season, it was expected that the measured values to be lower than the model. In addition, the noise model is found useful in providing a conservative estimate of the noise impacts surrounding the airport.

Projection for 2024 peak season shows that the 65 DNL contour line will further widen covering more residential communities, and extending from Barangay Basak to a small portion of Barangay Marigodon.

In 2013 the International Civil Aviation Organization (ICAO), aware of the worldwide expansion of local airports, issued a recommending guideline to member states specifying the need for new quieter aircrafts. This guideline targets 2017 as the deadline for new large civil aircraft types to be at least 7 EPNdB (Effective Perceived Noise in Decibels) quieter than the current Chapter 4 standard. By 2020, this guideline will also be applicable to smaller aircraft types of less than 55 tonnes. With this development, it is expected that by 2020 (or 2017 the earliest) newer aircrafts will come with lesser noise generation, and hence reduced noise levels in the airport community. Hence, the actual noise level for 2024 is expected to be less than the projected level upon applicability of this guideline.

This noise reduction at source strategy, the use of quieter aircrafts, is based on the 1st Principle of ICAO “balanced approach” on noise reduction. The other “balanced approach” principles are: land-use planning and management, noise abatement operational procedures, and aircraft operating restrictions.

These other measures will be discussed with MCIAA, airline operators, Lapu-Lapu City Planning and Development Office (CPDO) and other appropriate bodies for a more concerted effort in reducing the airport noise.

GMCAC will recommend to MCIA to create an MCIA Noise Management Committee (MNMC), composed of MCIAA, GMCAC, airline operators, Lapu-Lapu City LGU, Philippine Air Force (PAF), flight training schools, the airport Tenant's Association, and community representatives. This will be a subcommittee of the MCIA grievance committee, and will address issue related to noise concerns.

For the ground noise, all sources of noise emissions (landside vehicles, etc.) will be properly operated and maintained, and will be used at appropriate operating hours. When applicable, appropriate noise control device/s such as mufflers and sound barriers will be installed.

Planting of trees and/or provision of adequate barriers may be worked out to further mitigate the propagation of noise from aircraft and ground operations.

Landscape Character

Earthworks and site clearance operations during construction phase will have a temporary and localized impact to the landscape character of the area. Appropriate wall screens will be used to envelope all development sites to mitigate the visual impact of construction. During the operational phase, the project area will be visually enhanced with the well-designed new terminal building and of the appealing structures of the nearby Airport Village Mall at the landside.

For mitigation, specific areas within the airport will be landscaped according to landscape engineering and architectural design befitting a resort-type airport.

Seismic Design

The project will not have a significant impact to the seismic character of the surroundings since MCIA is already a built-up area with an almost flat terrain, and the buildings to be constructed will be considered low-rise.

As mitigation, the new terminal building (T2) will be constructed with due consideration of the seismic activities of the area following the National Building Code of the Philippines and of the AASHTO (American Association of State Highway and Transportation Officials)Standards to withstand any earthquake events.

Biodiversity

The impact of the project to the biodiversity of the area is low as the allotted area for expansion houses a very limited tree cover, therefore impacts to all other life forms will be minimal.
For mitigation, DENR permits will be obtained by GMCAC for all trees that will be removed, either by tree cutting or earth-balling. Earth-balled trees will be transplanted according to the specifications detailed out in the DENR Memorandum entitled "Guidelines and Procedures on the Planting, Maintenance and Removal of Trees in Urban Areas and in Areas Affected by Government Infrastructure Projects."There will be areas in the airport where biodiversity will be promoted following the local resort-theme of the Project. In landscape planting around the site, mature, and a mix of native and non-native trees, as well as shrub species, will be used, where appropriate, to provide opportunities for biodiversity to flourish in the area.

Groundwater

The use, transport, and storage of fuels, motor oils, and chemical solvents during construction and operation of airport pose a negative impact to the groundwater. If these toxic substances are not stored or handled properly, they can contaminate the land surface. From the soil, these substances will eventually seep down into the groundwater and contaminate it.

Aside from groundwater contamination, construction and operational activities in the airport will require significant volumes of water. It is projected that by 2017, both airport terminals will be requiring approximately 1,032 m^3per day of water, and discharging 826 m^3per day of waste water. Disposal of wastewater can have a considerable impact to the groundwater if this is not properly addressed. To mitigate the impacts to the groundwater, all fuel, motor oil, and chemical solvents must be sited on an impervious base within a bund and properly secured. The base and bund walls must be impermeable to the material stored. Leaking or empty containers of these materials must be removed from the site and properly disposed of by a DENR-accredited third party contractor. Washings from concrete mixers, paint or paint utensils will not be allowed to flow into the ground.

Wastewater coming from the airport will be treated by MCIAA as stipulated under the Concession Agreement.

Surface water

Construction activities within the airport will have an eventual impact to Mactan Bay in the form of sediments reaching the built-up channels and then the Mactan Bay. Sediment runoff can come from exposed ground surfaces, stockpiles of excavated areas, and concrete and cement products attached to construction tools and equipment.

To mitigate contamination of Mactan Bay brought about by sediment transport from surface run-off, sediment traps or basins will be provided to channel storm water from the work areas and to diminish the energy of the storm water flow.

Ambient Air Quality

Construction equipment and vehicles emit air pollutants such as NO_X, SO_X, and Particulate Matters (PM) that can be both harmful to health and to the environment. Vehicles passing on dry and windy areas can generate dust and increase the ambient Total Suspended Solids (TSP). Demolition of apron, MIP, and paved areas can increase the ambient TSP due to the release of fine debris particles and the increase in exposed (un-vegetated) ground areas.

The air quality modeling of aircraft emissions was carried out using the AERMOD air quality dispersion model, and the emission factors of UK-NAEI and/or USEPA emission factors for SO_2, NO_2, PM_{10} and $PM_{2.5}$.

Based on the results of the air quality model for 2014, the ground level concentrations of the emissions coming from the aircrafts during LTO will not exceed the ambient air quality standards of the DENR. The results of the ambient air quality baseline survey, carried out in September 2014, consistently shows that the air quality along the sampling stations do not exceed DENR's permissible levels. For 2024, the ground level will still not exceed the ambient air quality standards of the DENR. This indicates that the proposed expansion of the airport will not significantly contribute to air pollution along the surrounding communities of MCIA.

As for land transportation emissions, the expected concentration of pollutants emitted, based on the projected increase in the number of vehicles, will generally not contribute significantly in the overall ambient pollution concentrations.

To mitigate the impacts of air pollutants, vehicles and equipment to be used must first pass the mandatory emissions testing based on DENR/DOTC standards. During construction areas considered vulnerable to dust generation will be sprayed with uncontaminated water on a periodic basis to suppress proliferation of dust particles.

Climate Change Impact

Mactan Island is one of the few areas in the Philippines assessed to have a low impact risk to typhoons. In the past 5 years, two typhoons went over Cebu: Typhoon Bopha in December 2012, and Typhoon Haiyan in November 2013, two of the Philippines' worst storms in recent history. In both events, no significant damage has been reported in MCIA, or in any of its immediate surroundings.

Mactan Island is at low risk when it comes to the projected change in rainfall. However, when the topography of the area is considered, flood simulation suggests that majority of the airport area is at moderate risk when it comes to flooding, with a few segments within the airport at high risk. Overall, MCIA is assessed to face low to moderate risks.

To mitigate the risks associated with climate change events and natural disasters, GMCAC will ensure that the final design of T2 will be storm resilient.

Health and Safety hazards

Construction activities within the airport have the potential to negatively affect the health and safety of both workers and passengers. Unsafe activities and improper use of tools and equipment may result to accidents. People will also be exposed to high noise, vibrations, and air pollution while construction and renovation are on-going. There is also a possibility that fire, explosion, or chemical spillage will happen due to the presence of fuel storage area.

To mitigate the impacts of these hazards, construction workers will be given the necessary training in Health and Safety applicable to their respective line of work. They will be provided the necessary PPEs (Proper Protective Equipment) such as ear muffs, safety shoes, masks, and goggles. Baseline noise and air quality will be determined and monitored regularly to determine exposure levels of pollution to workers during the construction period. Fire fighting plan will be developed and fire fighting facilities will be provided in the fuel storage area to mitigate the hazards associated with the presence of the fuel storage area. To mitigate the impact to health and safety of airport staff and passengers during the operational phase, all buildings (T1, T2, Airport Village Mall, and support facilities) will be designed in such a way that the impact of fire, earthquake, and extreme weather events will be minimized. Proper evacuation plan during emergencies will be developed for every building.

Energy Efficiency

Based on the Visayas Power Supply-Demand Outlook for 2012 to 2030, the Visayan region has a peak demand growth rate of 4.45%. If the demand is projected and compared against the future power supply in 2024, the estimates indicate that there will be power shortage in the whole of the Visayan region.

One of the best ways to reduce its environmental impact is by reducing its overall energy consumption. GMCAC is planning to apply for at least a Leadership in Energy and Environmental Design (LEED) Silver Certification Rating for the new Terminal. The certification follows the LEED-US Green Building Rating System.

Road Network Traffic

Each lane of the access roads leading towards MCIA has an estimated capacity of 1400 to 1500 vehicles per hour. Based on projections the maximum capacity of the road lanes will not be exceeded, thus the impact of the expansion of MCIA on the road network capacity will not be significant, even in the long-term. However, measures to ensure and maintain the efficiency of traffic flow, especially in all intersections, must be put in place.

As a mitigation measure, GMCAC may regularly coordinate and discuss with the traffic authority of Lapu-Lapu City to ensure that the traffic management plan for roads leading to and exiting from the airport are updated. GMCAC may also collaborate with MCIAA in formulating airport landside policies to limit the loading and unloading time of passenger vehicles at the arrival and departure areas. Parking of vehicles in all roadways should not be allowed, and all road obstructions must be removed.

Domestic Water Discharge

The expansion of the passenger terminal would entail increase in water demand, which in turn would increase the domestic water discharge. The existing STP has a capacity of 900 m^3 /day, and the present discharge of the existing terminal is less than 300 m^3 /day. By 2017 the total daily water discharge rate would be 825.6 m^3/day, which is already near the maximum design capacity of the STP. By 2022, the daily water discharge rate would increase to 1060 m^3/day, an amount way beyond the capacity of the existing STP.

To mitigate the impacts, MCIAA has an obligation, to enhance the capacity of the existing STP. The new STP shall be in place well before the existing STP reach its peak capacity.

Greenhouse Gases (GHGs)

The planned expansion of MCIA is predicted to contribute to the increase of GHGs emitted to the environment due to airport-related activities. To assess the environmental impacts of the planned expansion of airport operations at the MCIA the magnitudes of CO_2, CH_4 and N_2O emissions that will be potentially released were calculated using IPCC methods. The aviation industry has been identified as one of the major sources of greenhouse gases that significantly contribute to global warming. Airport-specific emissions are important since these directly contribute to the local air quality and have the potential to affect climate at the global level. The airport was evaluated based on four sources of emissions:

a. Source 1 Emissions: Emissions due to ground access modes
b. Source 2 Emissions: Emissions due to electrical energy consumption for airport operations
c. Source 3 Emission: Emissions due to landing, take-off, taxiing on-ground aircraft (LTO)
d. Source 4 Emissions: Emissions due to ground service equipment

Table 3 shows the summary of the total equivalent CO_2 emissions from the four sources considered in the analysis. The results show that LTOs have the highest contribution (from 75 to 82%) which is consistent with previous reports.

Table 3 The annual CO_2e produced from the four sources of airport-specific GHG emissions from years 2014 – 2039

	CO_2e (metric tons)				
Year	***Source 1**	***Source 2**	***Source 3**	***Source 4**	**Total**
2014	1,172.89	24,986.35	85,600.27	1,065.82	112,825
2024	2,636.67	54,991.27	182,059.24	2,334.00	242,021
2039	4,730.30	65,610.05	354,597.60	4,451.00	429,389
*Note: Source 1 – Ground access vehicles; Source 2 – Electricity consumption for airport terminal operations; Source 3 – Aircraft Landing and Take-off (LTO) cycles; Source 4 – Ground service vehicles					

As mitigation for Source 1, MCIAA and GMCAC can regulate the entry of taxis into the airport premises, e.g. vehicles operating at substandard conditions will not be allowed to enter. Private vehicles on the other hand must be strictly discouraged from lingering in the airport premises with their engines turned on. The MCIA should explore partnerships with mass transport companies to further lower the GHG emissions at the airport.

For Source 2, to control or minimize the GHG emissions due to electricity consumption, the MCIA should implement power-saving guidelines and invest in energy-efficient equipment and devices.

For Source 3, MCIAA must optimize the duration of the LTO cycle for every aircraft to minimize the corresponding GHG emissions. It can also impose penalties or levy environmental taxes to operators based on the emission factors specific to the aircraft model.

For Source 4, lower GHG emissions may be achieved by utilizing a fleet of vehicles with higher fuel economies. These vehicles must also be selected based on the emission factors of its fuel requirement such that lower GHGs will be produced. Proper vehicle maintenance should also be strictly observed.

Other Airside Operations

One of the significant hazards associated with airport operation MCIAA has to deal with is on how to mitigate the impact of fuel storage and spillage. The presence of fuel tanks and depots within the airport premises poses incalculable risks to health, safety, and environment due to possible fire, explosion, and fuel spillage.

MCIAA currently addresses that with a Letter of Agreement between MCIAA and all fuel service providers. Contained in the agreement is the Fuelling and Spill Control Procedures covering Aircraft Fuelling, Spill Prevention, and Spill Control and Clean-up.

9. Summary of Environmental Impact Assessment and Mitigation

Project Phase	Key Environmental and Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures
CONSTRUCTION PHASE Construction of Passenger Terminal Building: Terminal 2 (2015-2017) Renovation and Expansion of existing Passenger Terminal Building: Terminal 1 (2015-2018) Complete reconstruction of Terminal 2 Apron (2015-mid 2016)	Hazardous Materials	▪ Paints, solvents, batteries, and fluorescent lamps will be used during the construction phase. Improper use, handling and storage of these may result to health and environmental risks.	▪ All hazardous materials will be stored in a special facility appropriate for hazardous materials. Every type of item will have an MSDS (material safety data sheets) label attached. The facility will be provided with the suitable safety and protection equipment. An environmental officer shall be assigned to monitor the quantity of the generated hazardous wastes, and the performance of the 3rd party contractor to treat and dispose these wastes.
	Air Quality	▪ Construction equipment and vehicles emit air pollutants that can be harmful to health and the environment such as CO, NO_X, SO_X, PM_{10}, and $PM_{2.5}$. ▪ Vehicles passing by dry and windy areas generate dust which can increase the ambient Total Suspended Solids (TSP). ▪ Demolition of apron, MIP, and paved areas can increase the ambient TSP due to the release of fine debris particles and the increase in exposed (un-vegetated) ground areas.	▪ Vehicles and equipment to be used must first pass mandatory emissions testing based on DENR/DOTC standards. ▪ Areas considered vulnerable to dust – generation will be sprayed with uncontaminated water on a periodic basis.
	Noise	▪ Construction activities such as the movement of heavy equipment and the delivery of construction materials to and from the site may cause noise and vibration to the surrounding communities.	▪ Noise generating activities will be minimized during the night time period (10PM – 5AM). ▪ During the renovation of Terminal 1, passenger traffic inside the building will be designed in such a way that noise will be far from the people in transit. ▪ Delivery of materials will be properly scheduled such that traffic is minimized during night time.
	Surface Water	▪ Sediments reaching surface water via runoff during rainfall events can come from exposed ground surfaces, stockpiles of excavated areas,	▪ Sediment traps / sediment basins / energy dissipating areas will be provided to channel storm water from the work areas and to diminish the

Project Phase	Key Environmental and Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures
		and concrete and cement products attached to construction tools and equipment.	energy of the storm water flow and thereby control the movement of sediments that can affect the quality of the nearby body of water.
	Solid Waste	▪ Solid wastes coming from the construction such as scrap wood, packaging materials, scrap metal, building rubble, gypsum wall board, asphalt, and concrete will be accumulated through time.	▪ A strategic solid waste management plan will be implemented which gives hierarchy to the recycling and reuse of materials. ▪ All building rubble and other suitable organic-free solid wastes will be used as backfill materials. ▪ Waste containers will be placed at specific points for the segregation and collection of solid wastes. Other solid wastes not recycled/reused will be handled and disposed by a third party contractor.
	Hazardous Waste	▪ The use, transport, and storage of fuels, motor oils, and chemical solvents may pose a negative impact to the groundwater. If these toxic substances are not stored or handled properly, they can contaminate the land surface and seep down into the groundwater and contaminate it.	▪ All fuel, motor oil, and chemical solvents must be sited on an impervious base within a suitable bund and properly secured. The base and bund walls must be impermeable to the material stored. Leaking or empty containers of these materials will be removed from the site and properly disposed of by a DENR-accredited third party contractor.
	Terrestrial Biology	▪ A number of trees will be affected in the construction of Terminal 2. Initial tree inventory shows the presence of the following tree species in the area: fire tree, gmelina, bo tree, nara, talisay, mahogany, acacia, agoho, ipil-ipil, and neem.	▪ All trees to be removed/balled will be addressed as per DENR standards.

Project Phase	Key Environmental and Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures
	Public Health and Safety	*Construction Phase* Construction activities pose a serious impact to public health and safety since there is a high possibility that accidents can occur within and the surrounding construction site. With an impending short-term increase in vehicular traffic, there is a high tendency that vehicular and pedestrian accidents will occur. In addition, this traffic issue will also cause disruptions and delays to the other road users. It also has the potential to damage road infrastructures because of the increase road usage of heavy construction vehicles.	A safety management program will be implemented to reduce the associated risks (such as accidents) in the construction area. There is an on-going vehicular traffic study to address the issues surrounding the impending short-term increase in vehicular traffic. Proper planning and scheduling of the use of heavy construction vehicles will be implemented such that the impact will be alleviated such as in the volume of traffic, possibility of vehicular accidents, and damage to road infrastructures.
	Occupational Health and Safety	Influx of workers from other towns/provinces may increase incidence of communicable diseases. If safety policies will not be observed, there is a high possibility that accidents may occur within and the surrounding construction site.	Contractors to conduct seminar awareness/trainings on communicable diseases. A safety management program will be implemented to reduce construction accidents.
OPERATIONAL PHASE	Hazardous Materials and Wastes	Used batteries, busted fluorescent lamps, and obsolete computers are expected to be generated within the operational phase. Improper disposal of these may result to health and environmental risks.	An environmental officer will be assigned to monitor the quantity of the generated hazardous wastes. Collected wastes will be disposed by a 3rd party DENR accredited contractor and will be disposed in an appropriate recycling or landfill facility.
	Air Quality	Passenger vehicles going to/leaving the airport emit air pollutants that can be harmful to health and the environment such as CO, NO_X, SO_X, PM_{10}, and $PM_{2.5}$. Areas considered vulnerable to dust – generation such as un-vegetated areas may increase the ambient TSP.	Trees and shrubs will be planted within the concession agreement boundary according to the landscape engineering design to enhance the airport's air quality. Areas considered vulnerable to dust – generation will be covered with grass according to the airport landscape engineering design and will be sprayed with uncontaminated water on a periodic basis.
	Noise	The major source of noise will be coming from the take-off and landing of aircrafts at the runway and	An MCIA Noise Management Committee (MNMC) will be created, composed of MCIAA, GMCAC, airline

Project Phase	Key Environmental and Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures
		will further increase with the projected growth in aircraft flights. Ground service equipment (GSE), auxiliary power units (APU), and landside vehicles will all also contribute to the ground noise of the airport.	operators, Lapu-Lapu CityPlanning and Development Office (CPDO), Philippine Air Force (PAF), flight training schools, the airport Tenant's Association, and community representatives Noise reduction strategies will be employed following the ICAO "balanced approach" which are: noise reduction at source (use of quieter aircrafts), land-use planning and management, noise abatement operational procedures, and aircraft operating restrictionsThese noise reduction measures will be brought for discussion in the MNMC Meeting for appropriate actions and fora more concerted effort in reducing the airport noise ICAO, aware of global expansion of local airports, issued a recommending guideline to member states specifying the need for new quieter aircrafts. This guideline targets 2017 as the deadline for new large civil aircraft types to be at least 7 EPNdB (Effective Perceived Noise in Decibels) quieter than the current Chapter 4 standard. By 2020, this guideline will also be applicable to smaller aircraft types of less than 55 tonnes. With this development, it is expected that by 2020 (or 2017 the earliest) newer aircrafts will come with lesser noise generation, and hence reduced noise levels in the airport community. For the ground noise, all sources of noise emissions (landside vehicles, etc.) will be properly operated and maintained, and will be used at appropriate operating hours. When applicable, appropriate noise control device/s such as mufflers and sound barriers will be installed. Planting of trees and/or provision of adequate barriers may be worked out to further mitigate the propagation of noise from aircraft and ground operations.

Project Phase	Key Environmental and Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures
	Water	There is a projected increase in water demand that might be a source of water competition. There is a projected increase in BOD load due to sanitary discharges.	Require a number of water meters in the different sections of the airport terminal buildings and landside facilities to monitor water usage and adopt appropriate water conservation measures. Ensure efficient operation of MCIAA STP by conducting audit and monitoring.
	Solid Wastes	There is a projected increase inthe quantity of solid wastes with an increase in the number of passengers entering and leaving the airport.	Ensure efficiency and capacity of the private hauler to segregate, recycle, and dispose solid wastes. Promote the 3-R (reuse, reduce, and recycle) concept within the airport.
	Biodiversity	It is expected that the airport will have a low biodiversity value since it is considered a built environment. With the airport expansion, biodiversity may be affected if no mitigating measures will be put in place.	GMCAC and MCIAA will develop a long-term sustainable biodiversity plan that is compatible with the airport operational constraints and commercial development.
	Energy Use	There is a projected increase inthe energy demand with an increase in the number of passengers entering and leaving the airport.	GMCAC will strive to commit to the principles of sustainable development by minimizing the environmental impacts of its daily operations through reduction of its overall energy consumption. GMCAC will apply for a LEED (Leadership in Energy and Environmental Design) Silver Certification Rating.

Project Phase	Key Environmental and Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures
	Labor	About 300-400 workers are expected to be employed during the construction period and it is expected that contractor ensure that labor conditions for the workers are at par with national labor standards. Influx of workers from other towns/provinces may increase incidence of STDs/AIDs	GMCAC to ensure contractors/subcontractors compliance with the national labor laws (mandated wages and benefits, number of hours worked, living conditions, etc.) and undertake measures to comply with the core labor standards (prohibition on child labor, forced labor, discrimination, and workers' rights for free association). Contractor contract to reflect labor clause and ensure monitoring. Contractors, in collaboration with relevant government units, to conduct seminar awareness/trainings on HIV/AIDS/STD. GMCAC contractors and subcontractors give priority to local labor from nearby barangays
	Labor restructuring resulting from the handing over of the Terminal operations	The wide gap in male-female employees' ratio under the MCIAA operation is now greatly reduced with GMCAC's "equal opportunity" policy, i.e. percentage of female employees increased from 20% to 42%.	GMCAC to conduct appropriate trainings to increase the female employees' capability to handle their assigned tasks in the new operational set-up.
	Public Health and Safety	Airport facilities that cater specifically to the needs of women, elderly, and disabled persons may not be sufficient to address the increase in local and foreign passengers resulting from the expanded airport operations. The increase in tourist influx may result in increased activities related to prostitution.	Implement design features that will cater to the needs of women and disabled including separate toilet facilities for women and disabled people, baby changing and breast feeding rooms, rest area suitable for persons with disability, separate security checks for women, among others. In collaboration with the relevant government agency organize orientation and training programs on specialized topics such as HIV/AIDS awareness and anti-trafficking of women and children among airport personnel especially those who are assigned to ground terminal operations.
	Occupational Health and Safety	More passenger needs especially for women, elderly, and disabled persons to be addressed while in transit.The anticipated increase in tourist influx	GMCAC to implement design features that will cater to the needs of women, disabled, and elderly. GMCAC to organize, in collaboration with relevant

Project Phase	Key Environmental and Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures
		may also result in higher incidents and activities that might compromise their health. There will be an increase in risk to public safety with more passengers entering the airport.	government agency, orientation/ training programs on sensitive health topics and anti-trafficking of women and children. Safety management manual to be always updated and strictly implemented.

10. Preliminary Information, Education, and Communication (IEC) Plan

Target Sector Identified as Needing Project IEC	Major Topic/s of Concern in Relation to Project	IEC Scheme/ Strategy Method	Information Medium	Indicative Timelines/ Frequency	Indicative Expenses	Source of Funding
1.LGU of Lapu-Lapu City; (City Planning and Development Council, Tourism Council)	1. General project orientation 2. Project implementation status 3. Project Impacts and Benefits 4. Roles & Responsibilities of concerned agencies in the implementation of the project 5. Social development program (CSR) 6. Job opportunities during construction and operating stages of the project	- Meeting with local officials - GMCAC Information/ and Inquiry Desk	Handouts - Audio-Visual Presentations	Prior to start of project construction; Construction, and Operation phases	Supplies/ Communication Cost Design/Layout/ Printing costs Publication costs	GMCAC
2.Barangay leaders and residents from Bankal, Buaya, Basak;	1. Project status. 2. Project Impacts and Benefits 3.Social Development Program (CSR) 4. Job opportunities during construction and operating stages of the project	-Barangay assemblies	-Hand-outs -Audio Visual presentations	Prior to start of project construction/ Twice a month until CSR Program/ Plan is developed	FGD logistics	GMCAC
3.Business sector representatives from Lapu-Lapu City	1.Potential business gains 2.Roles and responsibilities of concerned business operators in the implementation of the project 3.Investment potentials	GMCAC Information/ Inquiry Desk	Hand-outs	Prior to start of project construction, during construction and during project operation	Printing and publication costs	GMCAC
4.Women's groups and local entrepreneurs from	Social Development Program (CSR) Small-scale business opportunities	FGD; Barangay assemblies	-Hand-outs -Audio visual presentation	Prior to start of project construction	FGD expenses like food and venue; Printing	GMCAC

Bankal, Buaya, Basak					costs	
5.MCIAA employees to be affected by the project	Scope of GMCAC operations in MCIA	Office assemblies within MCIAA	Posters; Bulletin Boards; Audio visual presentation			GMCAC
6. GMCAC employees	HR Policies such as those consistent with ILO core labor standards (Safety Management; Employee benefits and responsibilities; Position/job description and salary scales; policies and procedures for promotion)	Orientation meetings with individual employees	Posters Bulletin Boards Audio-Visual Presentations Employees' Handbook Memorandum circulars or staff directives.			GMCAC

11. Indicative Social Development Framework/ Corporate Social Responsibility

CONCERN	Government Agency/ Non-government Agency and Services	PROPONENT	Indicative Timeline	Source of Funds
Support services for the tourism sector in Lapu-Lapu City in particular, and Cebu Province in general. Potential support areas: 1) Promotion of Cebu cultural heritage in collaboration with Lapu-Lapu City Tourism Office.	City and Provincial Tourism Council	Lapu-Lapu City Tourism Office (Mr. Hembler Mendoza)	Prior to project construction phase, hold coordination meetings with City Tourism Office for potential CSR planning.	GMCAC
2) Facilitation of training program with tourist transport operators to facilitate safe and easy access of tourist transport requirement	City Tourism Council; Local tourist transport operators	Local Tourist Transport Operators	Prior to project construction phase, hold consultation meetings with City Tourism Office and representatives of Local Tourist Transport Operators to develop appropriate training program.	GMCAC
3) Capability upgrading of hotel management operations particularly in Lapu-Lapu City	City Tourism Council; Local hotel operators	Local Hotel Operators	Prior to project construction phase, hold consultation meetings with City Tourism Office and representatives of Local hotel operators to develop appropriate training program.	GMCAC
4) Social development project (s) in Bankal, Buaya, Basak, Pajo, Pusok, Pajac, and Ibo	Relevant government agency	Barangay officials of Bankal, Buaya, Basak, Pajo, Pusok, Pajac, and Ibo Homeowners associations, women and youth groups	Construction and operations phase	GMCAC

GMCAC will conduct follow-up consultations with various stakeholders including nearby communities to prepare the Social Development Plan for implementation during the construction and operations phases. GMCAC may update the SDP on an annual basis.

12. Grievance Redress Mechanism (GRM)

GMCAC has established its Grievance Management Policy contained in the Human Resources Policy Manual. Specifically, it applies to individual employee's grievances and complaints which are primarily a manifestation of dissatisfaction about working conditions and managerial decisions, that, if not promptly addressed may affect morale and productivity. However, there is a need for GMCAC to establish a Grievance Redress Mechanism for communities to cater to grievances and complaints that are directly related to the project cycle in its various stages. Some environmental impacts like noise and dust pollution, among others, may trigger complaints from nearby settlements even if they are located outside of the airport boundaries.

Initial Environmental Examination Report

Mactan-Cebu International Airport Rehabilitation, Expansion and Operation (Philippines)

July 2015

Prepared for: GMR-MEGAWIDE CEBU AIRPORT CORPORATION

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Abbreviations

ADB	Asian Development Bank
AMSL	Above Mean Sea Level
AOC	Airline Operators Council
ATM	Aircraft Traffic Movement
BCM	Business Chairman
BFL	Busted Fluorescent Lamp
BOD	Biochemical Oxygen Demand
CA	Concession Agreement
CAAP	Civil Aviation Authority of the Philippines
CAB	Civil Aeronautics Board
CCTV	Closed Circuit Television
CEA	Chief Executive Advisor
CENRO	Community Environment and Natural Resources Office
CLIP	Cebu Light Industrial Park
CLUP	Comprehensive Land Use Plan
COD	Chemical Oxygen Demand
CPDO	City Plannng and Development Office
CSR	Corporate Social Responsibility
DAO	Department Administrative Order
DENR	Department of Environment and Natural Resources
DepEd	Department of Education
DFMD	Door Frame Metal Detector
DMC	Developing Member Country
DO	Dissolved Oxygen
DOLE	Department of Labor and Employment
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
DSWD	Department of Social Welfare and Development
DTI	Department of Trade and Industry
ECA	Environmentally Critical Area
ECC	Environmental Compliance Certificate
ECP	Environmentally Critical Project
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMB	Environmental Management Bureau
EMP	Environmental Management Plan
EPRMP	Environmental Performance Report and Management Plan
ESSD	Emergency and Security Services Department
FGD	Focused Group Discussion
FPIC	Free, Prior and Informed Consent
GAD	Gender and Development
GMCAC	GMR Megawide Cebu Airport Corporation
GMR	Grandhi Mallikarjuna Rao
GOCC	Government Owned and Controlled Corporation
GPS	Geographic Positioning System
GRC	Grievance Redress Committee
HR	Human Resource
IATA	International Air Transportation Association
ICAO	International Civil Aviation Organization
ICF SH&E	Inner City Fund Safety, Health, and Environment
IEC	Information, Education and Communication
IEE	Initial Environmental Examination
IFC	International Financial Corporation

ILS	Instrument Landing System
IP	Indigenous People
IRA	Internal Revenue Allotment
IRR	Implementing Rules and Regulations
LEED	Leadership in Energy and Environmental Design
LGU	Local Government Unit
MAEP	MCIA Airport Emergency Plan
MARS	MULTIPLE AIRCRAFT RECEIVING STAND
MCIA	Mactan Cebu International Airport
MCIAA	Mactan Cebu International Airport Authority
MCWD	Metro Cebu Water District
MEP	Mechanical, Electrical, and Plumbing
MEZ	Mactan Economic Zone
MGB	Mines and Geosciences Bureau
MIA	Mactan International Airport
MOA	Memorandum of Agreement
NCIP	National Commission on Indigenous Peoples
NEDA	National Economic and Development Authority
NGO	Non-Government Organization
NPCC	National Pollution Control Commission
OOG	Out of Gauge
OTS	Office for Transportation Security
PAF	Philippine Air Force
PAGASA	Philippine Atmospheric Geophysical and Astronomical Services Administration
PCN	Pavement Classification Number
PCUP	Presidential Commission on the Urban Poor
PD	Presidential Decree
PEISS	Philippine Environmental Impact Statement System
PFZ	Philippine Fault Zone
PGA	Peak Ground Acceleration
PGR	Population Growth Rate
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PNEL	Permissible Noise Exposure Level
PNP	Philippine National Police
PPE	Personal Protective Equipment
PPP	Public Private Partnership
PRM	Passengers with Reduced Mobility
PTB	Passenger Terminal Building
PWD	Persons with Disability
QSMR	Quarterly Self-Monitoring Report
RA	Republic Act
RWY	Runway
SDP	Social Development Plan
SMM	Safety Management Manual
SPS	Safeguard Policy Statement
SSS	Social Security System
STD	Sexually Transmitted Disease
STP	Sewage Treatment Plant
TESDA	Technical Education and Skills Development Authority
TN	Total Nitrogen
TP	Total Phosphorus
TSP	Total Suspended Particulate
PM	Particulate Matter
TSS	Total Suspended Solids

UPAO	Urban Poor Affairs Office
USGS	U.S. Geological Survey
VIP	Very Important Person
WCI	Woodfields Consultants, Incorporated
WEM	Work Environment Measurement

1. Introduction

The Government of the Philippines through the Department of Transport and Communication (DOTC) in conjunction with Mactan Cebu International Airport Authority (MCIAA) (together known as the "Grantors") has awarded the Project titled "Mactan Cebu International Airport Project" to a consortium comprising of GMR Infrastructure Limited and Megawide Construction Corporation, by way of Public Private Partnership (PPP) model on 22 April 2014. To this effect, a 25 year Concession Agreement (CA) has been granted to GMR Megawide Cebu Airport Corporation (GMCAC) a company incorporated by the consortium and registered within the Philippines.

The development works are planned to be executed in two phases:

- Phase 1 is for all the works to be developed for the requirements based on the forecasted demand up to the design year 2024.
- Phase 2 is for all the works to be further developed for the requirements based on the forecasted demand up to the design year 2039.

The operations and maintenance of the airport terminal shall be turned over by the Mactan-Cebu International Airport Authority (MCIAA) to GMCAC, beginning in November 2014 while MCIAA continues to have responsibility of airside operations. Part of the agreement is that the concessionaire shall expand the capacity of the existing airport by building a new passenger terminal which must be completed in 36 months from start of the construction date. This new terminal, to be placed right beside the existing passenger terminal, shall be devoted to international flights. Concurrent to the construction of the new terminal, GMCAC shall start the renovation works on the existing terminal, hereafter referred to as subject facility, which is expected to be completed in 48 months from the start of the date of construction.

In view of this, GMCAC has conducted an Initial Environmental Examination (IEE) on the subject facility, and requested Woodfields Consultants, Incorporated (WCI) to carry out the same. In response, WCI prepared the IEE based on the documents made available by GMCAC, and due diligence on existing facility. The subject facility has been visited and inspected by WCI. Key interviews with the airport's corporate management and employees, as well as representatives from nearby local communities, have also been carried out.

As part of this study, an Environmental and Social Compliance and Performance Review of the facility was carried out, which integrates the compliance audit reviews with ongoing industrial practices and operation. These reviews include assessing the policies and practices of the MCIAA and GMCAC, its compliance with legislative requirements and ADB policies,and review of best environmental management practices.

2. Brief Description of the Project

Airport operations in Mactan Island started in 1966 with the inauguration of the Mactan Alternate International Airport (MAIA). MAIA was established as the replacement to the Lahug Airport located within Cebu City due to the physical and safety problems the old airport was facing. MAIA was later expanded to become the Mactan Cebu International Airport (MCIA) under the jurisdictions of the Mactan Cebu International Airport Authority (MCIAA) by virtue of Republic Act 6958 promulgated in 1990. **Figure 2-1** shows the location of MCIA.

The existing airport consists of a passenger terminal building with six aerobridges (serves both the domestic and international flights), a parking bay (425 x 295 m), a parking ramp, two (2) aprons: south apron (250 x 100 m) and north east apron (220 x 95 m), a single runway, and General Aviation. **Table 1** shows the existing major facilities in the airport, and **Figure 2-2** shows the current layout of MCIA.

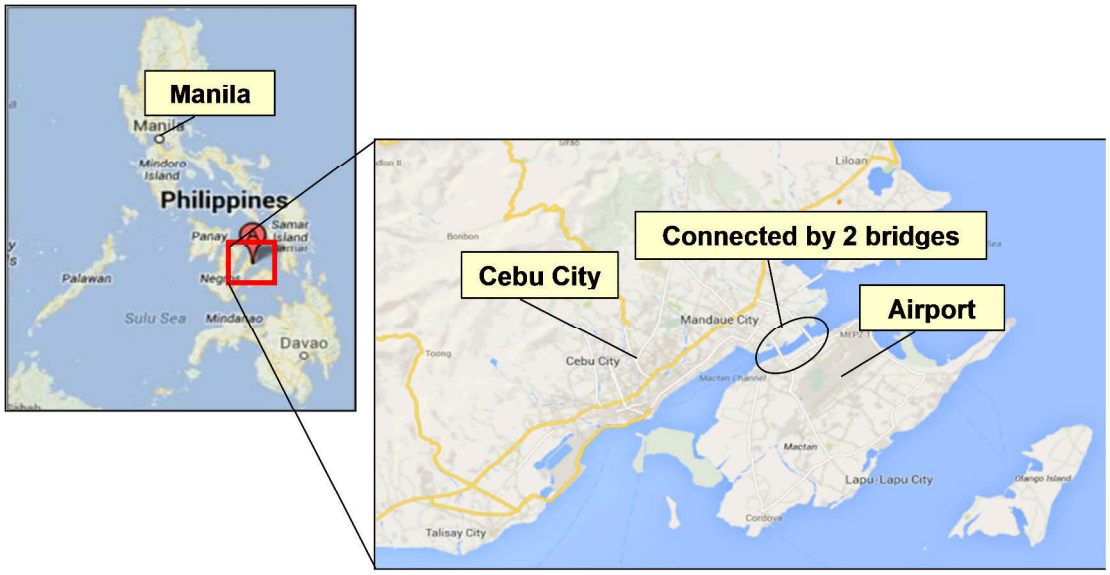


Figure 2-1
Location Map of the Project site

Table 2-1
Summary of the major facilities at MCIA.

Facilities	Dimension	Description
Runway	3,300m x 45m	Designation: 04-22, PCN 70/F/B/W/T
Approach category	-	ILS Cat I for RWY 04 and RWY 22
Parallel Taxiway	3,300m x 23m	With two Rapid Exit Taxiway and five Perpendicular Exit Taxiway
Civil Aviation Apron	113,350m^2	Six parking stands for B747 and A330 etc.
North-East Apron	220m x 95m	Five parking stands B737 and smaller aircraft
Passenger Terminal Building	Domestic: 18,575m^2 International: 19,950m^2	
Cargo Terminal Facilities	Domestic: 12,400m^2 International: 11,800m^2	Individual cargo handling facilities operated by airlines and logistics companies
Rescue and Fire Fighting	-	Meets ICAO Level 9

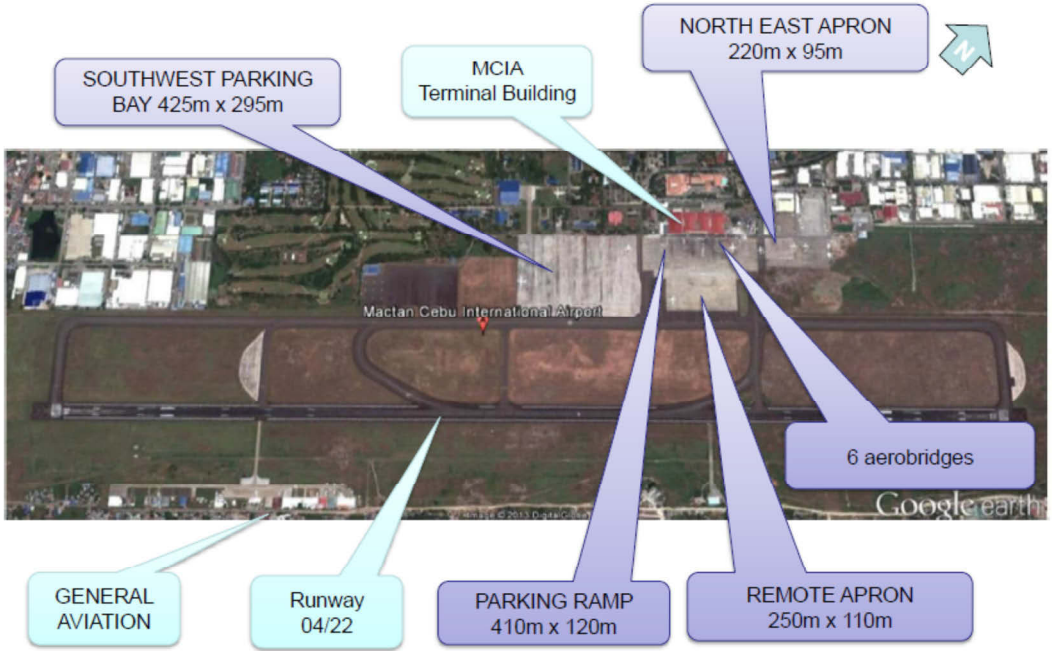


Figure 2-2
Current layout and study area of the subject facility

The annual International and Domestic passenger movements[1] from 1991 to 2011 are shown in **Figures 2-3a** and**2-3b**, respectively.

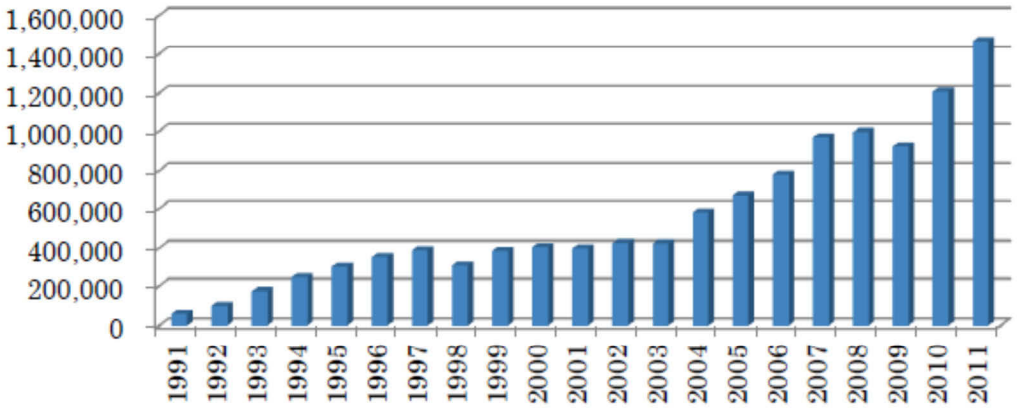


Figure 2-3a
International passenger movement at MCIA (source: JICA, 2013)

[1]Assistance for MCIAA for preparation of Mactan (Cebu) International Airport Improvement and Development Plans, 2013

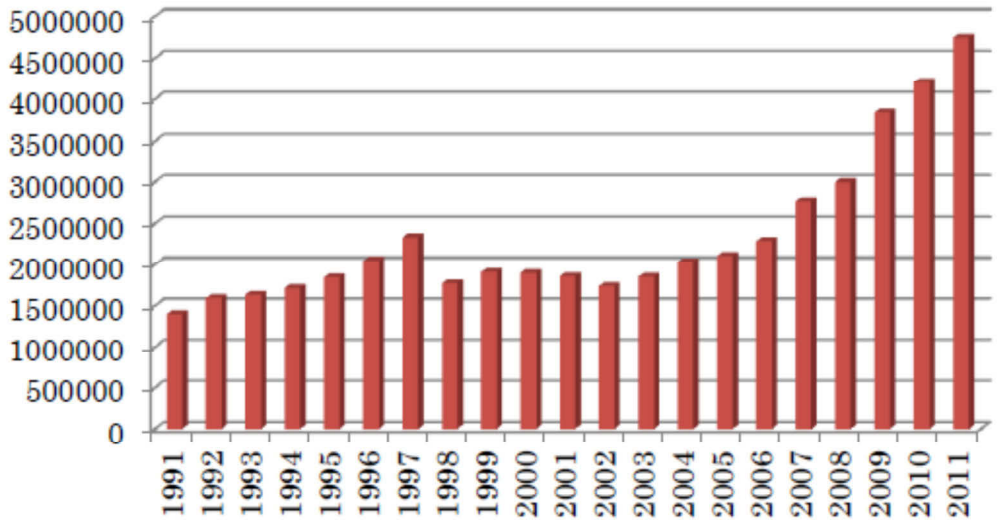


Figure 2-3b
Domestic passenger movement at MCIA (source: JICA, 2013)

The increasing trends on the movements of passengers, both domestic and international, provide merits for expanding the current capacity of the existing airport by building a new passenger terminal. **Figure2-4** shows site photos of some of the existing facilities in MCIA.

Flight Frequency

The international flight frequencies are estimated per aircraft for years 2024 and 2039, as shown in **Table 2-2**. The present-day flight frequency is represented by year 2014.

Table 2-2
International flight frequency

Aircraft	2014	2024	2039
	Flights/week	Flights/year	Flights/year
A320	54	5524	15240
A319		671	1851
A321	30	3069	8467
B 737	18	1841	5080
B 747	7	716	1976
A 330-300	5	511	1411
B 777-200	1	102	282
B 777-300ER	1	102	282
A340-300		102	282
B787		102	282

The domestic flight frequency will increase by 196.5% based on 2014 performance, and will further increase to 276.2% by based on 2024 performance.

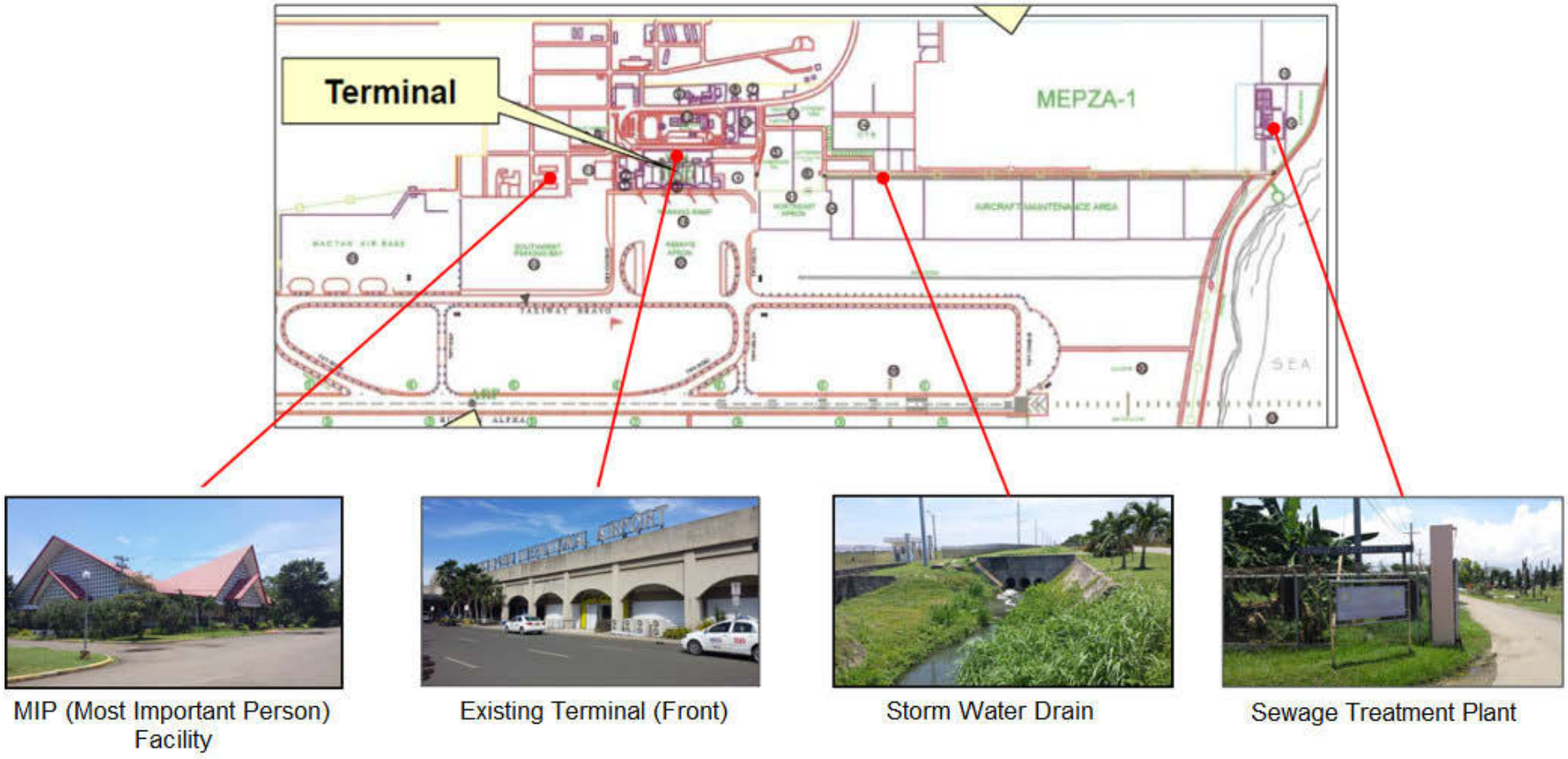


Figure 2-4
Photos and layout of MCIA including the subject facility

Passenger Terminal Building

The existing passenger terminal building, which was completed in 1998 under the MCIA Development Project[2], is used to cater to both international and domestic passengers. The terminal building consists of two levels for passenger processing with small mezzanine level and roof level. The first level is used for arriving passengers, and the second level serves as the departure processing area. The original passenger handling capacity of the passenger terminal building was approximately 4.6 million passengers per annum (4.1 million domestic and 0.5 million international). In 2013, MCIAA attended to 5.2 million domestic and 1.5 million international passengers. This shows that the capacity limit of the existing passenger terminal building has already been exceeded.

Apron

There are three aircraft parking aprons: i) the main apron in front of the existing passenger terminal building, ii) the northeast apron in front of the existing Reduced Mobility Operations (RMO) facility, iii) and the existing military apron which will be reconstructed for the new passenger terminal. The pavement for Code C aircrafts on the northeast apron is already seriously damaged and requires immediate reconstruction. A vacant area to the east of the northeast apron can be utilized for expansion of the northeast apron. The existing military ramp, built 50 years ago by the US Forces for C130 class aircraft, is still in fair condition, but its pavement will be reconstructed to be utilized as the new apron for the new international passenger terminal.

3. Planned improvements for MCIA

The general plan for the expansion and improvement of the existing airport is summarized as follows:

- Construction of T2, along with all Associated Facilities (such as car park, road network, Commercial Assets, Meeter Greeter Area)
- Renovation and expansion, but not the demolition of T1 and Associated Facilities;
- Complete reconstruction of T2 Apron;
- Capacity Augmentation in accordance with Concession Agreement;
- Development of adequate customer vehicle parking;
- Development of Commercial Assets;
- Installation of all required information technology and other equipment for the proper operation and maintenance of the above facilities.

The renovation of the existing terminal (T1) will be completed in 4 years, while the new terminal (T2), will be finished in 3 years, along with the completion of the landside development. The new apron will be completed in 18 months.

The development of the project will be spread into two phases: Phase 1 (2014 – 2024) and Phase 2 (2024 – 2039). Phase 1 pertains to all the developments based on the 2024 forecasted demands while Phase 2 is for all further developments based on the 2039 forecasted needs.

For Phase 1, GMCAC will simultaneously build a new passenger terminal building (T2), renovate the existing terminal (T1), demolish and rebuild the existing PAF apron, and

[2] Assistance for MCIAA for preparation of Mactan (Cebu) International Airport Improvement and Development Plans, 2013

develop the landside for parking and commercial purposes all within the first 4 years of operation. **Figure 3-1** shows the planned completion schedule of the four developments for Phase 1.

Figure 3-1
Development plan and schedules for the new airport

T2 will be completed, along with the landside development, within the first 3 years of the project. T1 will continuously be in operation while renovation works gradually proceed within a period of 4 years. The existing PAF apron will be demolished and rebuilt in 1½ years.

Figure 3-2 and **3-3** show the future layout of MCIA based on the proposed Master Plan for 2024 and 2039, respectively. The new terminal will be constructed adjacent to the existing terminal, but currently occupied by the Philippine Air Force (PAF). Based on a memorandum of agreement between MCIAA and PAF (signed on 15th November 2013) (refer to **Annex 1** for the MOA), all the facilities of PAF will be replicated prior to the construction of the new terminal.

Phase 2 developments are planned to ensure that the capacity of the airport facilities are adequate up to year 2039. Construction, renovation, and other developments are planned to start in 2024.

Details of the proposed developments are elaborated in the following sections.

3.1 Air Traffic Forecast

The master plan development plan of the concession is considerably anchored on the air traffic demand forecast. The traffic forecasting for Mactan Cebu International Airport has been done by ICF SH&E.

ICF SH&E is a premier transportation and tourism consultancy specializing in commercial aviation. For almost 50 years, it has provided real world solutions on a broad range of economic, financial, strategic and operational issues connected to the areas of airports, airlines, and aviation. For the last three decades, ICF SH&E has spent advising airlines worldwide on strategic, financial, and marketing issues, bringing a unique perspective to

airport consulting, and an in-depth and practical understanding on an airport's most important tenant base and largest source of revenue.

The analysis performed by SH&E considers historic and current traffic at the airport and provides details of future traffic expected during the concession period on an annualized basis and also busy hour.

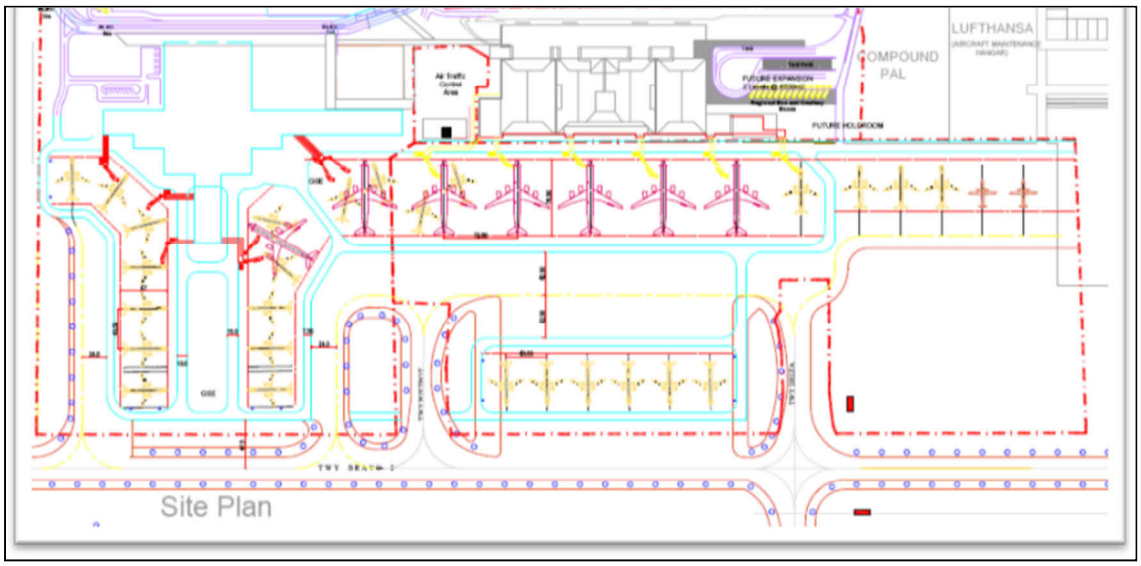


Figure 3-2
Layout of terminals & Apron – Year 2024 development

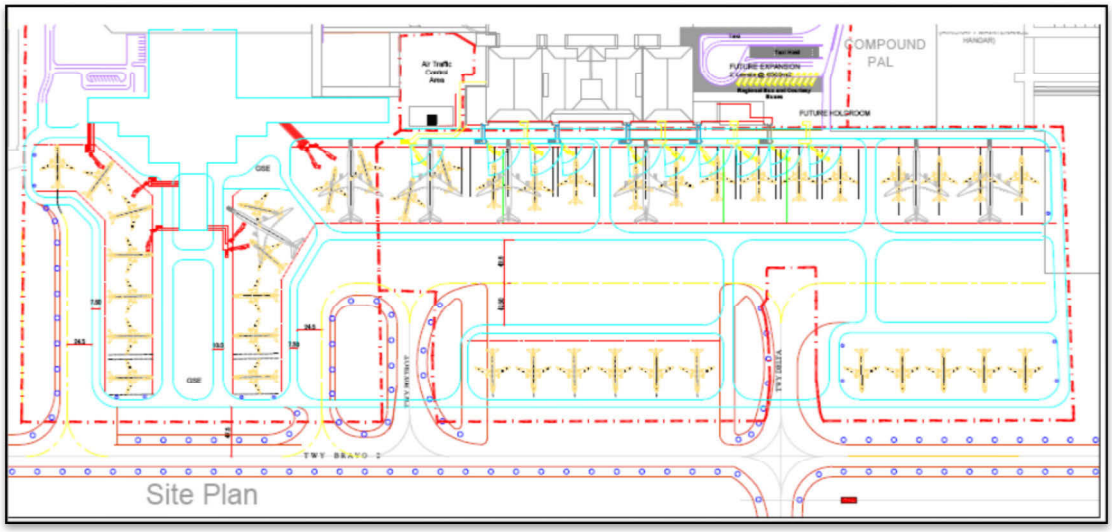


Figure 3-3
Snapshot of Terminals & Apron – Year 2039 development

Table 3-1 shows the annualized passenger traffic for design years 2024 & 2039:

Table 3-1
Projected passenger traffic for 2024 and 2039

Year	International Annual Passengers	Domestic Annual Passengers
2024	4,127,048	11,654,641
2039	8,068,000	20,243,972

Table 3-2 shows the busy period passenger traffic for design years 2024 & 2039 are as follows:

Table 3-2
Projected busy periods for 2024 and 2039

Year	International	Domestic
2024	Arriving 30th Busy day of year – 4664 30th Busy hour of year – 1216 Departing 30th Busy day of year – 4390 30th Busy hour of year – 878 Both Ways 30th Busy day of year – 8952 30th Busy hour of year – 1975	Arriving 30th Busy day of year – 13198 30th Busy hour of year – 1574 Departing 30th Busy day of year – 13140 30th Busy hour of year – 1492 Both Ways 30th Busy day of year – 26337 30th Busy hour of year – 2820
2039	Arriving 30th Busy day of year – 8660 30th Busy hour of year – 2082 Departing 30th Busy day of year – 8580 30th Busy hour of year – 1676 Both Ways 30th Busy day of year – 15158 30th Busy hour of year – 3344	Arriving 30th Busy day of year – 22915 30th Busy hour of year – 2733 Departing 30th Busy day of year – 22814 30th Busy hour of year – 2591 Both Ways 30th Busy day of year – 45730 30th Busy hour of year – 4899

Table 3-3 shows details of annualized air traffic movements for design years 2024 & 2039.**Table 3-4** shows details of the busy period air traffic movements for design years 2024 & 2039.

Table 3-3
Projected air traffic movement for 2024 and 2039

Year	International Annual ATM	Domestic Annual ATM
2024	22856	91546
2039	38315	122832

Table 3-4
Air traffic movements on 2024 and 2039

Year	International	Domestic
2024	Arriving 30th Busy day of year – 36 30th Busy hour of year – 9 Departing 30th Busy day of year – 32 30th Busy hour of year – 6 Both Ways 30th Busy day of year – 63 30th Busy hour of year – 14	Arriving 30th Busy day of year – 139 30th Busy hour of year – 13 Departing 30th Busy day of year – 135 30th Busy hour of year – 11 Both Ways 30th Busy day of year – 263 30th Busy hour of year – 22
2039	Arriving 30th Busy day of year – 49 30th Busy hour of year – 13 Departing 30th Busy day of year – 44 30th Busy hour of year – 10 Both Ways 30th Busy day of year – 86 30th Busy hour of year – 20	Arriving 30th Busy day of year – 168 30th Busy hour of year – 16 Departing 30th Busy day of year – 163 30th Busy hour of year – 15 Both Ways 30th Busy day of year – 317 30th Busy hour of year – 28

Table 3-5 shows details of 30th busy hour fleet mix of aircraft for design years 2024 and 2039, and **Table 3-6** shows the expected air traffic movement of aircraft mix in 25 years.

Table 3-5
30th busy hour fleet mix for 2024 and 2039

Aircraft Type	2024	2039
International		
Code C	10	14
Code E	4	6
Domestic		
Code C	22	27
Code E	0	1

Table 3-6
Aircraft mix

Aircraft Type	Expected ATM's in 25 years
Airbus A320	192,844
Airbus A319	23,451
Airbus A321	107,135
Boeing 737-800	64,281
Boeing 747-400	24,998
Airbus A 330-300	17,856
Airbus A 340-300	3,571
Airbus A 340-600	3,571
Boeing 777-200	3,571
Boeing 777-300 ER	3,571
Boeing 787 Dreamliner	3,571

3.2 Aircraft Stand Planning

Stand Occupancy Times for Domestic. **Table 3-7** shows the aircraft stand requirement for Domestic flights.

- Code C aircraft – 45 minutes
- Code E aircraft – 60 minutes

Table 3-7
Aircraft Stand Requirement for Domestic

Year	Aircraft Type	Number of Stands
2024	Code C	17
2024	Code E	0
2039	Code C	21
2039	Code E	1

Stand Occupancy Times for International is shown below. **Table 3-8** shows the aircraft stand requirement for international flights.

- Code C aircraft – 45 to 60 minutes
- Code E aircraft – 75 to 90 minutes

Table 3-8
Aircraft Stand Requirement for International

Year	Aircraft Type	Number of Stands
2024	Code C	10
2024	Code E	4
2039	Code C	10
2039	Code E	6

The peak stand demand of domestic operations is estimated as 17 Code C in 2024. Stand availability shall be met as follows:

- 6 Code C contact stands of domestic Terminal
- 5 Code C remote stands opposite to domestic terminal
- 3 Code C stands of north-east apron as remote
- 2 Code C stands of T2 Terminal which is designed for swing operations between Terminals
- 1 Code C remote stand close to T2

The estimated numbers of boarding passengers for Terminals 1 and 2 for the years 2024 and 2039 are shown in **Table 3-9**.

Table 3-9
Number of Passenger Boarding Bridges

PBBs	Terminal 2		Terminal 1	
Available in year	2024	2039	2024	2039
Total Number	7	12	6	10

With above number of stands, we will be able to achieve more than 90% of International ATM's through contact stands as required by Concession Agreement. **Table 3-10** shows the number of remote stands for each terminal and apron.

Table 3-10
Number of Remote Stands

Remote stands	Terminal 2		Terminal 1		North & South East Apron	
Available in year	2024	2039	2024	2039	2024	2039
Total Number	7	2	6	6	3	9

In the year 2039 the airport will have up to 40 numbers of Code C stand configuration to cater to the traffic needs for 2039.

3.3 Airside Roads

The new development envisages an efficient airside road network consisting of apron head-of-stand road 10m wide, an aircraft tail-of-stand road 7.50m wide and intermediate connecting roads 7.50m wide. **Figure 3-4** shows the layout of the airside roads for the 2024 development.

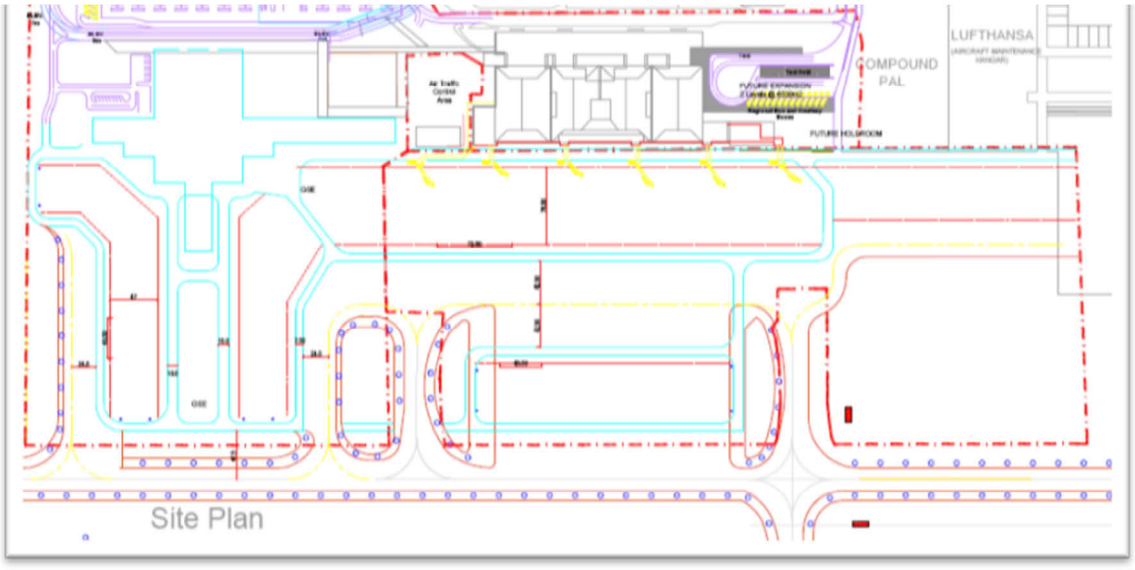


Figure3-4
Layout of Airside roads – 2024 development

3.4 New Terminal Building

3.4.1 Design basis

Terminal with state of the art technology will be built in three levels, with segregation of arriving and departing passengers. Sizing of the terminal was determined based on the International Air Transport Association (IATA) service level "C" calculations, Traffic forecast, Minimum Performance Standards and Specification (MPSS requirements), various standards & specifications mentioned in the concession agreement, passenger convenience and comfort.

3.4.2 Concept and Size

As per concession, a new terminal T2 building is to be developed and constructed for the International sector flights on the West side of existing air traffic control (ATC) tower and Terminal 1**. Figure 3-5** shows a conceptual layout of terminals 1 and 2

International terminal with 3 piers flexible to accommodate swing operations, segregation of arrival and departing passengers by levels, with no pre-check-in baggage screening, in-line screening, efficient passenger and baggage flow, process efficient, energy efficiency, people with reduced mobility (PRM)-friendly are some of the key principles while conceptualizing the terminal layout. The look and feel shall reflect local Cebuano architecture.

Terminal 2 (Phase 1) is designed with a terminal floor space of approximately 44,000 sqm with facilities to process international departing and arriving passengers to Cebu. Requirements for passenger facilities, commercial services for phase 2 have been estimated and an additional area of 10,900 sqm is provided and is sufficient to meet the traffic demand.

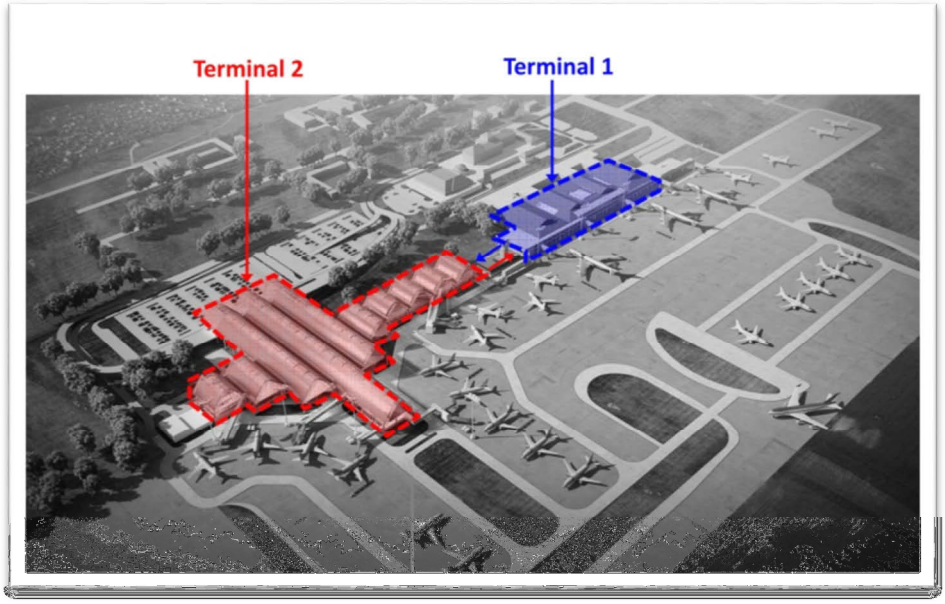


Figure 3-5
Layout showing the passenger terminal (Terminal 1) and international terminal (Terminal 2)

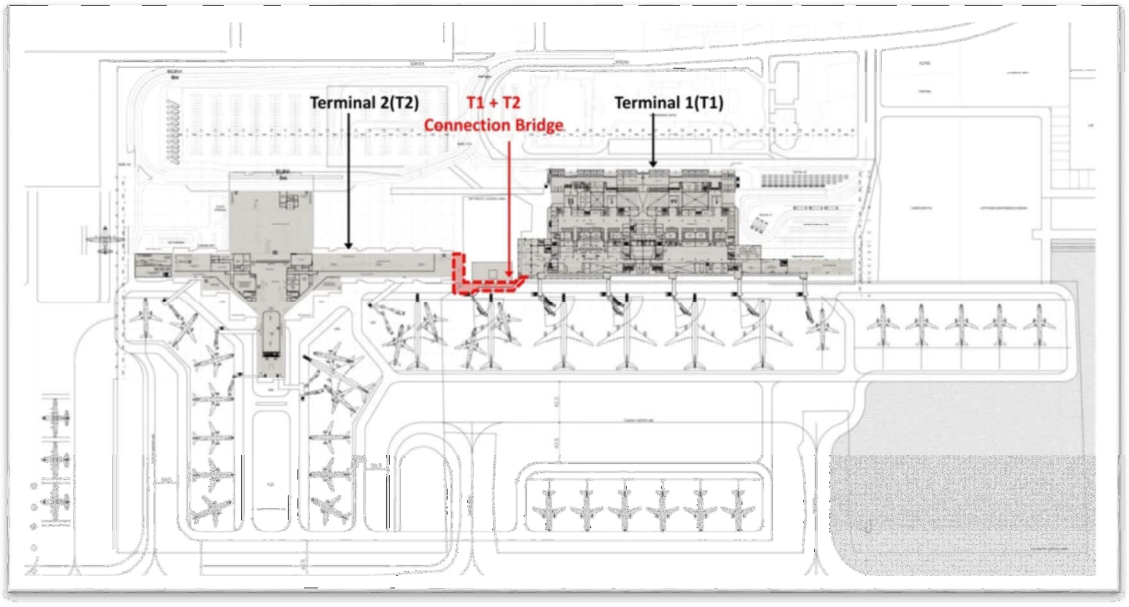


Figure 3-6
Layout of terminal T1 and terminal T2 connected by a bridge

The arrangement of swing operations between domestic and international operations, whilst providing connectivity for transfer passengers to transit between domestic and International flights is achieved by the connecting bridge between the two terminals as shown in **Figure 3-6**.

3.4.3 Building Heights& Levels

Terminal 2 datum levels are designed with Departure level being at +9m, Arrivals / Immigration at +4.5m and baggage reclaim / Apron level considered at ±0.0m.

The floor height of 4.5m for arrivals floor plate is derived to provide minimum headroom clearance of around 4.0m underneath fixed link bridges for airside vehicles. The 4.5m difference between arrivals floor plate and departure floor plate ensure that 3m clear false ceiling height is achieved in arrivals corridor and immigration areas after deducting the structural depth and MEP services. The baggage reclaim hall is designed as double height volume underneath the check in hall which provides sufficient space for check in hall feeder belts to route through the plenum space still providing 6m clear false ceiling height in the baggage reclaim hall. **Figure 3-7** shows the layout of proposed building levels. The arrival level of terminal 2 provides seamless connectivity to Terminal 1 at +5.5m with a gentle ramp to make up the level difference of 1m.

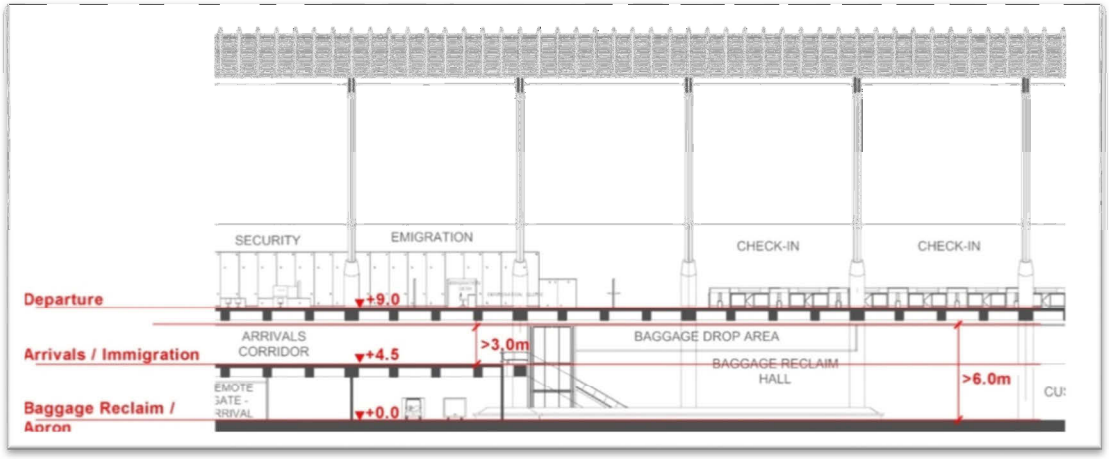


Figure 3-7
Layout of proposed building levels

3.4.4 Landside Connectivity

The existing approach road to Terminal 1 will be further extended to Terminal 2 with an elevated road network connecting to the departure forecourt at +9.0m and on grade road connecting the arrivals pickup below as shown in **Figure 3-8**. The vehicles departing the forecourt after dropping off the passengers will continue further and ramp down to alight back to merge with the existing road edge. Sufficient landside car park, Bus Park and taxi stands will be developed as an integral part of the commercial development.

Figure 3-9 shows the layout of the proposed upper level road network. The access road for the arrival area (located at the upper level) is depicted by the “pink” color, while the blue color indicates a portion of T2. Loading bays and VIP lounge is located on the landside of western pier providing on grade access leading from T2 arrivals road. The same road connects to the airside road after passing through a security check post.

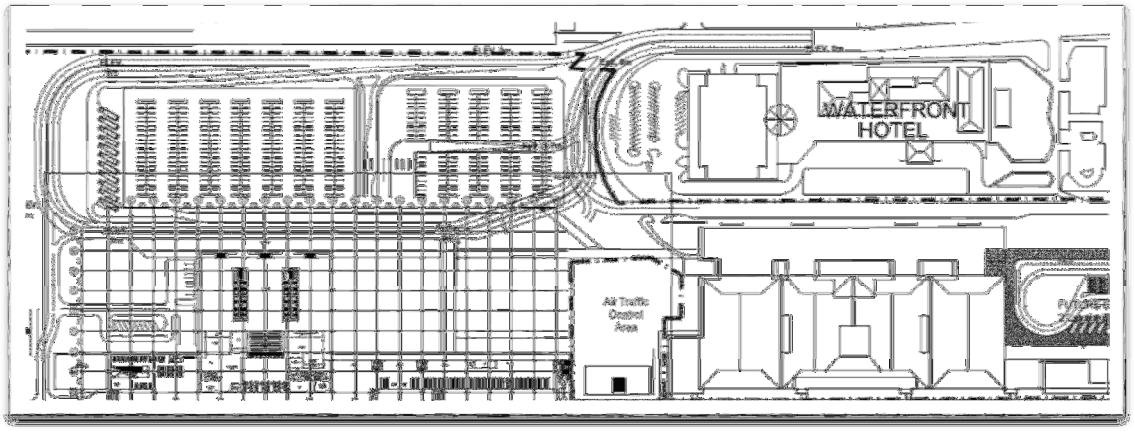


Figure 3-8
Proposed lower level road network

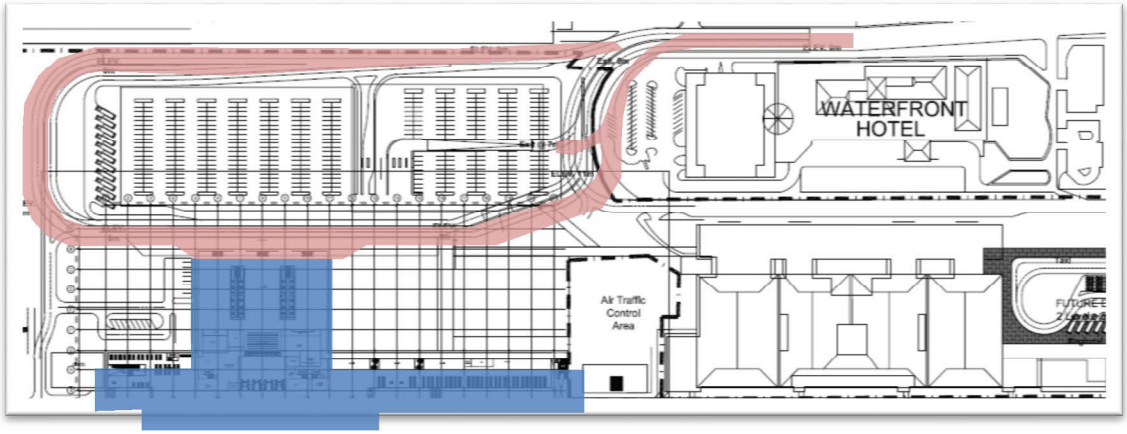


Figure 3-9
Proposed development of upper level road network

3.4.5 Passenger Flows

Departing passengers alighting at the departure kerb at +9.00 m level shall walk into the terminal at the same level into the check-in hall. After check-in, the passenger walks towards the airside passing in a linear fashion through the immigration and security checks. After security, the passenger will be directed into the security hold areas interlined with retail into the three piers at the same level. The remote gate hold areas are positioned at the ground level +0.00 m towards the west end of the terminal. After security clearance, the passengers shall reach the remote boarding gate by level change arrangements of lift, staircase and escalators. Boarding of contact stands will be through a fixed link bridge connected to the departure level except for fixed link connecting to a MARS stand in the southern pier at arrival level wherein the passengers shall change level before entering the fixed link bridge.

Passengers arriving by contact gates, shall enter through the fixed link bridge into the arrival level at +4.50 m level and are directed into the immigration hall. While passengers from

remote gates shall be dropped off at the apron level +0.00 m level shift level to +4.50 m level into the immigration hall. After immigration clearance, the passengers move into the baggage reclaim hall at +0.00 m level and are moved through set of level changers. After collecting the baggage, the passengers cross the Custom's area and reach the airport village for further departure into the city side.

The terminal design shall enable smooth moving of passengers transferring at the airport from International to International, International to Domestic and Domestic to International. **Figures 3-10** and **3-11**depict the passenger movements in terminal during Phase 1 and 2 of the Project.

3.4.6 Baggage Flows

Departures baggage flow

In the new terminal building, Baggage Handling System with inline screening is proposed to handle departures baggage. Baggage flows process is described below:

The departures system consists of two check-in islands with 24 counters each. The hold baggage check-in at a particular check-in island gets inducted into the system and travels through the transport conveyors from departures level to arrivals level wherein Level 1 automatic screening machines are proposed to be located. From the Level 1 screening, cleared bags are transported to the baggage make-up area through conveyors which are located at a high level in the double height space. The un-cleared bags undergo Level 2 screening by an operator and cleared bags are transported to the make-up area. Un cleared bags from Level 2 screening are transported to a Level 3 machine located near the baggage make-up area on ground floor. After completion of necessary Level 3 or Level 4 screening, these bags are manually transported to the make-up area.

The baggage make-up area has two make-up carousals which are used for making up departures baggage on containers or dollies for each flight. From the baggage make-up area, containers / dollies are transported to the apron stand for loading.

Out of gauge (OOG) Baggage: The OOG baggage will be subjected to a standalone screening at the departures level and will be transported to the baggage make-up area through an elevator. The OOG bags will be stored in the make-up area before being taken to the apron for loading into the aircraft.

Arrivals baggage flow

The arrivals baggage handling system comprises of four reclaim carousals located in the baggage reclaim hall. These reclaim carousals are fed through in-feed conveyors located behind the reclaim hall. The arrivals baggage is off loaded from aircraft and brought into baggage break up area where they are off loaded into in-feed conveyors. Passengers collect their baggage from reclaim carousal and leave the reclaim hall through customs channels into the airport village area.

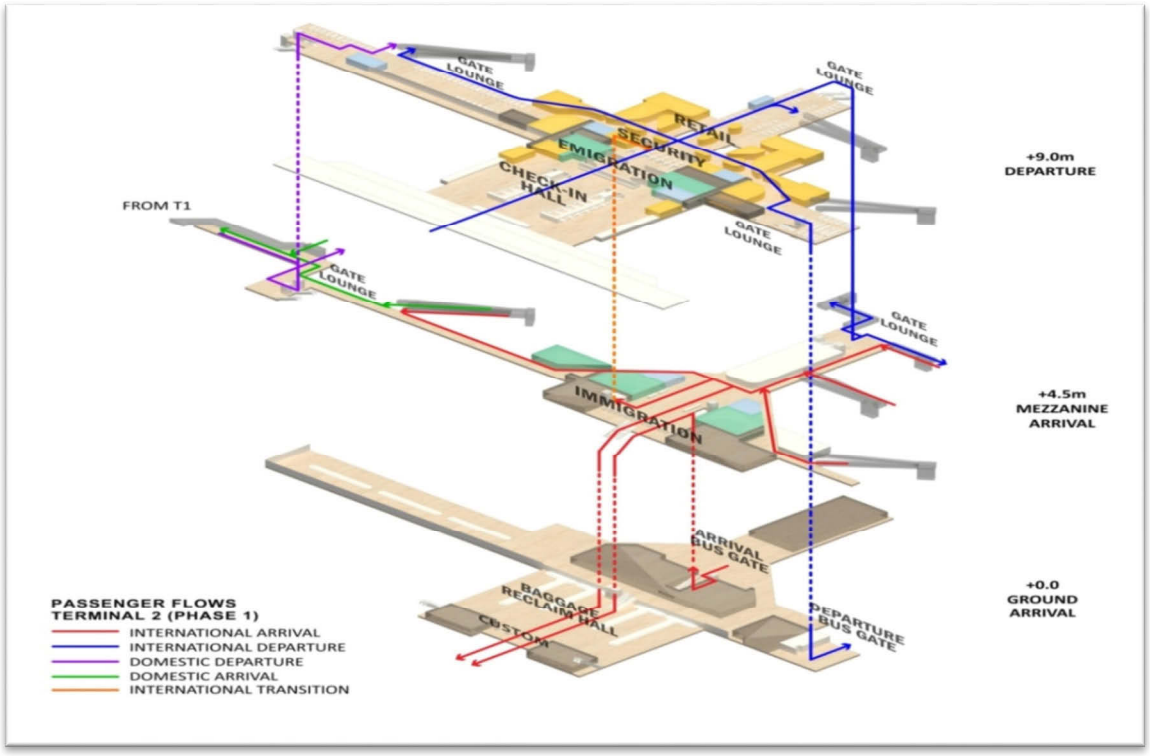


Figure 3-10
Passenger flow in Terminal 2 (Phase 1)

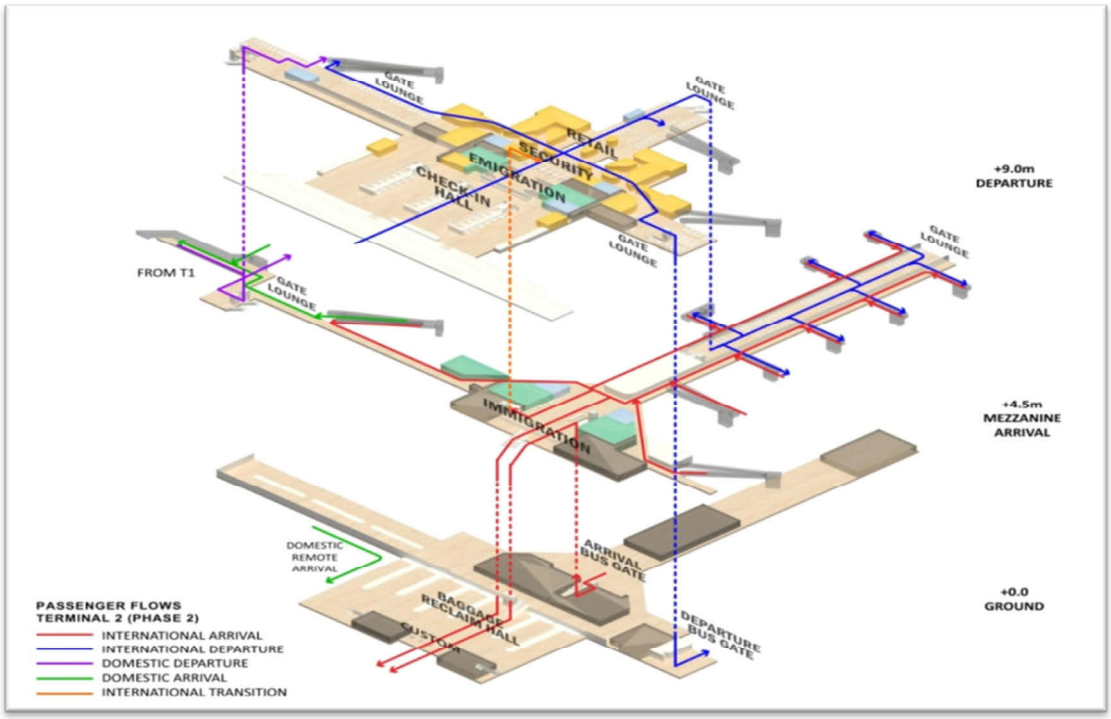


Figure 3-11
Passenger flow in terminal 2 (Phase 2)

3.4.7 Specific provisions for Disabled/ Passengers with Reduced Mobility (PRM)

Terminal 2 will be designed to comply with Philippine Accessibility Law and the Philippines Magna Carta for Disabled Persons by satisfying the requirements of PRM. The terminal is designed to have minimal level changes with ramps, Lifts provided to assist passengers where level change is required. Toilets for disable persons will be provided at major locations along with other toilet facilities. (Tactile protection will be provided as required by regulations.) The facility counters specifically designed to adjust to wheelchair height will be provided at the end of aisle to assist PRM passengers with increase aisle width between the counter and assisted at security X-ray screening.

3.4.8 Specific provisions for nursing mothers and baby changing rooms/ space.

Both terminals 1 and 2 shall have provisions for nursing mothers in compliance to Section 10 of the implementing rules and regulations of RA 10028, otherwise known as “An act providing incentives to all government and private health institutions with rooming-in and breastfeeding practices and for other purposes”.

Moreover, recognizing the needs of various passengers including parents and small children, changing rooms for babies (installed in specific male and female wash room areas) shall be provided as well.

3.5 Phased expansion Strategy

The developments through the concession will cater to two design Phases (2024 and 2039) which will provide sufficient passenger facilities, operational areas to fulfil the expected Air traffic movements and peak passenger growth for both Terminals.

Phase 1 will provide fully functional passenger processing Terminal 2 for International traffic whilst converting Terminal 1 for domestic traffic as shown in **Figure 3-12**.

Phase 2 will be expanding terminal 2 towards east adding processing facilities like check in aisle at departure and baggage reclaim belts at arrivals and extending southern pier to increase contact stands by 5 nos. of Code C as shown in **Figure 3-13**. Total area increase is considered as approximately 10,900 sqm for terminal 2.

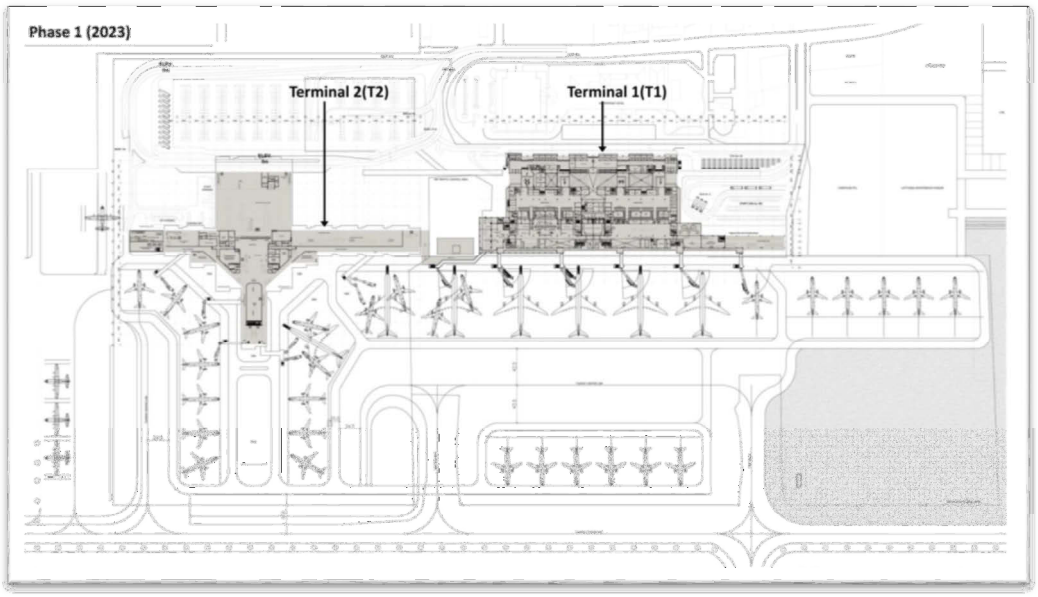


Figure 3-12
Phase 1 Expansion

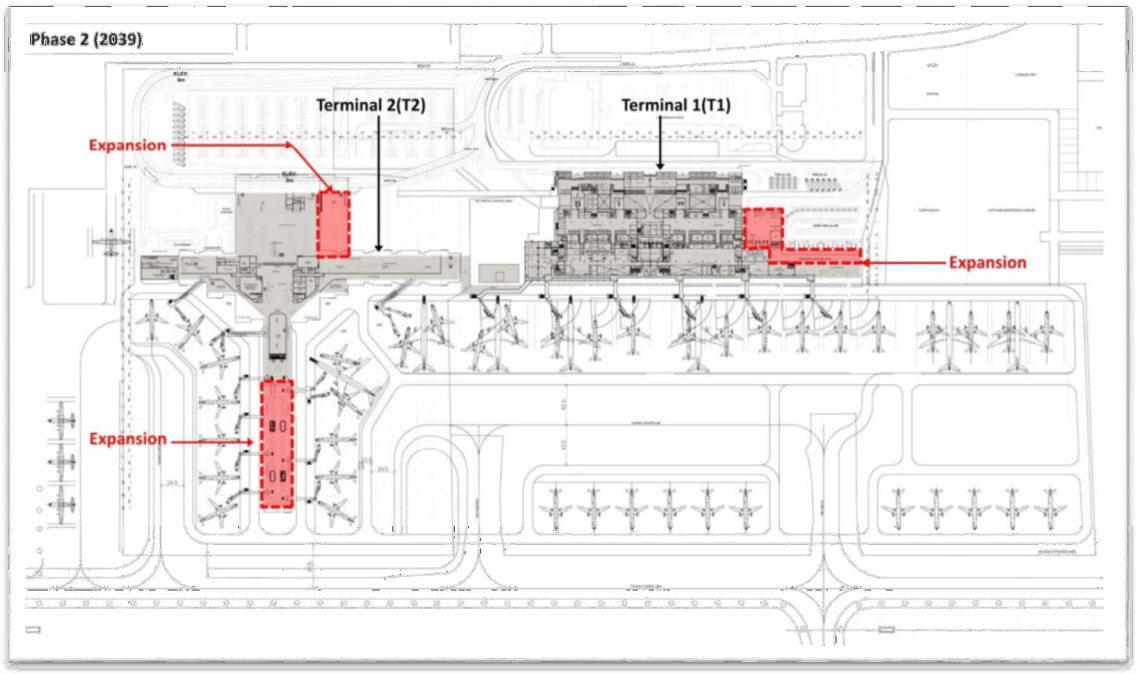


Figure 3-13
Phase 2 Expansion

Demand – Capacity Analysis

As per traffic forecast, the international passenger traffic will reach 4.1 and 8.1 million per annum by 2024 and 2039, respectively. The peak hour (1200H – 1259H) international passenger traffic as per forecast for these years are shown in **Table 3-11**:

Table 3-11
Passenger traffic forecast for 2024 and 2039

Year	2024	2039
Arrival	1,216	2,082
Departure	878	1,676
Total	1,975	3,344

The terminal area requirement during Phase 1 and 2 are shown in **Table 3-12**.

Table 3-12
Area requirement during Phase 1 and 2

Floor	**Phase 1**	**Phase 2**
Departure Level	18,092	20,129
Arrival Level	11,904	16,230
Ground Level	14,353	18,890
Total	**44,349**	**55,249**

Note : Above area calculations are estimated factoring deductions and cut-outs in the floors.

In addition to the information in **Table 3-12**, fixed link bridges and utility block planned to the west side of Terminal T2.

3.6 Landside Development

Landside development comprises of Road network, Car Park, Commercial Assets, Airport Village (Meeter-Greeter Area).

3.7 Road Network Development

An efficient road network has been planned considering the limited land availability. Following points have been considered in the process of design:

- Airport road network is connected to the 4-lane main access road leading to the city forming a loop near the airport and the vehicles have to return using the same road. This will not entail acquisition of additional land.
- Separation of domestic and international Passengers vehicular flows – Since the two terminals are standalone buildings, the vehicle flows to domestic and international terminals have been separated to reduce congestion in front of the terminals and will also facilitate the availability of adequate kerb lengths.
- Signal-free crossings – The road network is planned in such a way that there will be no traffic signals required and therefore the traffic flow will be free flowing in the airport vicinity. This is achieved by means of providing grade separating roads.

- Kerbside – T1 is currently equipped with a two level kerb side separating arrival and departure levels. Departure level kerb side will continue to exist while arrival kerb will be modified for arriving passengers. As per CA, T2 shall be equipped with a two level kerb side which is also being implemented. The availability of the kerb side lengths has been assessed for both 2024 and 2039 phases and is found to be adequate. Part of the kerb side will also serve a holding position for tourist bus considering the aspect that Cebu is a tourist place.
- To meet vehicular traffic requirements till the 25th year of concession i.e. 2039.
- Account the vehicular traffic arising out of Commercial development – The road network to and fro to the Commercial Development areas are planned in such a way that the flow is gradual and mixes with the normal traffic flow.

Currently, the main access road to the airport branches out of a city main road. It provides two decision points the first one offering choice to go to cargo terminal and the second one to the passenger terminal. A new road (< 500m) within the airport will be developed, the alignment of which would pass through the existing motor workshop (which needs to be relocated) and will extend towards the project land earmarked for T2 thereby creating a 'T' junction.

Passengers approaching T2 will continue to travel this main access road which will be 4 lanes. The four lane road will provide third decision point at an appropriate distance for arrival and departure levels. As specified in CA, T2 should be provided with a 2-level kerbside and therefore demands construction of an elevated road way. Departing passengers will take the elevated road way and arrival passengers will continue to travel at grade level. The departure level is 9m above the grade level approximately. Therefore a gradually ascending ramp from the main access road will be built.

The ascending ramp will be two lanes at the entry point and widens to 3 lanes as it reaches the departure level. At the departure level, the three lane road will continue to be flat and will also provide adequate drop off zone for cars and buses. Further, three lane road will converge to a two lane descending ramp to reunite the passengers to the main access road. The road leading to arrival level of T2 will continue to be grade level and will diverge to a four lane road in front of T2 and will further continue to meet the main access road. **Figures 3-14** and **15** show the traffic flow at the departure and arrival areas of T2, respectively. **Figure 3-16** shows the future traffic flow at T1

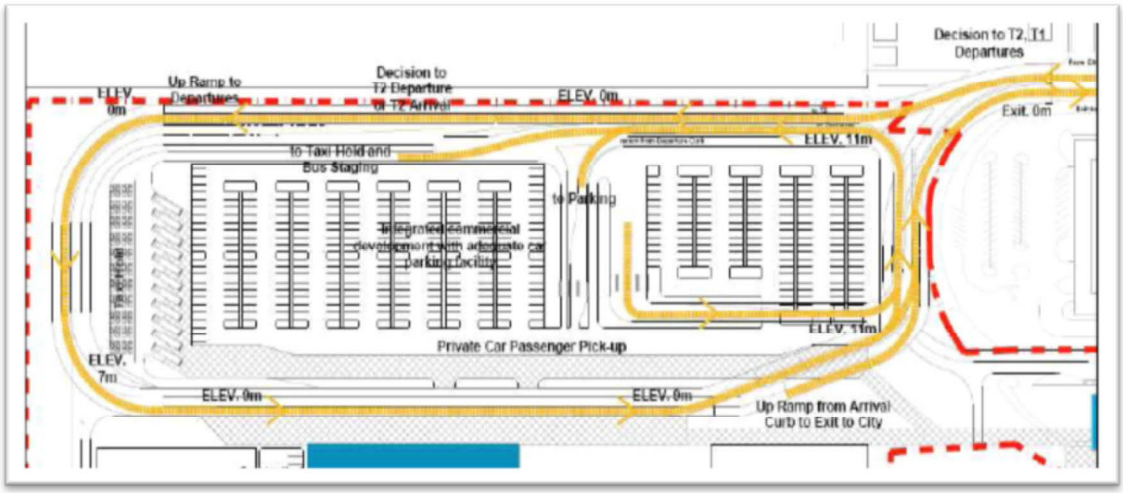


Figure 3-14
Departure traffic flow at T2

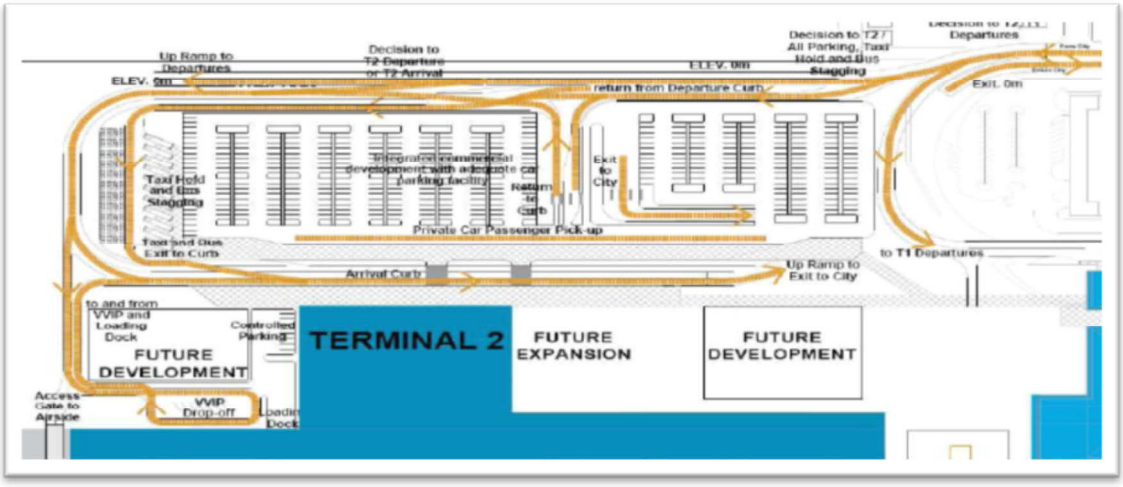


Figure 3-15
Arrival traffic flow at T2

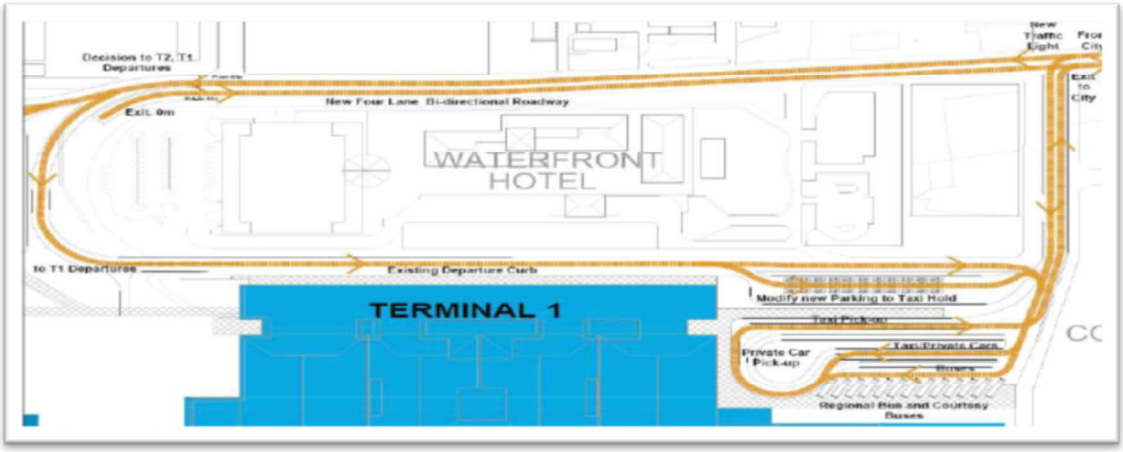


Figure 3-16
Future traffic flow at the arriving gate of T1

Passengers approaching T1 will take a left turn at the second decision point and will proceed to reach departure level of T1. They can proceed further to exit T1 and meet the traffic on main access road i.e. current flow model will continue as it is. For the T1 arriving passengers, a new road loop will be created on the east side of a terminal which will cater to the to and fro movement of arriving passengers of T1. Also, a taxi / cars staging area will be created to facilitate the staging of vehicles for early pick up of passengers.

The overall road network will be equipped with appropriate way finding signage to facilitate decision making for the passengers. Adequate lighting for road network will be provided as per the lux levels specified in Philippines local regulations.

3.8 Airport Village (Meeter/Greeter Areas)

A new meeter-greeter space has been planned at arrival level to cater to the needs of meeters and greeters. It has been observed that meter-greeters are in- convenience due to

lack of protected space provided to them With the revised arrival road scheme for T1, the existing four lane arrival road at T1 will be converted to an Airport village. This area is proposed to be served by natural light coming from the skylights coming out the openings at the departure levels. These openings will be covered by canopies to protect from weather.

For the new terminal T2, Airport village will be developed at arrival level in front of the façade of the building.

3.9 Car Park Development

The demand is estimated to be at 550 car park slots for design year 2024 and 650 Car park slots for design year 2039.The car parking slots will be completed and commissioned along with New Terminal T2.

Necessary space will be allocated for providing the requisite car parks in the proposed commercial development area. To facilitate the passenger movement from T1 to car park, covered walkways will be developed. The existing car park for staff will continue to exist near the east side of T1. However this will be re-aligned or modified as per the T1 road network development.
The details of the project captured in this document are as captured from the Preliminary Design submitted to the Grantors. GMCAC is progressing the detailed design and more improvements are expected to be incorporated in finer details.

4. Environmental and Social Standards, Policies and Regulatory Framework

4.1 MCIAA and GMCAC Concession Agreement

In Section 14.2, the Concessionaire must carry out an environmental and social impact assessment not later than one hundred twenty (120) days from approval of the Preliminary Design by the Independent Consultant or Grantors.

In Section 15.1.a, the Concessionaire must obtain requisite Environmental Compliance Certificate and procure all other relevant consents required to initiate Construction before undertaking Works for T1, T2 and T2 apron.

In Section 18.8, the Grantors attach special significance to the safety of the Passengers. If the Grantors are aware of any action or inaction on the part of the Concessionaire that indicates a failure to operate and maintain the Concessionaire operations and maintenance facilities with due regard to safety, the Grantors may forthwith exercise their rights under Section 18.7 (*Breach*)

4.2 Republic Act (RA) 9497

There are two government bodies that regulate aviation in the Philippines: the Civil Aviation Authority of the Philippines (CAAP) by virtue of Republic Act (RA) 9497 and the Civil Aeronautics Board (CAB) promulgated by RA 776 and amended by Presidential Decree (PD) 1462. The CAAP regulates the technical, operational, safety and security aspects of aviation while the CAB regulates the economic aspect of air transport.

Under Section 27 of RA 9497, the CAAP Director General is authorized “...to issue and adopt rules and regulations and other issuances of the ICAO” (or the International Civil Aviation Organization).

ICAO recently issued two resolutions related to environmental protection: ICAO Resolution A37-18 or "The Consolidated statement of continuing ICAO policies and practices related to environmental protection – General provisions, noise and local air quality" and ICAO Resolution A38-19 or "The Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change."

Both ICAO Resolutions A37-18 and A37-19 aim to:

- limit or reduce the number of people affected by significant aircraft noise;
- limit or reduce the impact of aviation emissions on local air quality; and
- limit or reduce the impact of aviation greenhouse gas emissions on the global climate

4.3 Presidential Decree (PD) 1151 (Philippine Environmental Policy)

The Presidential Decree 1151 (PD 1151) was issued in 1997. This embodies the policy of the state to create balance between socio-economic progress and care for the environment and enshrines the right to have a healthy environment.

It mandated every entity, whether government or privately owned, to issue a detailed Environmental Impact Statement (EIS) on the environmental effect of a proposed action, project or undertaking.

4.4 PD1152 (Philippine Environmental Code)

This decree issued in 1977 mandated the National Environmental Protection Council (now DENR) to launch a comprehensive program of environmental protection and management.

The Council coordinates the enforcement of ambient air quality emission and noise standards, including the monitoring and surveillance of air pollutants, licensing and permitting of air pollution control facilities, and the promulgation of appropriate rules and regulations.

4.5 PD 1586 (Philippine Environmental Impact Statement System)

Issued in 1978, this decree formally established the Philippine Environmental Impact Statement System (PEISS). It delineated developmental activities that would require environmental impact assessment.

The decree required all project proponents of an Environmental Compliance Certificate (ECC) for projects with a significant impact to the environment (Environmentally Critical Project or ECP) and projects located within a critical area (Environmentally Critical Area or ECA).

4.6 National Pollution Control Commission (NPCC) Memorandum Circular 002, Series of 1980 (Amendments to Article 1 (Noise Control Regulations), Chapter IV (Miscellaneous Regulations), Rules and Regulations of the National Pollution Control Commission (1978))

The standards for the ambient noise in general areas is governed by this Memorandum Circular. It establishes the noise standards at the different classified general areas across 4 time segments of the day. Classification of the general areas considers the land use, zoning, and presence of sensitive receptors within the community.

4.7 RA 8749 (Philippine Clean Air Act of 1999)

This law provides for a comprehensive air quality management policy and program in the Philippines which aim to achieve and maintain healthy air for all.

Peculiar to this law which is related to this project is that, it gives the Department of Transportation and Communication (DOTC) the jurisdiction to impose appropriate fines and penalties to mobile sources of air pollutants other than those specified in Section 21 of the Act, which presupposes the inclusion of emissions from aircraft engines.

The Implementing Rules and Regulations (IRR) of this Act is contained in the Department of Natural Resources (DENR) Administrative Order (DAO) No. 81, Series of 2000.

The Air Quality Improvement Framework – Air Quality Control Action Plan of RA 8749 on the other hand is embedded in DAO 82, Series of 2000 which aims to serve as the official blueprint with which all government agencies must comply with to attain and maintain clean and healthy air.

4.8 RA 9275 (Philippine Clean Water Act of 2004)

This law provides for a comprehensive water quality management in the Philippines. DAO 1990-34 and 1990-35 embodies the environmental quality guidelines on water quality.

4.9 RA 9003 (Ecological Solid Waste Management Act of 2000)

This law prescribe the procedures and guidelines for the implementation of the Philippine Solid Waste Management Act of 9003 in order to facilitate compliance.

4.10 DENR Administrative Order (DAO) 2001-34

This is the Implementing Rules and Regulations of Republic Act 9003.

4.11 RA 6969 (Control Toxic Substances and Hazardous and Nuclear Wastes)

The IRR (DAO 29 Series iof 1992) defined the administrative procedures to be followed in the adjudication of cases governing the control of toxic and hazardous substances.

4.13 RA 9147 (An Act on Conservation of Wildlife Resources and their Habitats)

Construction of a major project (such as an airport) poses a risk to wildlife and biological resources through habitat encroachment or degradation. This law prohibits infrastructure development in areas already classified as protected, and provides ways to conserve wildlife resources and their habitats.

4.14 RA 6958 (Charter of the Mactan Cebu International Airport Authority)

The act that creates the MCIA and transfers the authority of its operation to the MCIAA.

4.15 1985 Executive Order 1035

The land acquisition is to be based on fair market value, which will be negotiated between the owner and the appraiser. Financial assistance to displaced tenants, cultural minorities and settlers equivalent to the average annual gross harvest for the last 3 years and not less

than P15,000 per hectare. Disturbance compensation to agricultural lessees equivalent to 5 times the average gross harvest during the last 5 years. Compensation shall be given for improvements on land. Government has power to expropriate in case agreement is not reached.

4.16 Supreme Court Ruling 1987

Defines just compensation as fair and full equivalent for the loss sustained, taking into account improvements, location, capabilities, etc. The value given by the appraiser can only serve as a guide for negotiation. The objective is to enable the Displaced Person to replace affected assets at current market price.

4.17 Department of Public Works and Highways (DPWH) Department Order 142 1995

This aims to avoid unnecessary delays in civil works. Inclusion of parcellary plans and cost estimates for right of way acquisition in detailed engineering stage.

4.18 RA 6389 (Amending Agricultural Land Reform Code)

This provides for disturbance compensation to agricultural lessees equivalent to 5 times the average gross harvest in the last 5 years.

4.19 RA 7279 Urban Development and Housing Act of 1992

Provides guidelines for resettlement of persons living in danger areas, e.g. riverbanks, shorelines, and waterways or areas where government infrastructure projects are about to be implemented. Guidelines cover the provision of basic services and facilities in resettlement sites, livelihood support, meaningful participation and adequate social preparation for the affected households, close coordination between sending and host LGUs, grievance, redress and related aspects. Informal settles who built their houses on or before the effectivity date (March 28, 1992) are entitled to all benefits and considerations prescribed in the said act.

4.20 RA 8974 of 2000 "An Act to facilitate the acquisition of right-of-way, site or location for national government infrastructure projects and for other purposes"

Aims at ensuring that owners of real property acquired for infrastructure projects are promptly paid just compensation. It also provides for the compensation of affected improvements and structures at replacement cost (without depreciation and inclusive of labor costs for reconstruction) and the arrangement of independent appraisers for a more accurate determination of the market values of lands and improvements.

4.21 Commonwealth Act 141 (CA 141); Public Lands Act of 1936

This institutes classification and means of administration, expropriation and disposition of alienable lands of the public domain. Under Section 112, lands awarded for Free Patent are subject to a right-of-way not exceeding 6o meters in width for public highways, railroads, irrigation ditches, aqueducts, telegraph and telephone lines and similar works that the Government or any public or quasi-public service or enterprise including mining or forest concessionaires, may reasonably require for carrying on their business, with damages for the improvements only.

4.22 National Commission on Indigenous People (NCIP) Administrative Order No. 3, Series of 2002

Stipulates the processes necessary for securing Free, Prior and Informed Consent (FPIC) from Indigenous People (IP) communities and Executive Order (EO) 132 designating Presidential Commission on the Urban Poor (PCUP) as clearing house for the conduct of demolition and eviction since both have bearing on actions related to IPs.

5. Audit Approach and Findings

5.1 Overview

The objective of this audit is to identify the environmental and social risks associated with the implementation of the Project. This includes determining the performance and effectiveness of the current environmental and social management measures/ programs in place, as well as compliance status to local and international regulatory requirements.

The audit was carried out using the information from available records, technical plans, and environmental programs furnished by GMCAC.

5.2 Compliance with Asian Development Bank (ADB) Safeguard Policy Statement (SPS) and other social requirements, and Performance against the International Financial Corporation (IFC) Performance Standards

This preliminary audit was carried out to identify the current status of the airport against the existing local and international regulatory requirements (as set in Section 4). Compliance to ADB's SPS and IFC's performance standards is discussed in the succeeding sections.

5.2.1 ADB SPS (2009) requirements

Safeguard policies are generally understood to be operational policies that seek to avoid, minimize, or mitigate adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process.

ADB's SPS sets out the policy objectives, scope and triggers, and principles for three safeguard areas:

- Environmental safeguards
- Involuntary resettlement safeguards, and
- Indigenous peoples safeguards

5.2.1.1 ADB Safeguards Policy Statement – Safeguards requirement 1 on the Environment

The ADB classification system is used to reflect the significance of the proposed Project's environmental impacts. Based on initial assessment, the Project falls under **Category B**, which classifies the potential impacts as site-specific, reversible and can readily be mitigated through engineered measures. ADB thus sets out that an initial environmental examination be prepared, to include environmental management and monitoring plans

5.2.1.2 ADB Safeguards Policy Statement – Safeguards requirement 2 on Involuntary Resettlement

According to the Concession agreement between GMCAC and MCIAA, the property adjacent to the existing passenger terminal building, which is covered by Presidential Proclamation No. 784 (delegation of the administration of the MCIA lands to MCIAA), shall be used for the development of a new terminal building and other landside facilities. At present, the area needed for the development of the new terminal is host to several PAF facilities. A memorandum of agreement between PAF and MCIAA was signed on 15th November 2014, which stated that MCIAA will replicate all PAF facilities on MCIA lands, including the areas covered by the Concession agreement.

The information above indicates that there is no involuntary acquisition of land, nor is there any involuntary restriction on land or on access to legally designated parks and protected areas. The implementation of the proposed Project thus will not result to involuntary resettlement.

5.2.1.3 ADB Safeguards Policy Statement – Safeguards requirement 3 on Indigenous People

A project should give special considerations for Indigenous Peoples. The borrower/client will explore to the maximum extent possible alternative project designs to avoid physical relocation of Indigenous Peoples that will result in adverse impacts on their identity, culture, and customary livelihoods. In the case of the proposed Project area, there is no existing record of the presence of indigenous people living in or around the proposed Project site.

5.2.1.4 ADB's Gender and Development Policy (1998)

ADB's policy on GAD includes the following.

- *Gender sensitivity*: to observe how ADB operations affect women and men, and to take into account women's needs and perspectives in planning its operations.
- *Gender analysis*: to assess systematically the impact of a project on men and women, and on the economic and social relationship between them.
- *Gender planning*: to formulate specific strategies that aim to bring about equal opportunities for men and women.
- *Mainstreaming*: to consider gender issues in all aspects of ADB operations, accompanied by efforts to encourage women's participation in the decision-making process in development activities.
- *Agenda setting*: to assist DMC governments in formulating strategies to reduce gender disparities and in developing plans and targets for women's and girls' education, health, legal rights, employment, and income-earning opportunities.

5.2.1.5 ADB's Social Protection Strategy (2001)

ADB's Social Protection Strategy (2001 SPS) requires the Borrower to comply with applicable labor laws in relation to the Project, and take the following measures to comply with the core labor standards[3]for the ADB financed portion of the Project:

(a) carry out its activities consistent with the intent of ensuring legally permissible equal opportunity, fair treatment and non-discrimination in relation to recruitment and hiring, compensation, working conditions and terms of employment for its workers (including prohibiting any form of discrimination against women during hiring and providing equal work for equal pay for men and women engaged by the Borrower);
(b) not restrict its workers from developing a legally permissible means of expressing their grievances and protecting their rights regarding working conditions and terms of employment;
(c) engage contractors and other providers of goods and services:

    (i) who do not employ child labor[4] or forced labor;[5]

[3]the core labor standards are the elimination of all forms of forced or compulsory labor; the abolition of child labor; elimination of discrimination in respect of employment and occupation; and freedom of association and the effective recognition of the right to collective bargaining, as per the relevant conventions of the International Labor Organization;

(ii) who have appropriate management systems that will allow them to operate in a manner which is consistent with the intent of (A) ensuring legally permissible equal opportunity and fair treatment and non-discrimination for their workers, and (B) not restricting their workers from developing a legally permissible means of expressing their grievances and protecting their rights regarding working conditions and terms of employment; and
(iii) whose subcontracts contain provisions which are consistent with paragraphs (i) and (ii) above.

5.2.2 IFC Performance Standards on Environmental and Social Sustainability

The sustainability framework of IFC comprises policy and performance standards on Environmental and Social Sustainability. The Performance Standards are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable manner, including stakeholder engagement and disclosure obligations of the client pertaining to project-level activities.

The following Performance Standards are relevant to and required for the Project:

- Performance Standard 1. Assessment and management of environmental and social risks and impacts – it establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the project.

- Performance Standard 2. Labor and Working Conditions – it recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental1 rights of workers. For any business, the workforce is a valuable asset, and a sound worker-management relationship is a key ingredient in the sustainability of a company.

- Performance Standard 3. Resource Efficiency and Pollution Prevention- it recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.

- Performance Standard 4. Community Health, Safety and Security Performance Standard- it recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities.

- Performance Standard 5. Land Acquisition and Involuntary Resettlement- it recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to

[4] child labor means the employment of children whose age is below the statutory minimum age of employment in the relevant country, or employment of children in contravention of International Labor Organization Convention No. 138 'Minimum Age Convention" (www.ioo.org)
[5] forced labor means all work or services not voluntarily performed, that is, extracted from individuals under threat of force or penalty

economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood1) as a result of project-related land acquisition and/or restrictions on land use. Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement.

- Performance Standard 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources- it recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.

- Performance Standard 7. Indigenous Peoples- it recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development.

- Performance Standard 8. Cultural Heritage- it recognizes the importance of cultural heritage for current and future generations.

6. Existing Conditions

6.1 Description of present environmental conditions

6.1.1 Land

6.1.1.1 Land use

The area surrounding MCIA is composed of various land uses. On the north and on the southwest of the airport are two Special Economic Zones. The west side MCIA is dominated by urban/commercial area. On the east and south east side, low level residential land use dominates. A few hundred meters distance on the northeast side of MCIA is the Mactan Bay Area.

The Project Area is within MCIA, thus included in the land classification identified as Mactan Airport in the 2013 Comprehensive Land Use Plan of Lapu-Lapu City. **Figure 6-1** shows the land use classifications in the Mactan Island.

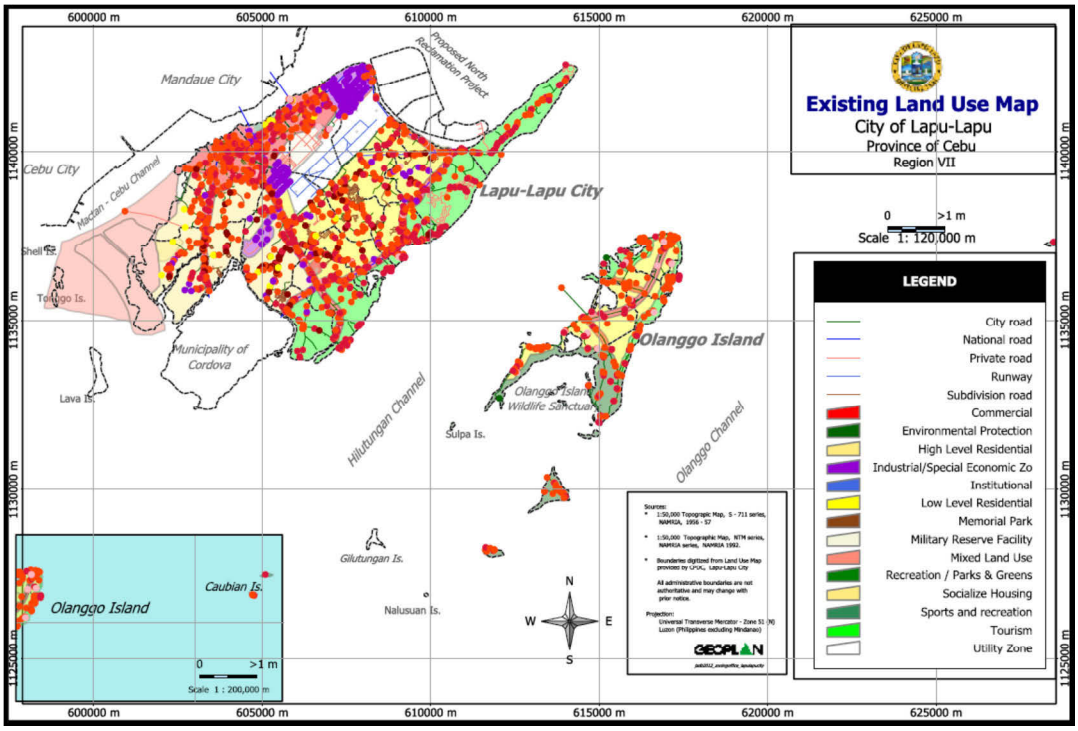


Figure 6-1
Existing Land Use Map of Lapu Lapu City (source: CLUP Lapulapu City, 2013)

6.1.1.2 Geomorphology

The topography of the entire Mactan Island is generally indicated by nearly flat terrain and is generally characterized with the occurrence of coralline limestone over much of the island. The entire island displays a terrain with elevations ranging from 0 to less than 10 meters above mean sea level (amsl). While the whole island is made-up mainly of hard coralline rocks, the entire landmass belongs to a one-slope category that ranges from 0 to 3%.

The entire island has no notable surface water domains that serve as the natural drainage system of the area. The shoreline is generally indicated by numerous raised corals, which makes the tidal inundated area moderately rugged in terrains. Limestone terraces within the inter-tidal zone become submerged during high tides and full exposures are distinct during low tides. Thin silty to sandy fragments of limestone generally covers the inundated surface.

6.1.1.3 Regional geology

The stratigraphy and structure of mainland Eastern Cebu is generally controlled by several succeeding phases of orogenic and volcanic activity since the late Cretaceous period. The oldest basement rock of metasediments is known to occupy the high-elevated areas in the central core of the island. Younger sedimentary strata of lower Miocene age occupy the flanks of the central highlands whereas the eastern and western rock successions towards the central highlands become older in deposition.

The older strata and other clastic sediments of the late Cretaceous period were covered uncomformably by the lower Miocene Malubog Formation (Argao Group), consisting predominantly of shale, siltstones and occasional beds of sandstone and minor conglomerates and limestone layers. Successive earth movements and continuous volcanic activity by intrusion of volcanic rocks (andesite) were followed by sedimentation and deposition of limestone. Due to several depositional breaks and numerous faulting, the sedimentary units of younger succession become complex in occurrence. **Figure 6-2** shows the Geologic Map of Eastern Central Cebu.

In general, though the stratification of Cebu has the younger sedimentary rocks concentrate along the coastline and becoming older towards the center of the island. The geo-anticlinal evolution of Cebu has formed an elongated narrow shaped island, which abruptly terminates to the sea on both the eastern and western coasts of the island providing limited catchment basins for fresh surface and groundwater occurrences.

The Carcar Limestone is generally coralline which forms an almost continuous margin around the islands of Cebu and Mactan. Deposited under a Plio-Pleistocene period of marine transgression and regression, the Carcar Limestone has an estimated thickness of about 500 meters towards near the alluvial toe in the coastal areas. Evaluation of the lithologic logs of some wells drilled in the Carcar Limestone reveals that the entire formation consists essentially of conglomeratic and brecciated limestone with lenses of sandy/marly fragments. Porosity and permeability are enhanced with sufficient fracturing and occurrences of small-scale karstic holes and/or cavities. The presence of marly matrix and lenses of silty fines in the serial layers however, have somewhat lessened the total permeability potential of the rock formation.

6.1.1.4 Structural Geology

Mainland Cebu is an anticlinal structure with its long axis (NNE-SSW) highlighted by a backbone of mountainous highland and rugged terrains. The relatively younger sedimentary rocks generally dip towards SE and the strikes trend towards its long axis (NE).

Fault systems are almost parallel to the island's southwest-northeast trend. The most prominent of the faults are the Cantabaco Fault having many auxiliary faults that emanate from it and merge with other minor parallel faults. These faults were observed cutting through the younger Carcar formation and Quaternary alluvium. Other fault lines can be traced in mainland Cebu but none has been observed in the island of Mactan.

Local Geology

Only two (2) rock types have been identified in the entire landmass of Mactan Island – the Alluvial deposit and the Coralline Limestone. The alluvium covers practically about 40% of the entire island and is generally prevalent in the southern part of the island. It is formed by thin sequence of alternating layers of unconsolidated clay, silt and sand with minor lenses of marl and gravels (limestone origin). The relatively porous characteristics of the soil make the runoff smaller around the island as the water more often seeps into the ground surface. While the whole island is basically flat, the ground slopes and its geologic topography are not susceptible to erosion. Unconsolidated mantle of soils is thin so that hard rocks of limestone formation are often exposed everywhere.

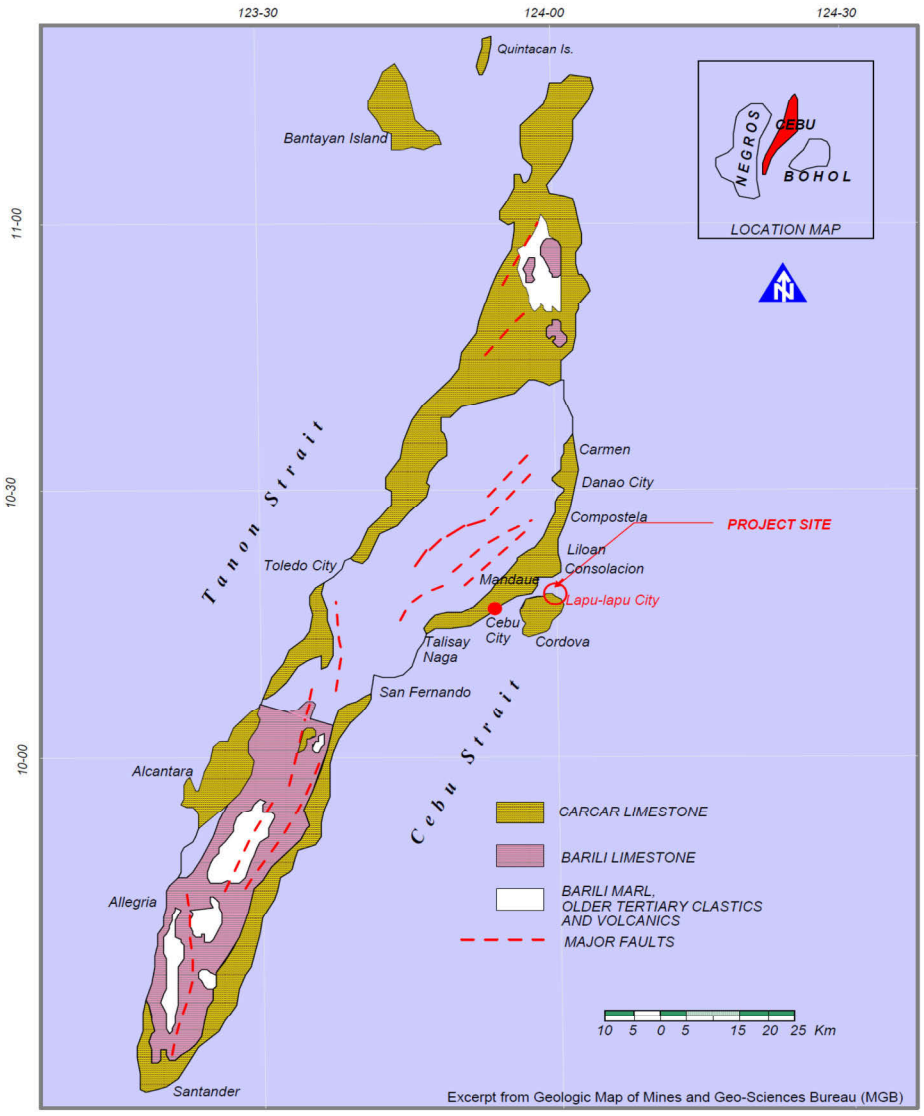


Figure 6-2
Regional Geologic Map of Cebu

The Carcar Limestone in Mactan is a massive, sandy and rubbly coralline limestone with near-continuous coastal occurrence. It is deposited in the Plio-Pleistocene period of marine transgression and regression environment.

The limestone formation in the island is generally buff to beige in color, and is locally, moderately hard, porous and karstic. Karsticity in the limestone is generated by small-scale pores and cavities, which predominates along and near the shoreline where terraced coralline rock mass are often exposed.

6.1.1.5 Hydrogeological baseline

Mactan Island covers a total land area of nearly 59 km^2, of which about 50 km^2 or 85% are exposed to the supposed limestone aquifer unit of the Carcar Formation. This area basically becomes the most important physiographic control in the island because of the occurrence of the productive aquifer whereby considerable amount of groundwater abstraction have been exercised since the proliferation of drilling of wells in the early 1970's wherein the water supply system could no longer cope up with the increasing water demands of the island. The province of Cebu has an average year-round rainfall record of about 1,740 mm and slightly lower variation may be registered at 1,650 mm along the eastern coastal plain, including the Mactan Island with a pronounced low-rainfall season from January-May.

The main aquifer or water-bearing formation in the entire Mactan Island consists mainly of the limestone unit of the Carcar Formation in a relatively flatter coastal slope. The increasing demand in the water requirements apparently calls for an effective management of the still available groundwater resources in the island as the on-going changes in the groundwater storage of the aquifer has already lead to the apparent deterioration in the quality (saline intrusion) of pumped water because of the reported localized over-abstraction of groundwater in some areas, particularly in the southern section of the island.

The main current source for domestic and industrial supply of the island is groundwater through wells and from desalination plants (coastal wells) by private owners for bulk selling. The rest comes from importation of water from the mainland Cebu. The main water providers at the airport are Metro Cebu Water District (MCWD) and Mactan Rock. Groundwater withdrawal had been used by MCWD as early as 1959 but has gradually shifted to surface water lately due to saltwater intrusion. Mactan Rock on the other hand uses Reverse Osmosis technology in processing its raw water.

6.1.1.6 Seismicity

The Philippine Archipelago is a north-south strip of lithosphere squeezed between 2 opposing subducting tectonic plates – the Eurasian and Pacific plates. The Manila and Negros-Sulu Trench-arc systems dip eastward while the Philippine Trench-arc system is northwestward. The latter being the most seismically active trench-arc system in the entire archipelago has formed several faults within its lithosphere. Of these faults, the Philippine Fault Zone (PFZ) is the most active and is physiographically traceable to about 1,200km starting from Luzon to Mindanao, passing through Visayas Islands. PFZ has many structure extensions and actually consists of a number of sub-parallel faults, branches and splays scissoring in part.

The Visayan segment of the Philippine Trench and Philippine Fault Zone (see **Figure 6-3**) and its numerous branches are mainly responsible for the high seismicity in the Visayas Islands. Eastern Visayas bounded by the said earthquake generators and Western Visayas bounded by Tablas – Antique Lineament and Negros-Sulu Trench frequently experience large earthquakes. In contrast, records show that prior to the 1990 Bohol earthquake,

Central Visayas had no earthquake with magnitude greater than Ms = 6.0. The Visayas region has been experiencing about 17% of the yearly earthquake occurrences in the country. At least 3,000 earthquake epicenters were plotted in Visayas from 1900 to present and twenty-two destructive earthquakes were recorded to be destructive from 1589 to 1994.

In Cebu Province, most parts of the mainland are seismically quiescent compared to the rest of the Visayas and entire Philippine Archipelago. Existing seismicity records show no sizable earthquake (magnitude $\geq$5) originating within Cebu from 1907 to present (PHILVOCS Earthquake Catalogue). In addition, no major active earthquake faults have, heretofore been identified in the island. Although tectonic faults have been recognized and mapped by DENR-MGB (1983) and Electrowatt Engineering (1991), they have not been studied with respect to their earthquake potential.

Accordingly, probabilistic estimates of ground motion hazards made by a PHILVOCS-USGS team (Thenhaus and others, in press) show that Cebu Island has relatively low seismic potential. This study estimated peak ground acceleration (PGA) values in Cebu of 0.11*g* for rocks, 0.17*g* for medium soil and 0.27*g* for soft soil, with 90% probability for non-exceedance in 50 years. On a regional scale, five (5) earthquake generators as identified by PHIVOLCS generally bound the entire mainland of Cebu and the island of Mactan. The geologic structures include the: Philippine Fault Zone in the east; Antique-Tablas Fault in the northwest; the Negros Trench and Sulu Trench in the southwest and; the Mindanao Fault in the southern tail of the island. The entire Province of Cebu has not been recorded of destructive earthquakes in the past.

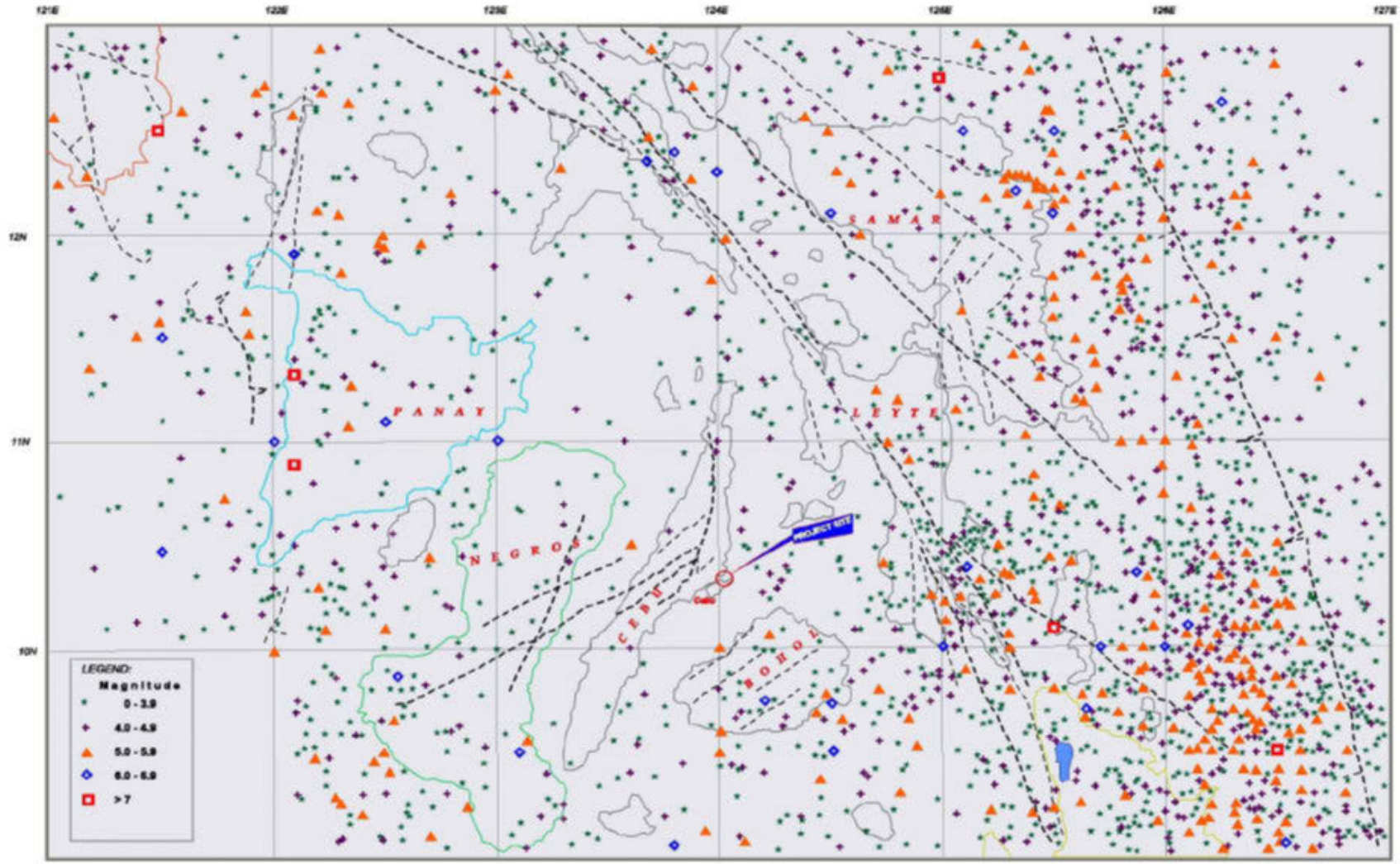


Figure 6-3
Visayan Segment of the Philippine Trench and Philippine Fault

6.1.1.7 Terrestrial Biology

Generally, the Project area (**Figure 6-4**) is highly built-up with sparse vegetation primarily for ornamental and/or orchard purposes. Vegetation present is a combination of shrubs, herbs, palms, vines, ferns, and scattered trees. Open spaces are mostly paved for access roads and parking areas with some occupied by grasses and shrubs.

Figure 6-4
Project Area

The observation for both the flora and fauna diversity was carried out from October 1 to 2, 2014**.** **Table 6-1** shows the coordinates of the areas to be developed by the proposed Project.

Table 6-1
Coordinates of the Project Area

GPS Readings (Coordinates)	
Northing	**Easting**
10°18'56.70"N	123°58'43.44"E
10°18'49.34"N	123°58'36.00"E
10°18'52.10"N	123°58'32.31"E
10°18'46.65"N	123°58'40.59"E

Terrestrial Flora

Since the study area only covers meager vegetation and the boundary is definitely identified on the ground, the use of any sampling methodology is not necessary. A 100 percent survey was conducted up to the MIP facilities. However, the survey was not carried out in the Philippine Air Force reservation area due to security reasons. To supplement the lack of data, secondary data was collected from the DENR CENRO Cebu. On 21 February 2014, the Forest Management Services of the CENRO Office conducted a tree inventory survey upon request of the Philippine Air Force for which the result was utilized for this report.

1. Distribution of species and population

There are about 48 species of plants (27 WCI survey, 21 CENRO Survey), predominated by the Families of Meliaceae, Arecaceae, Fabaceae, and Casuarinaceae, that are found in the study area. **Tables 6-2 and 6-3** enumerate the different species and their population/number identified in the study area.

Table 6-2
Plant Species surveyed by WCI

No.	Common Name	Scientific Name	Population
1	Fire Tree	*Delonixregia*	1
2	Gmelina	*Gmelinaarborea*	13
3	Bo Tree	*Ficusreligiosa*	6
4	Talisay	*Terminalliacatappa*	2
5	Big-Leaf Mahogany	*Switeniamacrophylla*	4
6	Acacia Auri	*Acacia auriculiformes*	1
7	Smooth Narra	*Pterocarpusindicus spp. Indicus*	1
8	Agoho	*Casuarinaequisetifoloia*	13
9	Neem Tree	*Azadirachtaindica*	3
10	Ipil-ipil	*Leusinaleucocephala*	1
11	Manila Palm	*Adonidiamerrilii*	16
12	Travellers Palm	*Ravenalamadagascariensis*	1
13	San Francisco	*Codiaenumvariegatum*	2
14	Bastonni San Jose	*Corlylinefruticosa*	3
15	Duranta	*Durantaerecta*	-
16	Carabao grass	*Paspalumcongugatum*	-
17	Bermuda grass	*Cynodondactylon*	-
18	Skyflower	*Thunbergiagrandiflora*	-
19	Salisi	*Ficusbenjamina*	4
20	India Rubber	*Ficuselastica*	1
21	False bird of paradise	*Heliconiaplastachys*	-
22	Nangka	*Arthocarpusheterophyllus*	1
23	Botong	*Barringtoniaasiatica*	1
24	Pakpaklawin	*Aspleniumnidus*	3
25	Banana	*Musa sapientum*	2
27	Mango	*Mangiferaindica*	5

Table 6-3
Plant Species surveyed by DENR CENRO Cebu (February 21, 2014)

No.	Common Name	Scientific Name	Population
1	Gmelina	*Gmelinaarborea*	24
2	Talisay	*Terminalliacatappa*	6
3	Big-Leaf Mahogany	*Switeniamacrophylla*	65
4	Smooth Narra	*Pterocarpusindicus spp. Indicus*	8
5	Agoho	*Casuarinaequisetifoloia*	27
6	Neem Tree	*Azadirachtaindica*	42
7	Ipil-ipil	*Leusinaleucocephala*	31
8	Travellers Palm	*Ravenalamadagascariensis*	1
9	India Rubber	*Ficuselastica*	6
10	Alim	*Melanolepismultiglandulosa*	3
11	Nangka	*Arthocarpusheterophyllus*	23
12	Kamansi	*Arthocarpuscamansi*	6
13	Mango	*Mangiferaindica*	12

No.	Common Name	Scientific Name	Population
14	Bitanghol	*Callophylumblancoi*	1
15	Pandan	*Pandanustectorius*	1
16	Raintree	*Samaneasaman*	6
17	Bagalunga	*Meliadubia*	1
18	Kaimito	*Chrysophullumcainito*	3
19	Lanete	*Wrightia pubescent*	1
20	Sampaloc	*Tamarindusindicus*	1
21	Pandan	*Pandanustectorius*	1

Leading in the list of species in terms of their population include Big-Leaf Mahogany, Neem Tree, Ipil-ipil, Gmelina, and Agoho.

2. Plant forms in the study area

There are 7 plant forms identified in the area as shown in **Figure 6-5**. Tree species dominate with 66 % of identified species found in the area. Shrubs and Herbs followed with both having 8 % in proportions. Monocots such as palms and grasses also have similar percentage with both having 6 %. With lesser number, ferns and vines both registered with 3 % a piece.

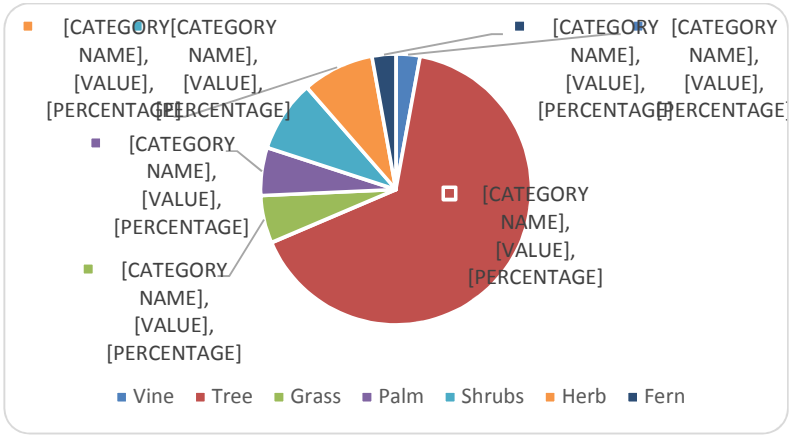


Figure 6-5
Proportion of Species per Plant Form

The complete list of species of plants recorded with their corresponding plant form is shown in **Table 6-4.**

Table 6-4
Number of Species per Plant Form

No.	Common Name	Scientific Name	Plant Form
1	Fire Tree	*Delonixregia*	Tree
2	Gmelina	*Gmelinaarborea*	Tree
3	Bo Tree	*Ficusreligiosa*	Tree
4	Talisay	*Terminalliacatappa*	Tree
5	Big-Leaf Mahogany	*Switeniamacrophylla*	Tree
6	Acacia Auri	*Acacia auriculiformes*	Tree
7	Smooth Narra	*Pterocarpusindicus spp. Indicus*	Tree

No.	Common Name	Scientific Name	Plant Form
8	Agoho	*Casuarinaequisetifoloia*	Tree
9	Neem Tree	*Azadirachtaindica*	Tree
10	Ipil-ipil	*Leusinaleucocephala*	Tree
11	Manila Palm	*Adonidiamerrilii*	Palm
12	Travellers Palm	*Ravenalamadagascariensis*	Palm
13	San Francisco	*Codiaenumvariegatum*	Shrub
14	Bastonni San Jose	*Corlylinefruticosa*	Shrub
15	Duranta	*Durantaerecta*	Shrub
16	Carabao grass	*Paspalumcongugatum*	Grass
17	Bermuda grass	*Cynodondactylon*	Grass
18	Skyflower	*Thunbergiagrandiflora*	Vine
19	Salisi	*Ficusbenjamina*	Tree
20	India Rubber	*Ficuselastica*	Tree
21	False bird of paradise	*Heliconiaplastachys*	Herb
22	Nangka	*Arthocarpusheterophyllus*	Tree
23	Botong	*Barringtoniaasiatica*	Tree
24	Pakpaklawin	*Aspleniumnidus*	Fern
25	Banana	*Musa sapientum*	Herb
26	Mango	*Mangiferaindica*	Tree
27	Bitanghol	*Callophylumblancoi*	Tree
28	Pandan	*Pandanustectorius*	Herb
29	Raintree	*Samaneasaman*	Tree
30	Bagalunga	*Meliadubia*	Tree
31	Kaimito	*Chrysophullumcainito*	Tree
32	Lanete	*Wrightia pubescent*	Tree
33	Sampaloc	*Tamarindusindicus*	Tree
34	Alim	*Melanolepismultiglandulosa*	Tree
35	Kamansi	*Arthocarpuscamansi*	Tree

Trees are dominant in the study area primarily to provide shade for humans working in the area as well as to important structural and transportation facilities inside MCIA concession. Palms, shrubs, ferns, and other grasses are planted for their aesthetic values.

3. Ecological status of species

In terms of endemicity, **Figure 6-6** shows that indigenous species make up 74% of the total species counted in the study area.

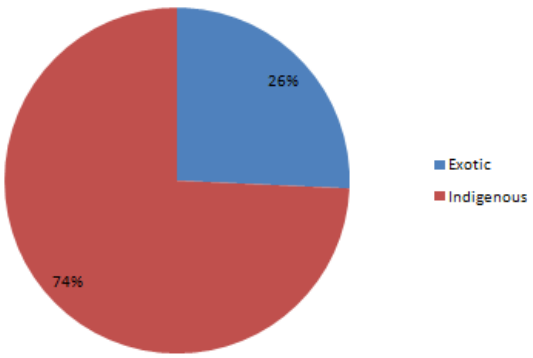


Figure 6-6
Ecological status of species

Indigenous species are those that have wider geographical ranges than endemics but are found nowhere else in the world. Exotic species make up only 26% of the total species recorded. There is no endemic species in the study area since most of the species recorded are common types of species and can be found all over the country.

4. Threatened /Endangered species

There are 2 species listed under DENR DAO 2007-01 or the "National List of Philippine Plants" pursuant to Republic Act 9147 or "Wildlife Resources Conservation and Protection Act". It is also noteworthy that these 2 species are included in the IUC N or CITE Appendix II. The two species are Smooth Narra (*Pterocarpusindicus spp. Indicus*) and Manila Palm (*Adonidiamerrilii*). The Narra species are considered as Category A species (Critically endangered) while Manila Palm is listed in Category B (Endangered). For IUCN and CITES classifications, Narra and Manila Palm are considered to be Vulnerable and Near Threatened, respectively.

5. DENR Declared Protected Areas

According to DENR CENRO Cebu, 76.3% of Cebu is under the National Integrated Protected Area System. These include declared protected areas such as Kotkot, Lusaran, and Mananga watersheds, the Central Cebu National Park, Sudlon National Park, and Cebu Watershed Reservation. On the other hand, the Island of Mactan, wherein the project site is located is not included in any declared protected area. Whatsoever, the Olango Island Wildlife Sanctuary can be considered as the nearest protected area with an approximate distance of 16-20 kilometers from the Project site.

6. Tree Inventory and Tree Cutting Permit

Simultaneous with terrestrial flora survey, a tree inventory was also conducted to determine the number and volume of trees present in the area. Under DENR policy specifically DENR Administrative Order No. 2000- 21, dated 28 February 2000, Tree Inventory is required to be conducted for the issuance of necessary Tree Cutting Permits.

Procedures in the conduct of Tree inventory survey

Prior to the actual Tree Inventory, preparatory activities were conducted to make the survey as smooth as possible. An ocular inspection accompanied with maps indicating the alignment was done to determine the boundary of the project area. Different inventory materials and equipment were secured and prepared (e.g. Meter Tape, Diameter tape, Abney-hand level, GPS, Camera, Tree markers, Inventory Tally Sheets, Stand and Stock Table, etc.). The following discusses the procedures followed during the tree inventory survey:

(a) Identification and plotting of the boundary of the study area to provide clear reference line on whether trees are counted and included.
(b) Only trees found growing within the boundary which may be affected by the project shall be counted/marked.
(c) Measurement of the diameter of each tree was done using diameter tape or its equivalent. Diameter tapes are calibrated and can be used to take direct measurements. Tree diameter was measured approximately 1.3 meters from the ground. For trees with buttress, diameter was measured 30cm above the enlargement of main width of buttress.
(d) Merchantable heights were obtained using the meter tapes or its equivalent. Coordinates for each tree was determined using Global Positioning Systems (GPS).

(e) Local name, diameter in cm, height in meters, species number, and coordinates were recorded in the field tally sheets. Tree marking is done using brush and paint;
(f) The volume of each tallied trees was computed from the equation of the standing trees applicable for a locality/region pursuant to DENR-FMB Technical Bulletin No. 3 dated 31 October 2012. For the Central Visayas region (Region 7), the applicable volume equation is V= 0.00004649 x D2 x H
(g) The stand and stock tables are prepared by species with corresponding Diameter at Breast Height (DBH) classes. Fruit trees shall be segregated from the list since these kinds of trees are not the jurisdiction of the DENR but rather under DA supervision. If fruit trees have been cut and needs to be transported to other areas, DENR will have authority and hence a transport permit of logs/lumber should be accomplished.

Procedures in the Acquisition of Tree Cutting Permit

The application for tree cutting permit is filed and processed initially at the concerned CENRO office. The CENRO Officer shall refer the application to the Chief of the Forest Management Services (FMS) who will assign FMS staffs that will conduct site inspection, validation, and assessment and asks for necessary requirements. Inspection report with recommendation is prepared then by the FMS Staff. If all requirements have been submitted, FMS shall Prepare Tree Cutting Permit to be signed by issuing authority. The following requirements shall be submitted by the applicant for the issuance of Tree Cutting Permit:

(a) Duly accomplished application form
(b) Authenticated copy of the land title/CLOA together with sketch map
(c) LGU endorsement (any of the Brgy Chair, Municipal Mayor, or Provincial Governor)
(d) Certification from Local DAR officer for CLOA areas.
(e) Initial Environmental Examination (IEE)
(f) Inventory fee based on existing regulations

Table 6-5 shows the DENR issuing authority responsible for the approval of Tree Cutting Permit.

Table 6-5
Approving authority for the issuance of Tree Cutting Permit

Volume (cu. m)	Approving Authority
1-50	CENRO
51-100	PENRO
101-500	RED
501-1000	USEC for Field Operations
Above 1000	Secretary

Note:
CENRO – Community Environment and Natural Resources Office
PENRO – Provincial Environment and Natural Resources Office
RED – Regional Executive Director
USEC – Under Secretary

Tree Inventory Results

The result of the tree inventory survey for carried out by GMCAC (Through WCI) and DENR CENRO Cebu is shown in **Annex 2**. The computed total merchantable volume is about 46.49 cubic meters. Following DENR policy, the issuing authority for such volume of merchantable wood will be CENRO Cebu.

Terrestrial Fauna

Opportunistic observations were employed for birds as well as for amphibians and reptiles. Secondary data gathering, such as key informant survey, was utilized to gather other information that otherwise would not be covered by the primary data gathering. Field investigations focused on four animal groups: birds, mammals and herps (amphibians and reptiles).

Knowing the busy condition and frequent human activities in the study site, it is expected that faunal behavior are less than normal. The airport operation started early morning and halted very late in the evening near midnight. In addition, the noise that is attributed to the operation of the Philippine Air Force also could alarm fauna from staying within or near the study site. Moreover, it is noteworthy to say that during the survey, the animals that were encountered are the following: Monitor Lizard (Varanusvarius), Common toad (Ingerophrynusphilippinicus) and a group of common Eurasian tree sparrow (Passer montanus).

1. Noteworthy species of Cebu

Cebu is home to numerous species of birds many of which are considered endangered and under strict management of the DENR. According to IUCN, the following species of birds are highly endemic to the island of Cebu **Table 6-6**:

Table 6-6
Endemic species of Birds according to IUCN

Species	IUCN Category
Philippine Spinetail (*Mearnsiapicina*)	Near Threatened
BalckishCuckooshrike (*Coracinacoerulescense*)	Least Concerned
Streak-breasted Bulbul (*Ixossiquironensis*)	Endangered
Black Shama (*Copsychuscebuensis*)	Endangered
Philippine leafbird (*Chloropsisflavipennis*)	Vulnerable
Cebu Flowerpecker (*Dicaeumquadricolor*)	Critically Endangered

The Cebu flowerpecker was considered extinct since 1906 until it was rediscovered in 1992 in a remnant of largely degraded forest near the village of Tabunan. With this condition, the IUCN have considered the bird species as one of the rarest species in Cebu.

2. Olango Wildlife Sanctuary

Located 4 kilometers of the Coast of Mactan Island and around 20 kilometers in the project area, the Olango wildlife sanctuary is the Philippines first wetland of international importance for waterfowl. In 1987, approximately 10,000 migratory birds was discovered in the island. In 1992, President Corazon Aquino declared the island as protected area. The island became more significant with the sighting of near threatened and vulnerable species such as the Asia Dowitcher and Chinese Egret. Other species of birds that can be found in the area are shown in **Table 6-7**.

Table 6-7
List of species found in Olango Wildlife Sanctuary

a. Little Egret	k. Common Greenshank	v. Curlew Sandpiper
b. Little Heron	l. Common Sandpiper	w. Gull-billed Tern
c. Grey Plover	m. Pied Fantail	x. Whiskered Tern
d. Kentish Plover	o. Brown Shrike	y. Common Kingfisher
e. Greater Sand-Plove	p. Olive-backed Sunbird	z. White-collared Kingfisher
f. Far Eastern Curlew	q. Terek Sandpiper	aa. Barn Swallow
g. Eurasian Curlew	r. Grey-tailed Tattler	bb. Pacific Swallow
h. Whimbrel	s. Ruddy Turnstone	cc. Yellow-vented Bulbul
i. Bar-tailed Godwit	t. Great Knot	dd. Golden-bellied Flyeater
j. Common Redshank	u. Rufous-necked Stint	

6.1.2 Water

6.1.2.1 Oceanography

The nearest water body to MCIA, which also receives the storm drains from the airport, is the Mactan Bay. Taken from the feasibility study carried out for the Mactan North Reclamation Development Project in 2006, the following indicators show the range of tides near the Mactan Bay area (Tide station, Port of Cebu, 2002):

Mean Higher High Water (MHHW) : 0.78 m
Mean High Water (MHW) : 0.51 m
Mean Sea Level (MSL) : 0.00 m
Mean Low Water (MLW) : -0.51 m
Mean Low Low Water (MLLW) : -0.69 m
Highest Tide Recorded : 1.50 m (1952)
Lowest Tide Recorded : -1.16 m (1970)

The prevailing wind in the Island of Mactan is northeast from October to May and southwest from June to September. The current patterns along the coastal region of Magellan Bay are influenced by the tidal force and wind direction with wind speed ranging 2-3 m/s. The highest wind speed recorded was 5.5 m/s along the south direction on November 12, 1990. Current patterns can also be influenced by the temperature gradient through convection below sea surface.

6.1.3 Water Quality

The storm water and STP effluent discharges of MCIA mainly go to Magellan Bay, fronting Barangay Ibo. Ambient water quality sampling along the bay area, about 20 meters from the outfall, was carried out on September 24, 2014. The results of water analyses are summarized in **Table 6-8**. The water quality values are compared with the DENR standards for Class SC water.

Class SC is a marine body of water meant for fishery and recreational use, and it also includes marshy and/or mangrove areas declared as fish and wildlife sanctuaries. This type of water body is intended for the propagation and growth of fish and other aquatic resources

for commercial and sustenance fishing, and for boating, fishing, or other similar recreational activities.

Table 6-8
Water Quality of Magellan Bay (Brgy. Ibo)

Parameters	DENR Standard (Ambient Class SC)[a]	Brgy. Ibo (2014 data)	Brgy. Ibo (2009 Data)[b]
pH	6.5 - 8.5	7.6	nd[c]
Temperature, ^{o} C	25 – 31	30.8	23.3
DO, mg/L	5	0.77	6.7
BOD, mg/L	n/a	48	3
COD, mg/L	n/a	110	nd
TSS, mg/L	80	50	46
Total Coliform, MPN/100mL	2.00E+02	1.60E+06	9.20E+05
Chromium Hexa, mg/L	0.05	0.032	<0.025
Salinity	-	7.59	nd
Conductivity	-	17.2	nd
Nitrate as Nitrogen, mg/L	10	0.02	nd
Phosphate, mg/L	0.5	1.34	nd
Cadmium, mg/L	0.005	<0.003	<0.003
Copper, mg/L	0.02	0.032	nd
Arsenic, mg/L	0.02	<0.001	<0.01
Cyanide (free), mg/L	0.1	<0.05	nd
Lead, mg/L	0.05	<0.01	<0.01

[a]DENR Administrative Order 2008-XX (Water Quality Guidelines and General Effluent Standards;
[b] Data acquired from the EIS of Mactan North Reclamation Development Project, 2009
[c] nd – not determined

Results of the 2014 sampling reveal that most of the parameters are within the standard limits for Class SC water, except for Total Coliform, Phosphate and Copper. Previous analysis (2009 data) also show that Total Coliform exceeds the permissible limit, however, it was lower in 2009. Comparing 2009 and 2014 water quality data, the high number of coliform and relatively high concentration of Phosphate suggest that there may be an increase in human activities (i.e. disposal of untreated septage) along or near the bay fronting Brgy. Ibo.

The waste water produced in the passenger terminal of MCIA is processed by an STP located near the Magellan Bay area. The STP effluent discharge is regularly monitored (monthly) by MCIAA as part of its compliance to the conditions stipulated in the discharge permit. The current design capacity of the STP is 900 m^3/ day and is presently receiving flow rate less than 300 m^3 per day.

MCIAA has certificates of previous water quality tests from January 2014 to August 2014, analyzed by Technolab Analytical Group. The parameters analyzed are as follows: Dissolved Oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD) total suspended solids (TSS), total nitrogen (TN), total phosphorus (TP) and pH. These parameters are analyzed using the analytical methods and water quality Standards for Class SC water body as shown in **Table 6-9**:

Table6-9
Effluent standards and analytical Methods for water quality analysis

Parameters	Effluent Standard, Class SC (for Magellan Bay)	Methods
DO, mg/L	-	Azide Modification (Winkler)
BOD, mg/L	100	Azide Modification
COD, mg/L	200	Open Reflux
TSS, mg/L	150	Gravimetric
TN, mg/L	-	Kjeldahl
TP, mg/L	-	Stannous Chloride-colorimetric
pH	6.0 – 9.0	Glass Electrode

Table 6-10 shows a summary of STP effluent water quality analyses based on the laboratory certificates from November 2013 to August 2014.

Table 6-10
Water Quality data based on laboratory certificate of analysis

Parameters	2013		2014							
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
DO, mg/L	1.6	0	0	1.4	3.0	0	0	0	0	0
BOD, mg/L	43	52	70	29	32	99	99	61	17	75
COD, mg/L	168	314	188	188	120	163	260	218	219	220
TSS, mg/L	75	154	69	76	34	99	95	93	140	139
TN, mg/L	49	9.9	9.3	43	4.0	13	1.3	3.7	30	81
TP, mg/L	2.7	6.3	7.2	6.1	1.3	4.9	5.7	6.4	5.2	2.0
pH	7.06	7.75	7.55	7.88	7.34	7.40	7.86	7.75	7.76	7.93

Source: Technolab Analytical Group, Inc., Labangon, Cebu City

Based on the water quality results, the BOD concentrations from January 2014 to August 2014 are all within the permissible limits. The COD concentration would sometimes exceed the effluent standard for Class SC, and MCIAA, as stipulated in its ECC discharge permit, will have to do the necessary corrective measures to meet the DENR regulatory requirements.

6.1.4 Air

6.1.4.1 Climate and Meteorology

The climate of Mactan Island belongs to the Type IV of the Modified Coronas Classification of Philippine Climate, which is relatively dry from November to April and relatively wet for the rest of the year. **Table 6-11**shows the climatological extremes in Mactan, Cebu.

Relying on information from the PAG-ASA and the Mactan Cebu International Airport (MCIA), Mactan's average annual rainfall is 1,547 millimeters. The entire island is generally remote from the normal and usual path of tropical cyclones originating from the Pacific Ocean.

Table 6-11
Climatological Extremes in Mactan, Cebu (1973 – 2010)

Month	Rainfall			No. of Rainy days		Wind		
	Ave	Greatest	Highest One day	Ave	Greatest	Prevailing Direction	Average Velocity	Dew Point
JAN	105.2	403.3	126.6	12	27	NE	3	23.6
FEB	69.6	173.8	61.8	9	17	NE	3	23.5
MAR	58.6	243.5	141.3	8	17	NE	3	23.9
APR	48.1	251.7	174	6	14	NE	3	24.5
MAY	95.0	206.2	88.6	8	22	E	2	25.1
JUN	175.6	390.3	87.8	14	22	SW	2	25
JUL	192.9	391.3	99.6	16	22	SW	2	24.8
AUG	143.5	358.6	96.6	14	19	SW	3	24.6
SEP	179.6	375.5	97.3	15	21	SW	2	24.8
OCT	194.8	373.8	166.1	16	22	NE	2	24.8
NOV	161.9	493.7	276.1	14	20	NE	3	24.6
DEC	139.7	423.5	185.4	14	23	NE	3	24.1
Annual	1,564.50	493.7	276.1	146	27	NE	3	24.4

Source: PAGASA

6.1.4.2 Wind Data

Based on meteorological data from PAG-ASA, there are two prevailing wind directions in the area. One direction is the northeast monsoon, which generally blows from November to February. The other is the southwest monsoon, from May to September. In the Project area, the prevailing average wind speed is 14 kilometers per hour and the maximum sustained wind speed is 36 kilometers per hour.

This wind direction data implies that the surrounding area will be directly affected during the months of June to September when wind direction is towards the south and southwest due to southwest monsoon. The monthly wind direction and the area most likely to be affected by the dispersion of wind are presented in **Table 6-12**.

Table 6-12
Monthly prevailing winds and direction

Months	Wind Direction	Ave. Speed, m/s	Ave. Speed, km/hr	Wind direction, with reference to MCIA
JAN	NE	3	10.8	Towards the bay
FEB	NE	3	10.8	Towards the bay
MAR	NE	3	10.8	Towards the bay
APR	NE	3	10.8	Towards the bay
MAY	E	2	7.2	Towards the bay
JUN	SW	2	7.2	Towards the bay
JUL	SW	2	7.2	Towards MEPZA and airport
AUG	SW	3	10.8	Towards MEPZA and airport
SEP	SW	2	7.2	Towards MEPZA and airport
OCT	NE	2	7.2	Towards the bay
NOV	NE	3	10.8	Towards the bay
DEC	NE	3	10.8	Towards the bay

Source: Philippine Atmospheric, Geophysical and Astronomical Services Administration

6.1.4.3 Ambient Air Quality

Methodology (Air Quality Sampling)

Air samples were collected at different sampling stations within and outside MCIA. The location of the sampling stations were selected based on the proximity of the proposed project to critical receptors like communities, schools and hospitals, as well as the potential locations of engine-based equipment (**Figure 6-7**). The density of the municipality is also considered in determining the locations of the stations. Since it is anticipated that the ground level concentrations of air pollutants due to aircrafts movements will be higher for receptors that are situated near and facing the airport, two sampling stations were placed in locations facing the runway. Another station is selected facing the terminal, but surrounded by critical receptors such as schools, residences, and commercial establishments.

Figure 6-7

Map of Air Quality Sampling Stations in Mactan Cebu International Airport
AQS1 is at MIP Facility, AQS2 at Cargo Bay Area, AQS3 at Bangkal Barangay Hall, AQS4 at Science and Technology Educational Center, and AQS5 at Pusok National High School.

During the surveys, the coordinates of each observation sites were recorded using a Geographic Positioning System. The parameters measured include Sulfur Dioxide (SO_2), PM_{10}, Total Suspended Particulates (TSP) and Nitrogen Oxides (NO_x) for 24 hours. $PM_{2.5}$ is commonly emitted from due to the incomplete combustion of fuel (low efficiency combustion). In Cebu, many passenger vehicles have already employed the use of natural gas, which in most cases do not result to $PM_{2.5}$ emissions. Aircraft engines and fuels have very low $PM_{2.5}$ emission factor. For the purpose of this study, $PM_{2.5}$ was not included, but can be part of the proposed environmental monitoring plan.

The equipment used for the 24-hour average SO_2 and NO_2 level measurements was a Kimoto Handy Gas Sampler. The gas sampler uses an impinger that collects ambient air pollutants by bubbling the ambient air through an absorbing solution. After bubbling, the solutions were preserved and analyzed to determine the pollutant concentrations. The methods for the analyses of the parameters are Pararosaniline Method for SO_2 and Griess-Saltzman Method for NO_x.

For Particulate Matters (PM) and TSP, the instrument used was a Staplex high-volume sampler. This instrument collected particulate matter from ambient air in a glass fiber filter and measured the flow of ambient air through the filters of specific sizes. The filters were stored in a desiccator for at least 24 hours before and after sampling. The PM and TSP concentrations were computed using the initial and final weight of the filter, average flow rate and the sampling duration. **Table 6-13** shows the results of ambient air quality sampling.

Table 6-13
Ambient Air Quality

Parameters	Method	DENR STD	AQS 1	AQS 2	AQS 3	AQS 4	AQS 5
PM_{10}, g/Ncm	Gravimetric Method-High Volume	150	48	89	53	99	96
TSP, µg/Ncm	High-Volume -Gravimetric	230	86	92	62	147	96
NO_2, µg/Ncm	Gas Bubbler -Greiss -Saltzman	150	0.9	1.55	<0.10	<0.10	<0.10
SO_2, µg/Ncm	Gas Bubbler -Greiss -Pararosaniline	180	1	1	<1	<1	<1
CO, ppm	Direct Reading - Using Electrochemical Sensors	-	0	0	0	0	0

Based on the results above, the air quality level in all sampled areas are within the permissible levels in the DENR standards. AQS1 is situated on a grassy lot in front of the MIP building, adjacent to Terminal 1. AQS2 is located in front of Terminal 1 near the cargo transport area. The PM_{10} and TSP in AQS1 would most likely come from dusts carried by the wind coming from the apron. In AQS4, the dusts emitted PM_{10} and TSP are relatively high which may have been caused by the disturbance of soil (due to student activities at the Science Technology Educational Center (STEC)) during the time of sampling.

6.1.4.4 Ambient Noise

Baseline Noise levels

Ambient noise levels were determined at 5 stations near the airport by using a sound level meter. The location of these stations are summarized in **Table 6-14** and in the figure below:

Figure 6-8

Map of Ambient Noise Monitoring Stations at Mactan Cebu International Airport
NS1 and NS5 are at Science and Technology Educational Center, NS2 at a private residential compound facing the airport, NS3 at Helenville Subdivision, and NS4 at EMD Carmelite School

Table 6-14
Location of the Monitoring Stations around MCIA

Station	Name	Latitude	Longitude	Land Use
NS1	STEC 1	10°17'50.06"N	123°57'55.88"E	Recreation/Parks and Greens
NS2	Evangelista	10°17'35.34"N	123°58'6.47"E	Recreation/Parks and Greens
NS3	Helenville	10°18'4.68"N	123°58'44.81"E	Recreation/Parks and Greens
NS4	EMD	10°19'8.79"N	123°59'39.13"E	Recreation/Parks and Greens, Light Industry Zone
NS5	STEC 2	10°17'47.05"N	123°57'58.81"E	Recreation/Parks and Greens

The first station is found inside the Science and Technology Educational Center (STEC) near the airport perimeter and Runway 04. It belongs to Barangay Basak and the area is classified as Recreation/Parks and Greens in CLUP.

The second station is located inside the house compound of Col. Evangelista. This station is facing the airport perimeter fence and is located near a busy road and at the back of St. Augustine International School. The area belongs to Barangay Basak and is classified as Recreation/Parks and Greens in the CLUP.

The third station is situated within Helenville Subdivision, and is a few blocks away from the Holy Infant School. This monitoring area is approximately 150 meters from the airport fence. It is within the border of Barangay Pajac, Bankal, and Pusok and is classified as Recreation/Parks and Greens in CLUP.

The fourth station is located within a residential area at the back of EMD Carmelite School, and is fronting the airport perimeter fence. This area belongs to Barangay Buaya and is within the classification of Recreation/Parks and Greens and Light Industry Zone in CLUP.

The last station is also located within STEC and is very near Runway 04. This station was chosen because of its proximity to the runway 04 (RWY 04) where noise is perceived to be the loudest prior to the departure of aircrafts.

Results of the monitoring are summarized in Table 6-15 below. Values are presented in chronological order[6] and expressed as either DNL, L_{eq} (24-hour average), L_d (7AM-10PM average), L_n (10PM-7AM), L_{max}, L_{min}, L_{10} (10^{th} percentile rank value), L_{50} (50^{th} percentile rank value), and L_{90} (90^{th} percentile rank value). Figures 7 to 11 below represent the plotted data.

Table 6-15
DNL Values of the 5 Monitoring Stations

Monitoring Station	DNL (dBA)	Sampling Date	Time Period	Noise Level in dBA					
				Ave	Min	Max	L_{10}	L_{50}	L_{90}
NS1 STEC 1	59.13	9pm 5Nov (W) - 9pm 6Nov (Th)	24Hrs	55.4	43.2	80.4	46.3	56.4	64.5
			L_d	58.9	46.2	80.4	52.9	58.3	66.0
			L_n	49.5	43.2	77.0	45.4	47.6	56.9

[6] Note: Permit to conduct a 24-hour monitoring to all 5 stations was not given simultaneously, as such conduct of monitoring did not follow by station number.

Monitoring Station	DNL (dBA)	Sampling Date	Time Period	Noise Level in dBA					
				Ave	Min	Max	L_{10}	L_{50}	L_{90}
NS3 Helenville	54.98	10pm 6Nov (Th) - 10pm 7Nov (F)	24Hrs	49.5	37.9	85.5	43.3	48.0	58.2
			L_d	50.3	40.5	85.5	44.7	48.7	58.6
			L_n	48.2	37.9	77.1	42.0	46.2	57.3
NS5 STEC 2	53.94	7am 8Nov (Sa) - 7am 9Nov (Su)	24Hrs	48.6	39.0	83.2	42.6	55.1	60.5
			L_d	49.5	39.0	83.2	42.5	46.8	61.7
			L_n	47.1	40.5	82.3	42.7	44.7	57.0
MS4 EMD	57.46	9am 9Nov (Su) - 9am 10Nov (M)	24Hrs	53.6	42.0	89.0	44.1	53.2	62.5
			L_d	56.6	43.7	89.0	48.3	56.0	63.9
			L_n	48.6	42.0	88.9	43.5	45.8	56.7
MS2 Evangelista	59.78	12nn 10Nov (M) - 12nn 11Nov (Tu)	24Hrs	55.3	42.1	84.5	46.3	55.2	62.3
			L_d	57.0	46.6	84.5	52.4	56.2	62.4
			L_n	52.3	42.1	84.4	44.4	50.9	61.8

6.2 Description of Socio-economic Conditions

6.2.1 Land area

The LGU Profile of Lapu-Lapu City, 2010 indicates that the area of the city is 6,424.19 hectares. Lapu-Lapu City is a first class and a highly urbanized city in the province of Cebu. It occupies most of the Mactan Island, and also covers the Olango Island group and a few islets. The city is also part of the Cebu Metropolitan Area.

The city is joined to Mandaue City on mainland Cebu by the Mactan-Mandaue Bridge and Marcelo Fernan Bridge. Mactan-Cebu International Airport, the second busiest airport in the Philippines, is located at Lapu-Lapu City.

The airport is within the boundaries of Barangays Pajo, Pusok, Buaya, Bankal, Pajac, and Basak.

Barangay Pajo has a land area of 154 hectares and a population of 26,400 as of 2013. It is a first class barangay where main sources of livelihood are employment, business, entertainment and manufacturing. It has 2 public and 8 private pre-schools; 2 public and 5 private elementary schools; and 2 public and 3 private high schools. Social amenities include telephone system and 2 cable TV systems. Power is supplied by Mactan Electric Cooperative while water provider is the Mactan Cebu Water District. Based on the CLUP 2010-2020, there are 219 informal families in Pajo, occupying approximately 1.4 hectares of private land.

Other barangays that are likely to be affected are Barangay Ibo, particularly the route that might be affected when transporting construction materials to the terminal site; Barangays Buaya, Bankal, Pajac, Basak, and Pusok that are partly within the flight path of incoming and outgoing aircraft.

Barangay Ibo has a land area of 230 hectares and a population of 12,465 as of 2014 based on its Barangay Profile, where nearly 60% are permanent residents and the rest are transient or boarders who work in nearby Mactan Export Processing Zone. CLUP 2010-2020 indicates that there are 222 informal families occupying .2 hectares of government land.

Barangay Buaya has a land area of 271 hectares and its population as of 2014 Barangay Profile is registered at 16,339.The main livelihood activities of the people are fishing,

shellcraft, small business, factory works, employment with government, and retail, small food business, and retail selling of fish and vegetables.

Barangay Basak has a large area of 603 hectares, of which 63 hectares had been developed as an economic zone which is the City Light Industrial Park. Its population as of 2010 (CLUP 2010-2020) was recorded at 45,927. The people's main source of livelihood is employment in the export processing zone. Barangay Basak is the seat of the Mactan Doctors Hospital, Blue Sky Hotel, Indiana Aerospace University and many other business establishments. CLUP 2010-2020 indicates that there are 272 informal families in Basak occupying 2.3 hectares of government land.

Barangay Pusok has a land area of 153 hectares. Its present population is recorded at 27,365 based on its Barangay Profile. Being strategically located at the heart of Lapu-Lapu City, it is the show-window of tourism and is considered as a commercial and industrial area. It consists of 348 commercial establishments and it is the seat of the MCIA. Despite the presence of many commercial establishments, the Barangay Profile of Pusok indicates that it has the largest number of urban poor areas attributed to the influx of inhabitants from different regions taking advantage of job opportunities offered by PEZA which is very near to Barangay Pusok.

6.2.2 Population and demography

Based on the 2010 Census on Population and Housing, Lapu-Lapu city has a population of 350, 467, which is larger by 133,448 compared to its population in 2000 which was recorded at 217,019. The increase in the population count from 2000 to 2010 is translated to an average annual population growth rate (PGR) of 4.91 percent. This is higher than the 4.03 percent annual PGR of the city between the census years 1990 and 2000. It is also much higher than the population growth rate of Cebu Province at 1.68% and Cebu City at 1.46% for census years 2000 – 2007.

Based on the annual growth rate of 4.91 percent from 2000 to 2010, the population projection of Lapu-Lapu City is estimated to double after 15 years (2025) as follows (**Table 6-16**):

Table 6-16
Population Projection in Lapu-Lapu City (2011 – 2025)

Year	Population	Year	Population	Year	Population
2011	367,675	2016	467,249	2021	593,790
2012	385,728	2017	490,191	2022	622,945
2013	404,667	2018	514,259	2023	653,532
2014	424,536	2019	539,510	2024	685,620
2015	445,381	2020	565,999	2025	719,284

Based on the CLUP of Lapu-Lapu City, Ibo is one of the barangays with fast growing population. Its population in 2012 was recorded at 8,386 which accounts for 2.3% of the total population of Lapu-Lapu City for the same year. Total land area of Barangay Ibo is 148 hectares with a percent share of 2.3% of total area of Lapu-Lapu City. On the other hand, Pusok has an area of 153 hectares or 2.3% share in the total area of the city. Its population in 2012 was registered at 32,985 which accounts for 9.1% of the city's population in the same year.

Among the 30 barangays comprising Lapu-Lapu City, barangay Basak is the most populous with a population size making up 13.1 percent of the total population of the city. Barangay Gun-ob ranks second with 9.9 percent share, followed by Mactan (8.3 percent), Pusok (7.6 percent), Pajo (6.6 percent), Babag (5.1 percent), and Marigon (5.0 percent each). The rest of the barangays contributed less than 5.0 percent each.

The least populated barangay is Cawhagan with 0.16 percent share to the total population of the city in 2010 (**Table 6-17**).

Table 6-17
Population distribution in Lapu-Lapu City per barangay

Barangay	Population	Percentage
1. Agus	8,185	2.34%
2. Babag	17,721	5.06%
3. Bankal	13,802	3.94%
4. Baring	3,014	0.86%
5. Basak	45,927	13.10%
6. Buaya	12,123	3.46%
7. Calawisan	8,433	2.41%
8. Canjulao	11,471	3.27%
9. Cawhagan	559	0.16%
10. Caubian	2,028	0.58%
11. Caw-oy	1,629	0.46%
12. Gun-ob	34,662	9.89%
13. Ibo	7,055	2.01%
14. Looc	14,073	4.02%
15. Mactan	29,262	8.35%
16. Maribago	12,064	3.44%
17. Marigondon	17,542	5.01%
18. Pajac	16,084	4.59%
19. Pajo	23,107	6.59%
20. Pangan-an	1,767	0.50%
21. Poblacion	8,243	2.35%
22. Punta Engano	7,106	2.03%
23. Pusok	26,568	7.58%
24. Sabang	5,603	1.60%
25. San Vicente	3,413	0.97%
26. Sta. Rosa	3,934	1.12%
27. Suba-basbas	5,457	1.56%
28. Talima	4,855	1.39%
29. Tingo	2,830	0.81%
30. Tungasan	1,950	0.56%
TOTAL	350,467	100.00%

In 2010 the female population accounted for 50.7% indicating a sex ratio of 97 males per 100 females, similar to the sex ratio of 2000 (96 males per 100 females).

Median age increased to 23.3 years in 2010 from 21.3 years recorded in 2000. The age distribution in 2010 indicated that one in every 3 persons (33%) was under 15 years old. Children aged 0 – 4 years comprised the largest group (11.9%), followed by age group 5 – 9 (11.3%) and age group 10 – 14 (10.5%).

The number of households in 2010 was recorded at 80,913, higher by 36,474 households compared with the 44,439 households posted in 2000. The average household size in 2010 was 4.3 persons, lower than the average household size of 4.9 persons in 2000 (**Table 6-18**).

Table 6-18
Average Household Size in Lapu-Lapu City, 2010 and 2000

Census Year	Household Population	No. of Households	Ave. Household Size
2010	350,467	80,913	4.3
2000	216,045	44,439	4.9

The Dependency ratio decreased to 56 dependents per 100 persons in the working age group. In 2010, the young dependents (0 to 14 years) comprised 33.1 percent of the household population while the old dependents (65 years and over) posted a share of 2.6 percent. The working-age population (15 to 64 years) accounted for the remaining 64.3 percent.

The overall dependency ratio was 56, which indicates that for every 100 working-age population, there were about 56 dependents (52 young dependents and four old dependents).This ratio is lower than the dependency ratio in 2000, which was recorded at 65 dependents per 100 working-age population (61 young dependents and four old dependents).

Persons with disability comprised 1.2 percent of the population in the city

In 2010, around 4,300 persons or 1.2 percent of the 350,467 household population had a disability. This proportion of persons with disability (PWD) is similar to the proportion in 2000, which was 1.2 percent of the 216,045 household population of the city during that year. The number of PWD for the same year was around 2,600.

There were more females than males with functional difficulty.

Of the 308,667 household population five years and over, 2.0 percent (or 6,114 persons) had at least one type of functional difficulty either in seeing, hearing, walking or climbing steps, remembering or concentrating, self-caring (bathing or dressing), or communicating. There were more females (55.0 percent) than males (45.0 percent) among those persons with at least one type of functional difficulty.

6.2.3 Economic Situation of the City

Lapu-Lapu City is a first class and highly urbanized city. The Government of Lapu-Lapu City derive its income from local and external sources. The local sources comprise of tax revenues such as property transfer tax, real property tax, and local taxes and non-tax revenues from regulatory fees, business and service income, and other income/receipts. The external sources of income are share from national tax collection (IRA), other share from national tax collection such as share from economic zones and share from national wealth, and share from government owned and controlled corporations (GOCCs) like PAGCOR and PCSO.

Based on the Lapu-Lapu City Profile of 2013, the city revenues from 2008 – 2012 are shown in **Table6-19**.

Table6-19
Lapu-Lapu City revenues from 2008 – 2012

Revenue	2008	2009	2010	2011	2012
Real Property Tax	62,065,983	58,243,602	63,851,552	77,275,958	100,697,100
Business Tax	290,785,532	280,459,484	309,730,192	365,074,534	414,344,061
Other Local Taxes	25,579,786	33,936,491	29,596,255	52,042,268	64,397,342
Permits/Licenses	28,031,043	29,926,115	34,462,414	36,102,659	43,628,998
Services Income	2,241,893	2,185,871	2,256,941	2,448,750	2,886,128
Hospital Fees/Income	5,748,607	8,084,530	11,160,956	11,116,832	11,662,444
Economic Enterprises	10,421,513	11,720,380	11,539,824,89	9,942,367	10,689,756
Other Non-Tax Revenue	29,445,084	33,282,028	32,193,519	33,776,118	41,122,041
IRA	315,878,041	394,888,171	430,668,075	461,479,837	410,493,728
Others	3,384,093	2,432,674	2,457,808	4,837,108	4,176,084
Total Revenue	**773,581,574**	**854,709,318**	**927,917,537**	**1,054,096,430**	**1,104,097,681**
Increase		***81,127,744***	***73,208,220***	***126,178,893***	***50,001,251***

There are 6,542 commercial and industrial establishments that include factories in MEZ I and II, Cebu Light Industrial Park (CLIP), malls, gasoline stations, jewelry and pawnshops, private hospitals, pharmacies, restaurants and beach resorts, banks, water refilling stations and so many others, that have contributed to the economic growth of the city. Some of the major industrial firms operating in Lapu-Lapu City are the following:

- Oil Companies (Chevron, Pilipinas Shell, Petron Corp.)
- Export Processing Zones (MEZ I & II, Cebu Light Industrial Park (CLIP)
- Flour Milling (General Milling Corp.)
- Shipbuilding/Ship repair (Keppel Cebu Shipyard Inc.)
- Manufacturing/Export Companies (Heritage Muebles Export Co., JMX, TEC, ACM Manufacturing Inc., Arkwell, Sugeco, Interior Basic Export Corp.)
- Power Plant/Supply (MECO, East Asia Utilities)

The main industrial activities include the following:

- Fishing - at present there are about 600 has. of developed fishponds.
- Farming - fruits and vegetables
- Craftsmanship - because of its soil deficiencies and very rocky terrain, the people of Lapu-Lapu City have developed skills in carpentry, mechanics, printing, welding, plumbing, masonry, photography, metalwork, dressmaking and beauty culture.
- Cottage Industries - guitar making, lime manufacturing, rope making, mat weaving, shellcraft, furniture, poultry, Mactan stone and piggery.
- Transportation - taxis, barges and ferry boats, motorized tricycles, multicabs, buses, truck and jeepneys.
- Domestic Air Lines - Mactan International Airport is geared to expanding its facility to cater to growth of international air traffic.
- Mactan Stone Factories
- Rattan Factories
- Shellcraft Factories
- Metal / Iron Factories
- Tropical Fish Marine Export

6.2.4 Poverty Situation

Due to lack of available data on poverty situation of Lapu-Lapu City, the profile on poverty situation of Central Visayas is hereby presented. The NEDA-Central Visayas reported to the Regional Development Council-Central Visayas that the poverty threshold for 2012 was P18,855 per month for a family of five. In the 2009 survey, 151,425 poor families were identified in Cebu and poverty incidence was at 25.2%[7].

6.2.5 Labor force

Based on the Comprehensive Land Use plan of Lapu-Lapu City, the 2007 census of Lapu-Lapu City recorded an estimated labor force of 184,232 equivalent to 63% of the total population. By the end of the planning period of City's labor force is projected to reach 334,844 as shown in **Table 6-20**.

Table 6-20
Projected Labor Force in Lapu-Lapu City

Year	Labor Force	Year	Labor Force
2012	228,053	2017	282,297
2013	237,996	2018	294,605
2014	248,373	2019	307,450
2015	259,202	2020	320,854
2016	270,503	2021	334,844

6.2.6 Livelihood

Lapu-Lapu City is a famous tourist destination that caters to a large number of hotels, eateries and recreational industries that in turn provide job opportunities in the locality. The synergy between the industries catering to migrant workers in Lapu-Lapu City also exist as a source of income to the local population providing bedspaces and house rentals to these transient workers. Based on the Lapu-Lapu City Profile, there were more than 3,000 commercial and industrial establishments which include the factories in MEZ I and II, financing establishments, manufacturing, exporter and banking establishments as well as insurance agencies. The main industries serving as a source of livelihood in the area include farming, fishing and manufacturing industries. Lapu-Lapu City also takes pride in its crafts and cottage Industries such as guitar making, lime manufacturing, metalworks, furniture making, shellcrafts and others.

6.2.7 Indigenous People

Majority of the household population (97.52 percent) in the Province of Cebu classified themselves as Cebuano. Other ethnic groups included Bisaya/Binisaya (0.94 percent), Kankanai/Kankaney/Kankanaey (0.23 percent), Boholano (0.15 percent), Tagalog (0.14 percent), Hiligaynon/Ilonggo (0.13 percent), and Bicol (0.06 percent).[8] Lapu-Lapu City is home to approximately 430,000 people and to several industrial factories within the Mactan Export Processing Zone. It is a highly urbanized area and there are no indigenous peoples, ethnic groups or tribal groups in the project area that fall under the category of indigenous peoples as described in ADB's SPS Safeguards Requirement 3: Indigenous Peoples.

[7]http://www.nscb.gov.ph/poverty/2009/table_17.asp

[8]http://web0.psa.gov.ph/content/cebu-second-most-populated-province-philippines

6.2.8 Health

Based on the Lapu-Lapu City Profile of 2013, there are two government-run hospitals in Lapu-Lapu City. The Lapu-Lapu City Hospital, located at Barangay Gun-ob is a secondary hospital that provides definitive care in the four (4) basic specialties, namely: medicine, surgery, obstetrics, gynecology and pediatrics.

The second government-run hospital is located in Sta. Rosa, Olango Island. The Sta. Rosa Community Hospital is categorized as a primary hospital and serves the barangays in Olango Island.

To promote Family Welfare and improve the quality of human life in a just humane society through primary health care approach the City Health Office is also extending medical consultation, dental consultation, case finding (laboratory services) and treatment, control of diarrheal diseases, immunization, and family planning seminar.

The education campaign conducted by the City Health Office in partnership with the Barangay Health Workers effectively lowered the rate of malnutrition among children in the City in the last three years. **Table 6-21** shows the percentage rate of malnutrition in Lapu-Lapu City in 2011, 2012 and 2013.

Table 6-21
Degree of Malnutrition in Lapu-Lapu City

Degree of Malnutrition	2011		2012		2013	
	No.	Rate	No.	Rate	No.	Rate
Underweight	552	0.94%	595	0.99%		0.97%
Severely Underweight	193	0.33%	108	0.18%		0.29%
Total	745	1.27%	703	1.17%		

Based on City Health Office records, the ten (10) leading causes of morbidity in Lapu-Lapu City for the last three years are;

1. upper respiratory tract infection
2. skin infection
3. Animal Bite
4. Tuberculosis
5. Punctured Wound
6. Hypertension
7. Diarrhea
8. Pneumonia
9. Malnutrition
10. Bronchial Asthma

On the other hand, the ten (10) leading causes of mortality for the last three years are:

1. pneumonia
2. hypertensive vascular disease
3. cancer (all types)
4. myocardial infraction
5. diabetes mellitus

6. pulmonary tuberculosis
7. Traumatic Injury/gunshot/stab wound
8. Renal Failure
9. Septicemia
10. Congestive heart failure

6.2.9 Transportation/Traffic Situation

Table 6-22 shows the total lengths of each type of major roads in Lapu-Lapu City. Based on the Lapu-Lapu City Profile, the total road length of Lapu-Lapu City is 115.757 kilometers and almost 72% are barangay roads. However, most of its roads (52%) are still paved with gravel and only about 7% are concrete. The short Mactan-Mandaue Bridge connects Lapu-Lapu and the rest of Mactan Island with Mandaue on Cebu Island.

Table 6-22
Road Lengths in Lapu-Lapu City

ROADS	LENGTH (km)
A. HIERARCHY OF ROADS	
1. Barangay Roads	83.488
2. City Roads	2.881
3. National Roads	27.788
4. MCDP Highway	1.600
B. PAVEMENT TYPE	
1. Concrete	8.043
2. Asphalt	47.206
3. Gravel	60.508

The simplest way to get around is by hopping on a tricycle or multicab (small jeepney). Taxi is also available for a comfortable trip.

The Mactan-Cebu International Airport is located in Lapu-Lapu City and it is a major trade center in the south for both domestic and international traffic. It is the main entryway to Cebu and traffic is continually increasing. It is now serving 602 commercial flights weekly transporting 10,223 passengers daily. The Mactan Cebu International Airport is only 3 to 4 hours to 14 cities in Asia Pacific and is the country's second primary gateway.

7. Environmental and Social Audit Findings and Areas of Concerns

7.1 Environmental, health and safety policy

As far as operation and maintenance of the passenger terminals are concerned, there are no expected overlaps in responsibilities between MCIAA and GMCAC. Availability of management plans and system manuals are discussed in the following sections.

7.1.1 Environmental management plan

MCIA did not have an environmental management plan since the start of its operation. As part of the commitment of GMCAC to ensure that the operation of the terminals will not cause any significant environmental issues, a third party contractor (SGS Philippines) was commissioned by GMCAC to prepare an environmental management plan (EMP), which will be implemented at the start of their concession. The details of this EMP can be found in **Annex 3.** This EMP includes the following:

- Impact management and monitoring plans for

  - Hazardous and non-hazardous wastes,
  - Water and wastewater quality management,
  - Air quality and Noise level management, and
  - Impacts on People, which took into consideration occupational safety, population, employment, additional revenues to the local government units (LGUs)

- Information, Education and Communication (IEC)
- Social development program
- Environmental risk management and emergency response program
- Abandonment programs, and
- Institutional plan

7.1.2 Safety management system (SMS) manual

MCIAA has prepared a SMS manual in January 2011 for the existing terminal, which is included as **Annex 4**. This manual contains MCIAA's safety policies and objectives, including the company's safety commitment, corporate roles in the SMS, and documentation of aspects concerning safety. The manual provides guidelines on Safety Risk Management, which includes a process on hazard identification, and documentation of hazards and incidents. The manual also details the promotion of safety within the organization.

In July 2014, GMCAC issued a new SMS manual (**Annex 5),** which has minor differences with the earlier SMS (e.g. safety risk management for Aprons). The new SMS ensures conformity with the Civil Aviation Act of 2007 and Doc. 9859 AN/474 Safety Management Manual (SMM) of ICAO.

7.2 Emergency preparedness and response plan

Emergency response is within the domain of the Emergency and Security Services Department (ESSD) of MCIAA. Based on an interview with Col. Melvin Gayotin (MCIAA) – ESSD Head, MCIAA has an emergency response manual that is maintained by the Crash Fire and Rescue Division, and the Medical Division (included as **Annex 6.1**). The emergency plan contains detailed emergency response procedures on various emergency cases, such as:

- Aircraft accident on and off the airport
- Bomb threats
- Ground incidents
- Structural fire
- Earthquake
- Hazardous material incident
- Aviation pandemic incident
- Crowd control

Part of the main features of the airport's emergency plan include: i) evacuation route plan and ii) emergency communications plan. Roles and functions of the emergency response teams are clearly explained. Records of emergency incidents are maintained using the forms in **Annexes 6.2** and **6.3**.

Recently, Cebu has been identified to be at high risk for landslide and flooding landslide. In the case of landslide, based on Mactan Island's geomorphology, its topography is indicated by nearly flat terrain, which makes the proposed Project at no risk to any landslide.

Flooding in Mactan Island normally occurs during the monsoon and typhoon seasons. The MCIA Airport Emergency Plan (MAEP) in **Annex 6.1** provides a detailed approach on how MCIAA will respond to emergency situations, which includes extreme weather conditions (Section 3.10, EMPLAN 10).The emergency plan also details the responsibilities of concerned offices/personnel during weather monitoring and actual event of emergency.

7.3 Environmental clearance and other pertinent clearances

The sewage treatment plant (STP) of MCIA was issued an environmental compliance certificate (ECC) by the Environmental Management Bureau (EMB) Region 7, and is kept and maintained by the Environment Management and Safety Office of MCIAA. Other pertinent clearances that are being maintained are as follows:

- Discharge permit for the Sewage Treatment Plant (STP). The STP discharges directly to the artificial storm drain, which leads directly to the Mactan Bay.

- Permit to Operate Air Pollution Source Equipment. The Airport maintains 3 units (one 300 KVA and two 537 KVA) diesel generating sets; two (2) units of 1538 KVA Model 3512VB diesel generating sets; and two (2) units 182 Bhp "Cummins" water/fire pump diesel engine, all provided with exhaust muffler and silencer. The generator sets serve as standby power source in case of emergency power outage.

Table 7-1 shows a summary status on the compliance of MCIAA in the ECC conditions of the STP.

Table 7-1
Review of ECC conditions for the STP

ECC Conditions	Remarks
i. Area coverage of 1.3 ha, only for the STP; ii. Rate of 300 m^3./day or 109,500 m^3/year (January 2014 Discharge Permit)	• Compliant, the STP is within the 1.3 ha allocated land. • Compliant, wastewater effluent is always less than 300 m^3/day
iii. Effluent flow is chlorinated; iv. Comply with Effluent standards of DENR	• Compliant • From Nov 2013 to August 2014, most parameters comply with the DENR standards (for Class SC waters), except for COD in Dec 2013, and from May 2014 to August 2014. Exceedance in BOD was also reported in 2010.
v. Safety measures and good housekeeping vi. Maintenance of equipment	• Compliant • Recently improved and complied
vii. Monitoring of effluent parameters viii. Results of analysis submitted quarterly	• Compliant • Compliant
ix. Buffer strip of trees with the perimeter of the treatment	• Trees along the perimeter of the STP are present.
x. Landfill area for the sludge generated	• At present, the sludge coming from the drying bed is collected by MCIAA employees as soil conditioners for yard plants. Other solid wastes generated by the

ECC Conditions	Remarks
	STP is collected by a private contractor (FDRCON Company, Inc.) for further segregation of non-biodegradable wastes and composting of biodegradable wastes.
xi. Authority to Construct for STP xii. Permit to Operate for APSE	• Complied • Compliant
xiii. Adequate storage facility for rainwater for the restrooms, fire hydrant, lawn, ground watering etc.	• The cistern can be used to store rainwater, but generally, water coming from the water district is used for the daily operation of MCIA. The water regularly used for flushing in restrooms, fire hydrants and watering lawns generally come from the water district to ensure a more stable water supply.
xiv. Compliance to P.D. 984 and RA 6969	• Generally complied, except for the recent increase in COD concentration in the effluent.
xv. Solid wastes (screenings, sludges) shall be properly classified for recycling or collection/hauling to designated area	• Compliant

7.4 Environmental Monitoring

A quarterly self-monitoring report (QSMR) for the STP is regularly prepared by MCIAA in compliance to the requirements of EMB based on the STP's ECC terms and conditions.

The existing terminal does not have an environmental monitoring plan, but upon the start of the Concession, GMCAC shall apply the environmental monitoring plan detailed in Table 2 of **Annex 3**. This plan shall focus on the environmental monitoring of both the existing and proposed new terminals. It shall cover the monitoring of solid and hazardous wastes, air quality from pollution sources, ambient air quality, noise levels within the terminal premises, and wastewater that goes to the sewer.

7.4.1 Water quality

Water discharge from the sewage treatment plant is being monitored on a regular basis, at least once every month. The laboratory analysis on water quality includes the following parameters:

- Dissolved Oxygen (DO)
- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Total Suspended Solids (TSS)
- Total Nitrogen
- Total Phosphorus
- pH

Section 6.1.3 above details the results of the STP effluent water quality. The laboratory analyses show that all parameters are within the DENR permissible level except for COD, which sometimes exceed the effluent standard. GMCAC will conduct quarterly meetings with MCIAA to discuss STP discharge quality and to recommend measures in case of non-compliance with discharge requirements in the future.

7.4.2 Ambient Air Quality

MCIAA, at present, does not have an ambient air quality monitoring plan for the existing terminal, since an EMP was not prepared since the beginning of the terminal's operation.

For the purpose of obtaining a baseline for the ambient air quality, sampling stations were determined to established within MCIA (2 stations), and along the airport's immediate vicinity (3 sampling stations were situated within the nearby residential commercial, and institutional facilities).

7.4.3 Ecology

There are no critical habitats within the Project area. The Project site has been well developed to cater to the busy activity of incoming and outgoing traffic of planes and passengers. Trees on the landside are managed and maintained for aesthetic purposes.

7.4.4 Solid wastes management (non-hazardous wastes)

In the existing terminal, it is the responsibility of each concessionaire to regularly bring their own segregated solid wastes (garbage, trash etc.) directly to the airport's solid wastes staging area. From the staging area, a private hauler (FDRCON) collects all the solid wastes, and then transferred to a Materials Recovery Facility. Recyclable materials are recovered and sold to recycling facilities, while materials with high calorific values (such as petroleum-based products) are sent to a cement- processing plant as refuse-derived-fuels (RDF). Biodegradable materials are sent to a composting facility owned by the hauler.

At MCIA, the staging area for solid wastes is made of concrete with 3 compartments: 2 for non-biodegradable wastes, and 1 for biodegradable wastes. It was noted that the compartment gates for the non-biodegradable wastes require fixing, and that rainwater can freely seep through all the 3 compartments. Domestic animals can also freely access all of three compartments. According to MCIAA, a new, but larger waste facility will be constructed, with better safety and security features, details of which are not yet available during the time of audit.

Upon the start of the GMCAC-MCIAA Concession, the management of solid wastes shall be under GMCAC's responsibility for the scope of works under GMCAC. GMCAC shall apply the solid waste management plan prepared for the existing terminal, which covers 1) Waste Minimization, 2) Waste Segregation, 3) Utilization of Reusables, 4) On-site Waste Storage, and 5) Waste Disposal. Details of these are shown in Section 1.1 of **Annex 3**(EMP for the existing terminal operation of Cebu International Airport)**.**

7.4.5 Hazardous wastes management

Training and awareness campaign on hazardous waste management has been provided to all concerned employees of MCIAA. A temporary storage area for hazardous wastes has been established, but plans for disposal and treatment of stored hazardous wastes (e.g. busted fluorescent lamps) are already under way. According to a representative of the Property Office, MCIAA intends to have all the stored hazardous wastes treated and disposed before the end of 2014.

GMCAC has prepared a management plan for hazardous wastes to be implemented during their concession (**Annex 3**). A more detailed management plan shall be prepared by GMCAC prior to the start of their concession on Terminal 1 and 2.

7.4.6 Ambient noise level monitoring

The monitoring of ambient noise level has never been carried out outside the premises of the existing terminal. The environmental monitoring plan for the airport was not available since the start of its operation. Based on the scoping meeting with DENR-EMB Region 7 (for the proposed expansion and rehabilitation of MCIA), the environmental management and monitoring plans for the existing airport must be prepared as part of the EIA Study for ECC application.

7.5 Land acquisition and involuntary resettlement

Mactan Airport has been established in 1960 as a replacement to Lahug Airport located in Cebu City. This airport was later expanded to become the Mactan Cebu International Airport (MCIA), which is being operated by MCIAA since the 1960s. The terminal 1 facility was built on a 1.3 hectare land. There are no outstanding claims or complaints or compensation issues related to the land where the existing airport and related facilities are located as of today.

The project will pursue the renovation of the existing terminal (T1) and a new terminal (T2) will be constructed on 12 hectares of land adjacent to the existing terminal which is currently occupied by the Philippine Air Force (PAF).Several military facilities such a hangar, military barracks, parking lot, military ramp, armory, among others are presently installed on PAF lands which will be replicated within the PAF territory as per the memorandum of agreement (MOA) signed between MCIAA and PAF on 15November 2013. The MOA further permits MCIAA to utilize the proposed land for the concession project and indicated that all facilities of the PAF will be replicated by the PAF prior to the construction of T2.
The planned improvement of the airport road network which is connected to the 4-lane main access road leading to the city will not require any right of way (ROW) acquisition. There are also no informal settlements or structures including any ambulatory vendors or users on the existing road network which will be improved under the Project.

There are no other project facilities which will require any further land acquisition, land purchase or ROW acquisition or clearance.

7.6 Indigenous peoples

The Project is located in Lapu-Lapu City, a highly urbanized city where there are no indigenous peoples, ethnic groups or tribal groups that fall under the category of indigenous peoples as described in ADB's SPS Safeguards Requirement 3: Indigenous Peoples.

7.7 Labor, working conditions and occupational health and safety

The HR Policies of GMCAC are generally compliant with the IFC Performance Standard 2 on Labor and Working Conditions. The GMCAC HR policies promote sound worker-management relationship by implementing its grievance mechanism, regular coordination meetings, performance recognition through awards system, healthy working conditions as embodied in the Work Environment Policy and protection of the right of employees. Performance incentives are very well laid out with the objective of increasing employees' efficiency levels. Capability upgrading programs are also lined up to help the employees attain their career goals. Furthermore, the benefits for employees extend to their family members, particularly education benefits for their children. In protecting the rights of employees, the Grievance Management Policy shall be implemented by GMCAC.

MCIAA endorsed a list of 94 personnel whose functions are directly involved in the terminal operations for appropriate transfer to GMCAC. These personnel were offered jobs by GMR of whom only 46 or less than half accepted the offer. GMR affirmed the following employment terms:

- There will be no reduction in the current salary of MCIAA employees who accepted the offer to transfer to GMCAC.
- They will retain their regular employment status.
- There will be no question of redundancy of functions from the employees' present position and job description. In terms of employees' benefits, GMCAC is currently studying the present benefits of the employees, based on which, a new structure will be worked out. However, the current salary will be protected. According to GMCAC, the basic benefits for employees will be provided in accordance with the national labor laws pertaining specifically to minimum wage, overtime pay, vacation and sick leaves, maternity leaves for women employees.

A brief consultation with some representatives of MCIAA employees who accepted the job offer revealed that the primary consideration for their acceptance is their perceived professional growth resulting from the expansion and modernization of the new airport under private management. GMCAC's human resource policies include enhancement of individual and organizational capacity by means of periodic trainings and more exposure to world-class airport operations. However, the trade-off is for these employees to waive their government benefits, such as government retirement pension, particularly pertaining to their service record that shall be the basis for their retirement pension. Specifically, none of them shall avail of government pension since none have reached retiring age even if they have rendered significant number of years in the government service. In other words, they shall waive their government retirement pension in favor of severance or separation pay from the government service.

On the other hand, GMCAC shall apply the benefit policies of Social Security System to MCIAA transferees to private sector.

Similarly, representatives of MCIAA employees who refused transfer to GMCAC indicated that their main concern is length of service that they have rendered as government employees and its concomitant retirement benefits.

The total manpower requirement for the operation phase of Terminals 1 and 2 is 197 while labor requirement for the construction phase is estimated at 300 to 400 personnel. Outsourcing will be minimal such as housekeeping services.

Perceived impact of the project on the current employees of MCIAA: There is possible displacement of MCIAA employees whose functions are directly involved with airport terminal operations and who chose to remain with MCIAA because the entire terminal operations will now be managed by GMCAC. The issue was taken up by GMCAC with the MCIAA. The appropriate action that will be taken by MCIAA is to re assign the concerned employees to the other departments/functions. Based on the list of employees nominated by MCIAA for transfer to GMCAC, there are eleven (11) employees assigned to Operations who did not accept the job offer that MCIAA shall transfer to other departments.
GMCAC affirmed that the existing shuttle service for employees will continue and they will look into enhancing this service facility.

Other details of the new Human Resources policies are included as **Annex 7**.

The Occupational Safety and Health Policy of GMCAC shall demonstrate its commitment to promote high standard of safety and health to prevent personal injury or ill health resulting from work activities for the duration of the project. The project aims at zero dangerous occurrences. The existing health and safety management procedures are contained in the MCIA Safety Management System Manual.

7.7.1 Work Environment Measurement (WEM)

WEM is performed regularly in various areas of the existing terminal as a means to monitor the safety of employees against the potential health hazards in their work place. A sample WEM report performed in July 2012, with reference number ECD-12-109-W (**Annex8**), shows six (6) parameters (i.e. dust, carbon dioxide, noise measurement, illumination, heat and general ventilation) measured in six (6) different locations within the vicinity of MCIA. The methods used in the measurement and analysis of these parameters conform to the Occupational, Safety and Health Standards of the Department of Labor and Employment (DOLE). Based on this report, WEM was carried out in the following areas: Baggage area, Collection area, Cashiering area, Property Department, Civil works area and Accounting Department.

Results are summarized as follows:

- Dust measurement: All the areas tested have dust concentration within permissible limits
- Carbon dioxide measurement: The tested areas have carbon dioxide concentration way below the threshold (passed).
- Noise level measurement: All the areas measured are within permissible limits, but may require mitigation measures in some areas to avoid reaching/ exceeding the permissible noise exposure level (PNEL). (Such as scheduled maintenance of equipment, and additional hearing protection for the workers)
- Illumination measurement: several areas were found to require better lighting, which may easily be addressed by replacing the light bulbs with better lux output, or simply place additional light source.
- General ventilation: the chiller area and the domestic baggage area have relatively low ventilation, but may easily be addressed by setting up additional ventilation fans, or generally improving the ventilation system.

7.8 Gender and Development

There is a difference in the distribution of employees in terms of gender. Of the 94 employees nominated by MCIAA for transfer to GMCAC, only 20% are female. Of the 46 employees who accepted the job offer, only 11% are female. Data on employees' gender obtained from GMCAC recently indicates that 42% of its total manpower requirement are females, showing a significant increase in the female-male ratio of employees as compared to the MCIAA records on female-male ratio. This is also aligned with GMCAC's goal of providing "equal opportunities for employment" of men and women.

Also pertaining to gender and development, it is noted that HR Policy of GMCAC covers procedures dealing with sexual harassment.

Table 7-2
Sex-disaggregated employees of MCIAA

MCIAA Employees who accepted GMCAC offer				Did not Accept Did not show up			TOTAL	TOTAL	
Department	**Male**	**Female**		**Male**	**Female**		**MALE**	**FEMALE**	
Engineering	11	0		17	0		28	0	
Operations	27	4		9	2		36	6	
Public Affairs		1			1			2	
Collection	2			5	7		7	7	
General Services	1						1		
Corporate Planning					1			1	
Procurement					2			2	
totals	41	5	**46**	31	13	**44**	72	18	**90**
% share	89%	11%		70%	30%		80%	20%	

Table 7-3
Latest data from GMCAC pertaining to sex disaggregation of employees

Source	Female	Male	Total
MCIAA	5	41	46
MCIAA (Outside List)	4	28	32
GMCAC	0	6	6
Megawide	1	1	2
Market	82	49	131
Total	91	126	217
%	**42%**	**58%**	**100%**

Concerning Concessionaire's design of the airport facilities, the following features are deemed beneficial to women, children and persons with disability.

- Covered walkways from car park to terminal buildings
- Expansion of terminal areas to facilitate movement of disabled persons especially those who move in wheelchairs
- Increase in number of toilet facilities in strategic location and expansion of toilet floor area, and assigning separate toilets for women and disabled persons.
- Increase in seating facilities in check-in halls
- Expansion and improvement of welcome and send-off areas to accommodate non-passengers

While the detailed design of airport facilities from GMCAC is not yet available, the following gender sensitive features are recommended for consideration:

- Special facilities that cater to sensitive needs of women and children such as baby changing room, breastfeeding room, rest area suitable to persons with disability and the elderly
- Separate queue and security screening for male and female
- Screening of female passengers by female security personnel only
- Provision for anti-trafficking office for women and children

In addition to the above design features for consideration, GMCAC should also consider conduct of gender orientation and training among airport personnel especially those who are assigned to ground terminal operations.

There is no existing cultural heritage site in the project area. As confirmed with the Lapu-Lapu City Tourism Office, none of the affected military installations inside the Benito Ebuen airbase are considered cultural property, or declared as built heritage by the National Museum or National Historical Institute as defined in Republic Act No. 10066.

7.10 Security arrangements

MCIAA, through its Emergency and Security Services Department ESSD, is responsible for the general airport security such as airside security, security for anti-sabotage, security for anti-hijacking, and maintenance of law and order. Description of airport security in MCIA is shown in **Annex 9.**

7.11 Preliminary consultation of stakeholders

The first stakeholders' consultation was carried out by GMCAC during the preliminary design stage of Terminals 1 and 2 on June 26, 2014. Stakeholder representatives were form MCIAA, Customs, Immigration, and Office of the Security in Cebu. A similar consultation was held with Manila Airport Operation Control (AOC) Executive Committee on July 2, 2014.

In both consultation meetings, GMCAC presented the airport Master Plan, design criteria, capacity, internal layouts and process flows of Terminals 1 and 2. There were no particular issues raised by the Manila AOC ExCom since the presentation coverage was only the preliminary design. Subsequent meeting shall be held with Manila AOC ExCom during the Detailed Design phase.

On the other hand, the stakeholder representatives from Cebu raised a number of issues that GMCAC shall address as summarized in **Table 7-4**.

Table 7-4
Summary of the preliminary consultation meeting

Stakeholder Participants	Issues Raised	GMCAC Reaction/ Action to Take
MCIAA officials	Narrow vehicular lanes for T1 arrival passengers.	Preliminary calculations show that capacity is adequate, but GMCAC shall validate during the Detailed Design.
	Door Frame Metal Detector (DFMDs) at T2 entrance might obstruct passenger movement with trolleys.	Requirements for DFMDs in T2 when the terminal is equipped with in-line screening will be discussed with OTS during the Detailed Design phase.
	Adequacy of GSE area availability	Adequate area is being planned.
	There is a requirement for baby care room at departure level of T2.	GMCAC shall consider this requirement in the Detailed Design.
Customs Officials	For T2, a quarantine counter facility is required in the check-in hall to enable the passengers to declare	GMCAC confirmed that a space will be provided in the form of a cubicle.

Stakeholder Participants	Issues Raised	GMCAC Reaction/ Action to Take
	forex even before they check-in.	
	Provision for an Exclusion Room and Inter-Line baggage room in their offices at T2.	GMCAC clarified that the office space provided is large and internal partitions created can be used to divide the space as required.
	Need for CCTV cameras at the Customs Zone	GMCAC has clarified that this has been noted and will be taken up during Detailed Design stage.
Immigration Officials	The immigration counters are in a bad condition including the hardware/software. Overall the immigration facility has only 6 passport readers in both arrival and departure levels.	GMCAC clarified that they will be provided with hardware to improve the passenger processing rate.
	Additional Immigration manpower at Cebu airport is being requested.	Immigration confirmed that the average processing time achievable is 45 seconds.
	Immigration officials have expressed need for a few CCTV cameras at the Immigrations Zone at T2 to profile the passengers.	GMCAC clarified that this has been noted and will be discussed with them during Detailed Design stage.
	Immigration rep has requested for Suspect Holding Rooms at Departure and Arrival levels.	GMCAC clarified that this can be accommodated in the areas assigned to them.
Security Officials	On the issue of exemption from security screening in the VIP lounge, OTS clarified that only the President and Vice-President are exempted from screening.	

In addition to the stakeholder preliminary consultation conducted by GMCAC, two separate small stakeholders' consultation meetings were organized (both facilitated by WCI). The first (September 1, 2014) was to determine the employees' awareness and perception of the Project, while the second one (September 2, 2014) was to get a profile of the existing airport concessionaires, as well as identify the potential impacts of the Project on their operations.

A third Participatory Consultation initiative was conducted by GMCAC with guidelines from WCI in terms of selection of key informants and topics for discussion.

Twenty (20) representatives were invited to participate in the Key Informant's Interview held on Sept.24-25, 2014 in Lapu-Lapu City. The Key Informants represented neighborhood associations from nearby barangays of Matumbo and Ibo, government and private employees.

The topics covered were a) project awareness; b) concerns and issues about the Project; c) recommendations to address such issues; and d) perceived benefits of the Project.

7.11.1 First small group consultation meeting (with MCIAA) employees)

In the first meeting, two groups of employees were represented: i) those who accepted the job offer of GMCAC, and ii) those that refused the job offer of GMCAC. Two participants for each group participated in the small group consultation. The results of the consultation, including recommendations are summarized in **Table 7-5**:

Table 7-5
Summary of the First small group consultation meeting

Topic	Issues/Remarks	Recommendations
1. Project Awareness	• The participants disclosed that they did not get a clear picture of the Project from the management of MCIAA. It was a simple announcement that a new management shall take over in the operations of MCIA. • They obtained more thorough information from the orientation seminars conducted by GMCAC • Other sources of information they identified were co-employees; newspaper; and internet.	• The participants recommended a continuing project orientation among the MCIA staff including those who are not transferring to the new management outfit for better understanding of delineation of tasks and responsibilities in the entire airport operations.
2. Perceived Impacts of the Project	• The top-ranking perceived impact of the project is improvement in the airport operations and management towards achieving international standards. • The expansion or airport operations shall contribute to the city's economic growth. • A direct positive impact on the employees who accepted GMCAC job offer is the waiver of probationary status under the new management/ employer. • Also for those who will transfer, they anticipate more exposure, training, and professional growth to achieve better performance level in their respective jobs. They claimed that in the present set up, they are performing beyond their respective position and job description. • A "negative" impact mentioned by the participants is the potential increase in terminal fees. Mr. Sridhar Jayati expressed that GMCAC shall focus first on the necessary improvement in services and facilities before gradually increasing the terminal fees. • For those who accepted the job offer, a direct negative impact is their waiver of government employment benefits.	• Provide more informative materials especially for tourist passengers. • GMCAC to re-classify positions and clarify respective job description. • GMCAC to study the feasibility of terminal fees charged to credit cards. They indicated frequent cases of foreign passengers who are not aware of terminal fees requirement and have no ready cash upon leaving.

7.11.2 Second meeting

A meeting was held with the Chief Reinvention Officer of District 32, the holder of master franchise of commercial operations in the domestic and international airports. In the domestic airport, District 32 operates 65% of the stalls while 35% are allocated to sub-

lessees. In the international airport, they operate almost 80% of the stalls and only 20% are operated by sub-lessees. According to him, their franchise has been in operation for only 1.5 years as they spent considerable time in operations planning and renovation of stalls appropriate for the intended business.

The following were mentioned as some advantages of having a master franchise holder as follows:

- Zoning and classification of business stalls prevent unnecessary competition among stall operators. Stalls of the same category are limited and located strategically to avoid over supply of similar items scattered in different business areas. This strategy enables the passengers to find easily what they want to buy given their limited time for shopping.
- Price control among sub-lessees can attract passengers to spend more.
- The master franchise holder, District 32, aims to showcase Cebu culture and promote products of community or local producers in the different stalls that they operate.

7.11.3 Highlights of the Key Informants' Interview

Approximately 70% of the 20 representatives from neighborhood associations from nearby barangays of Matumbo and Ibo, government and private employees have heard about the Project less than six months ago. The leading sources of information about the Project are local media/news and unofficial sources like friends, neighbors, and relatives. Their most common concern is getting updates and transparent information about the Project. Generally perceived beneficial impacts are a) employment opportunities for local residents; b) increase in city's revenue from tourist influx, local and foreign; and c) taking pride in having a world-class airport.

7.11.4 GMR Megawide Cebu Airport Corporation Community Consultation

Another consultation was held last 26 November 2014 at Waterfront Hotel. There were 48 participants/ representatives from the local government offices, both city and barangay levels, homeowners' association, women and elderly, and educational institutions.

The consultation agenda consisted of the following:

- Project Description/Status
- Environmental and Social Impacts
- Mitigation Measures
- Disclosure of Grievance Mechanism
- Discussion of CSR Action Plan
- Open Forum

The issues highlighted in the Open Forum are the following:

- Residential area to be affected by the construction of Terminal 2
- Management of the potential increase in the volume of wastes
- Clearance procedures for cutting of the trees in the PAF area
- Management of increase in traffic flow and disturbance resulting from the transport of construction materials into the terminal site

- Priority of local residents for employment
- Transport route of construction trucks going in and out of the airport
- Livelihood opportunities particularly open to women's associations
- Building permit procedures
- Possibility of runway expansion
- Possible restrictions or land use considerations that should guide the city's land use planning

The full details of the Open Forum are contained in the Minutes of Consultation in **Annex 10.1** while the presentation of GMCAC is in **Annex 10.2** and the photo-documentation in **Annex 10.3**.

Engagement with various stakeholders will continue in the future. The preliminary information, education and communication (IEC) plan provides the framework for engaging with various stakeholders during construction and operations phases of the project.

8. Gaps analysis and Corrective Action Plans

8.1 Environment Component

Based on the documented procedures, policies and records that were provided by GMCAC and MCIAA, and the information obtained from site inspection of MCIA facilities, the following gaps have been identified, and appropriate corrective actions are recommended.

1) There is no environmental management plan and environmental compliance certificate for the existing terminal.

   The first airport in Mactan, known back then as the Mactan Airbase (where the present day MCIA is located) was completed in January 1961 and was operational in September 1961. The first airport structures were built in 1970, thru the Republic of the Philippine-United States Agreement. In 1966, the Mactan Alternate International Airport (also known as Mactan International Airport, or MIA) was inaugurated by Pres. Ferdinand Marcos, and with the transfer of the Airline Operations from Lahug to MIA, its first commercial operation started in January 1973. In 1990, through Republic Act 6958, the Mactan-Cebu International Airport Authority (MCIAA) was created to administer and operate MIA.

   The first environmental law in the Philippines that required the preparation of an environmental impact statement was passed in 1978 through Presidential Decree 1586. The development of the Mactan airport thus pre-dates the early legal frameworks that would require the preparation of an environmental management plan (EMP), which then would have led to the acquisition of an Environmental Compliance Certificate (ECC). In the case of a more recent airport facility, the sewage treatment plant (STP), environmental impact assessment was carried out with corresponding EMP, which was then used to apply for an ECC.
   Corrective Action:

   In September 2014, through the Concession agreement entered with MCIAA, GMCAC has initiated the application for ECC for the proposed expansion and rehabilitation of MCIA, which includes the construction of a new terminal building (Terminal 2). During the technical scoping in September 2014, the Environmental Management Bureau (EMB) in Region 7 required the inclusion of the existing airport in the preparation of an Environmental Performance Report and Management Plan (EPRMP) - Environmental Impact Statement (EIS), where each of the terminals shall have its own environmental management plan. The existing terminal shall also be covered by the new ECC.

2) The effluent water quality of the STP exceeds the water quality standards (for Class SC marine water) in terms of the Chemical Oxygen Demand (COD).

   Based on the certificates of analysis for the monthly water quality monitoring of the effluent in the STP, since May 2014, the COD concentration in the effluent slightly exceeds the permissible limits for the discharge of the treated waste water to Magellan Bay. MCIAA indicated that the likely cause of the increase in COD is due to the inoperability of 1 out of 4 installed aerators.

   Corrective Action:

   As a corrective action, GMCAC will meet with MCIAA to discuss operational efficiency of the STP and measures to comply with discharge requirement.

3) There is no clear procedure or guideline in the disposal of hazardous wastes.

Busted fluorescent lamps (BFLs) dominate the relatively short list of potentially hazardous wastes generated from the existing terminal. At present MCIAA has no clear procedure on how to dispose this type of waste. An area has been designated to store all the BFLs, but works to engage a third party contractor (accredited treater/ waste handler) is already in progress.

Corrective Action:

GMCAC shall provide for the temporary storage of future hazardous wastes that will come from both Terminals 1 and 2. Accredited third party contractor(s) shall be engaged to regularly collect hazardous wastes generated by the two terminals. An environmental officer shall be assigned to monitor the treatment and disposal of these wastes.

4) There is no monitoring of ambient noise levels in the communities near the airport.

Noise levels within the airport are expected to exceed the permissible values for noise set by the National Pollution Control Commission (NPCC, Memorandum Circular No. 002 - 1980) for different times of the day (Morning/ Evening, Daytime and Nighttime). In areas where workers have high exposure to noise levels, they are provided with PPEs, such as mufflers and ear plugs. However, in the absence of monitoring stations in the nearby communities, appropriate actions to mitigate noise might not be put in place due to lack of information on noise levels.

Corrective Action:

MCIAA shall try to establish the MCIA Noise Management Committee composed MCIAA, GMCAC, airline operators, Lapu-Lapu City Planning and Development Office, and affected communities.

MCIAA, in joint support with GMCAC and other members of the MNMC, will locate monitoring stations within Barangays Basak, Buaya, Pusok, and Bankal strategically representing the ends and midsection of the runway. These stations will also provide indicative noise levels of the affected surrounding communities.

Once noise levels are established, noise reduction strategies, following the ICAO “balanced approach”, will be discussed within MNMC and noise reduction strategies will be identified.

5) Solid Wastes are exposed to weather elements and domestic animals at the staging area.

Corrective Action:

Immediate replacement of the compartment gates and installation of roofs at the staging area will help prevent the exposure of the disposed garbage/ trash. Separate secured (with enclosure) containers may also be used for certain types of recyclable wastes (e.g. papers, cans, petroleum-based food containers etc.) These scope of works will be recommended to MCIAA for appropriate action.

8.2 Social Component

1) Insufficiency of information campaign about the Project particularly within the city where the Project is located.

As culled from the results of the various consultations held with different stakeholders, there is a common issue pertaining to the lack of information about MCIA Rehabilitation, Expansion and Operation Project. Even the employees of MCIAA claimed that they were not given the proper information dissemination about the Project. Those who obtained information about the Project were the employees who were nominated by MCIAA for transfer to GMCAC. In which case, they learned about the Project during the GMCAC project orientation. The other consultation participants generally learned about the Project from the local media/news and unofficial sources.

Corrective Action Plan:

There should be an effective information, education, and communication (IEC) plan to be formulated by GMCAC and disseminated to the various sectors of the city like LGUs at the city and barangay levels. The city constituents are highly interested to know the Project updates on a timely basis. There are several effective ways of disseminating information that can reach the institutions concerned as well as the barangay constituents such as, among others, a) press releases; b) local TV news and occasional talk shows; c) memorandum circulars to concerned offices of the government and private sector.

2) GMCAC's Human Resource Policy Manual lacks the section that specifically pertains to wages, salaries and other compensation benefits. Although their Human Resources Policies are generally employees' welfare oriented, there are no concrete information on employees' description of duties and responsibilities, salary classification and detailed employee benefits that will be provided within the scope of private employment under the rules and regulations of the Social Security System. This gap particularly surfaced during the small consultation with MCIAA employees who did not accept the job offer from GMCAC. There is an element of uncertainty in their decision making process because of the absence of more specific policies pertaining to wages, salaries and benefits of employees.

Corrective Action Plan:

GMCAC shall align remuneration and benefit- schemes with the mandates of the national labor law, requirements of the Social Security System and the Department of Labor and Employment.

9. Environmental Impact Assessment and Mitigation Measures

9.1 Noise Impact

9.1.1 Construction Phase

POTENTIAL (CUMMULATIVE) IMPACT

The greatest noise impact of construction activities in the airport will most likely be associated with the use of heavy equipment at construction site. **Table 9-1** shows the expected equipment to be used in T2 construction and apron renovation with their corresponding noise levels[9] perceived 50 ft from their assumed locations.

Table 9-1
Noise Levels per Construction Equipment

Equipment and Number of Units	Typical Noise Level (dBA) 50 ft from Source
Backhoe (x1)	80
Concrete Pump (x1)	82
Crane, Mobile (x2)	83
Dozer (x2)	85
Concrete Mixer (x1)	85
Grader (x2)	85
Loader (x2)	85
Jack Hammer (x1)	88
Truck (x1)	88
Paver (x1)	89

The noise levels of these equipment were combined to estimate their overall noise level generated using the equation[10] below:

$$L_T = 10\log\left[10^{\frac{(L_1)}{10}} + 10^{\frac{(L_2)}{10}} + 10^{\frac{(L_3)}{10}} + \ldots\right]$$

where

L_T = total noise level (dBA)
$L_1, L_2, \ldots$ = noise level of an equipment being considered

The computed combined noise level for the fourteen (14) equipment is 96.93 dBA during peak time measured at 50 ft from the source of noise.

This noise level can be assumed as a point source coming from the MIP Facility. Based on the Google Earth, the nearest residential community to the MIP Facility is located along Opon-Airport-Sangri Road, 471 m far from the construction site. Assuming that the 96.93 dBA noise level is measured 50 ft (15.24 m) from the source, the remaining distance to the residential community becomes 455.76 m. This distance is enough to dissipate the construction noise assumed to come from the departure level of Terminal 2 being constructed at elevation 9.0 m from the ground. Even without any noise barrier, the

[9] Source: U.S. Environmental Protection Agency, "Noise from Construction Equipment and Operations, Building Equipment and Home Appliances," NTID300.1, December 31, 1971.
[10] Source: Peterson, A.P.G. Handbook of Noise Measurement -9th Ed. General Radio, Inc. 1980.

computed noise level at the community area 3.0 m from the ground, assuming that the receiver is at the second floor of a house, is only 31.4 dBA. This approximate noise calculation also assumes that there is no transmission of sound around and through the barrier, and that there are no significant weather conditions, such as wind or temperature inversion, affecting the local environment. This hypothetical configuration is presented in **Figure 9-1** below.

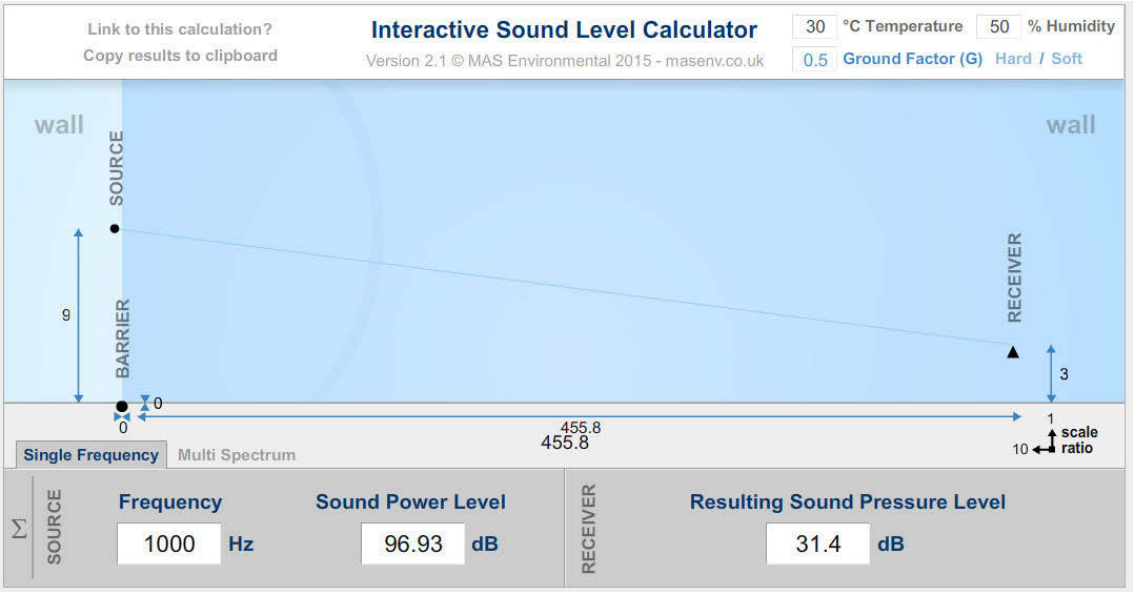


Figure 9-1
T2 Noise Impact to the nearest residential community

This noise level is far below 45 dBA, the maximum noise allowed for Class A (residential) areas during night time. Hence, the noise levels of the construction activities in T2 and apron, even on a 24-hour basis, will have an insignificant impact to the nearby residential communities.

Along with the construction activities in T2 and apron and associate facilities, there will be the gradual renovation of T1 while under commercial operation. This renovation will be done in several stages, during off-peak hours, and spread in a period of four (4) years. The noise level inside T1 is expected to increase but the projected impacts will be moderate in magnitude, localized and temporary with the attenuating effect of distance and noise barrier.

Equipment used in the renovation of T1 includes construction tools such as welding machine (95 dBA), small jack hammer (98 dBA), and air compressor (90 dBA), with noise levels based from the operator's side. Combined use of these three equipment is anticipated to have a noise level of 100.2 dBA. In order to reduce this noise level below the 55 dBA limit for nighttime, a 2.5-m high barrier will be installed at least 15 m from the source and 5 m from passenger waiting area to have a perceived noise level of 54.2 dBA. It is recommended that concurrent use of equipment more than the number of the above three equipment will have to be limited, particularly during night time (10PM to 5AM)

MITIGATING MEASURE

Although considerable distance attenuates the impact of construction noise, the use of a screen barrier will further mitigate the impact of construction noise affecting the nearest

community receptor. Construction activities during night time shall also be minimized, and all construction equipment and trucks shall be well maintained including the appropriate use of mufflers.

During the renovation of T1, passenger traffic inside the building will be designed in such a way that intense noise generating activities will be far from the people in transit. Similarly, screen barriers shall be installed to mitigate the impact of noise and to comply with the ambient noise level standards. Passengers in transit will be given prior notice, and noise levels shall be monitored within the waiting areas. In an event of a customer complaint, renovation activity shall be halted.

9.1.2 Operational Phase

POTENTIAL (CUMULATIVE) IMPACT

During the operational phase, the major source of noise will be due to the take-off and landing of aircrafts at the runway.It is expected that additional aircraft flights will further increase the noise levels within the area. In addition, ground service equipment (GSE), auxiliary power units (APU), and landside vehicles will also contribute to the ground noise of the airport.

Local Noise Standards

The standards for the ambient noise in general areas is governed by the National Pollution Control Commission's Memorandum Circular No. 002 (NPCC MC002) issued on May 12, 1980. ***Table 9-2*** below summarizes the established noise standards in this circular at the different classified general areas across 4 time segments of the day. Classification of the general areas considers the land use, zoning, and presence of sensitive receptors within the community.

Table 9-2
Philippine Standards for Noise in General Areas

Time	Class				
	AA	A	B	C	D
Daytime (9AM-6PM)	50 dBA	55 dBA	65 dBA	70 dBA	75 dBA
Evening (6PM-10PM)	45 dBA	50 dBA	60 dBA	65 dBA	70 dBA
Night Time (10PM-5AM)	40 dBA	45 dBA	55 dBA	60 dBA	65dBA
Morning (5AM-9AM)	45 dBA	50 dBA	60 dBA	65 dBA	70 dBA
Class AA – a section of contiguous area which requires quietness, such as areas within 100 m from school sites, nursery schools, hospitals and special homes for the aged. Class A – a section or contiguous area which is primarily used for residential purposes. Class B – a section or contiguous area which is primarily a commercial area. Class C – a section primarily zoned or used as light industrial area. Class D – a section which is primarily reserved, zoned or used as a heavy industrial area					

For areas directly facing a public transportation route or an urban traffic artery, an additional correction factor equivalent to the following shall apply:

1) Areas directly fronting or facing a four-lane road …..... + 5 dBA
2) Areas directly fronting or facing a four-lane or wider road …….. + 10 dBA

This provision in the noise standard has considered the inevitable impact of transportation noise to the community. Hence for residential areas directly facing a four-lane road, the

maximum noise level is 55 dBA during night time and 65 dBA during day time. The 10 dBA maximum additional noise allowance may be assumed to be also applicable to all airports as these areas are considered major public transportation places. Hence, within the airport, the maximum noise levels are 75 dBA during night time and 85 dBA during day time while for the residential areas directly facing an airport, the maximum levels are 55 dBA during night time and 65 dBA during day time.

Noise Metrics and International Noise Standards

Currently, there is no specific noise standard for airports in the Philippines. In 2013, A Bill on Aviation Noise Limit has been passed by Senator Jinggoy Estrada. This bill still has to undergo a series of review prior to the approval of the Philippine President. In case of enactment of the bill, the Civil Aviation Authority of the Philippines (CAAP) under the Department of Transportation and Communications (DOTC) shall develop a medium-term plan to reduce at least 75% of the number of individuals residing in areas within the vicinity of the airport who are exposed to yearly DNL (day-night average sound level) of 60 dBA.

In some developed countries around the world, the noise levels within the airport's community follow different noise metrics and standards. Noise levels are commonly computed as either DNL (day-night average sound level), WECPNL (Weighted Equivalent Continuous Perceived Noise Level), or NEF (Noise Exposure Forecast).

1.) DNL

The day-night average sound level (DNL or L_{dn}) was first developed by the US Environmental Protection Agency (EPA) in 1973[11]. The value is an average noise level computed over a 24-hour period which considers noise levels to be factored up by 10 dBA for the 10PM to 7AM time period using the following formula:

$$L_{dn} = 10\log\left[\frac{1}{24}\left\{15*10^{\frac{L_d}{10}} + 9*10^{\frac{L_n+10}{10}}\right\}\right]$$

where $L_d = L_{eq}$ value[12] in dBA for daytime from 7AM to 10PM
$L_n = L_{eq}$ value in dBA for night time from 10PM to 7AM

In quantifying airport noise, the US Federal Aviation Administration (FAA) in 1981 formally adopted the DNL as its measure in evaluating cumulative noise effects on people due to aviation activities[13]. Furthermore, the US Federal Aviation Regulation (FAR) Part 150 Section A150.205(c) defines this DNL value as "the 365-day average, in decibels, day-night average sound level" computed using the following formula:

$$L_{dn} = 10\log_{10}\frac{1}{365}\sum_{i=1}^{365}10^{L_{dni}/10}$$

where L_{dni}= the day-night average sound level for the i-th day out of the year
Summation is from i = 1 to 365.

[11] EPA (1973), "Public Health and Welfare Criteria for Noise," U.S. Environmental Protection Agency, Office of Noise Abatement and Control (ONAC), Rpt . EPA550/9-73-002, Washington, D.C.
[12] L_{eq} is the constant sound level that contains the same amount of energy as the time-varying sound level over the same time period. It represents the energy "averaged" level and can be expressed for any time interval
[13] Part 150 of Title 14 of the Code of Federal Regulations: Airport Noise Compatibility Planning

FAR Part 150 specifies a maximum yearly DNL value of 65 dBA for noise-sensitive land uses such as homes, schools, places of worship and hospitals. This regulation was also adopted, as part of a good practice, in another ADB airport project[14]located in a country with no specific noise standards surrounding the airport.

2.) WECPNL

The Weighted Equivalent Continuous Perceived Noise Level (WECPNL) on the other hand is a measure proposed by the International Civil Aviation Organization (ICAO) to assess the continuous exposure to long-term noise of multiple aircraft. WECPNL as used for environmental regulations is computed as follows:

$$WECPNL = \bar{L}_{A\text{-}max} + 10\log(N_1 + 3N_2 + 10N_3) - 27$$

where $\bar{L}_{A\text{-}max}$ = average value of maximum aircraft noise level in dBA per day
N_1 = number of flights from 7AM to 7PM
N_2 = number of flights from 7PM to 10PM
N_3 = number of flights from 10PM to 7AM

3.) NEF

The Noise Exposure Forecast (NEF) is used to predict the degree of community annoyance from aircraft noise (and airports) on the basis of various acoustical and operational data such as duration of flyover, the peak noise level, the tonal characteristics, and the number of aircraft movements in the daytime and night-time period.

The calculation is based on the Effective Perceived Noise Levels (EPNL, unit is in EPNdB) for various aircraft, and considers all aspects of flight operation and time of day. The measurement is based on the following equation:

$$NEF = EPNL + 10 \log_{10} (N_D + 16.7\ N_N) - 88 \text{ (dBA)}$$

Where N_D= number of flights during the day (7AM to 10PM)
N_N= number of flights during the night (10PM to 7AM)
16.7 = factor representing a 10-to-1 weighting of night flights over day ones

In the US, the Federal Aviation Administration (FAA) measures noise in NEF and DNL units, the Department of Defense (DOD) requires noise levels to be expressed in DNL and WECPNL, while the Department of Housing and Urban Development (HUD) measures it in NEF and DNL. ***Table 9-3*** below summarizes the different Aircraft Noise Control Standards in the US. It is has to be emphasized here that NEF, DNL, and WECPNL follow different formula, and therefore should be treated differently.

Table 9-3
Aircraft Noise Control Standards in the USA[15]

Office	Zone Group	Unit	Limit Value	Permission/Restriction
FAA (Federal Aviation Administration)	Zone A	NEF	20	Permission to construct a new house
		DNL	55	
	Zone B	NEF	30	Regular permission
		DNL	65	

[14] ADB Armenia - New Passenger Terminal Construction at "Zvartnots" International Airport.
[15] S. Chang. 2005. "Study on Environmental Impact Investigation and EIA Consultation Standard of Aircraft Noise". University of Seoul.

Office	Zone Group	Unit	Limit Value	Permission/Restriction
	Zone C	NEF	40	Partial Permission
		DNL	75	
	Zone D	NEF	Above 40	Prohibition
		DNL	Above 75	
DOD (Department of Defense)	Outside of noise zone	DNL	Below 65	Permission to construct a new house
		WECPNL	Below 78	
	Inside of noise zone	DNL	Below 70	Restriction on new house construction
		WECPNL	Below 83	
		DNL	Above 70	Restriction on new house construction (noise level investigation inside region needed)
		WECPNL	Above 83	
HUD (Department of Housing & Urban Development)	-	NEF	Below 30	Permission to construct a new house
		DNL	Below 65	
	-	NEF	Below 40	Restriction on new house construction (noise reduction: above 10 dBA)
		DNL	Below 75	
	-	NEF	Above 40	Prohibition on new house construction
		DNL	Above 75	

FAA, DOD, and HUD have varying noise standards using different formula to measure noise levels. All of these offices are in agreement that areas with DNL values less than 65 dBA are compatible with residential zone. In areas with noise levels beyond DNL 65 dBA, special restrictions are applied in granting construction permits for a new house, with FAA and HUD prohibiting construction of a new house if noise levels go beyond DNL 75 dBA.

In Japan, the WECPNL values serve as guide in formulating appropriate measures near the airport community. Noise levels higher than 70 would require soundproofing for school and hospital; values higher than 75 would be needing soundproofing for housing; noise levels higher than 90 would require relocation for housing; and values higher than 95 would require green belt buffer zone.

In PRC, the noise levels are also evaluated based on the WECPNL. The country has an Environmental Standard on Aircraft Noise Around Airport which follows that Category 1[16] has an exposure limit of </70 dBA and Category 2[17] areas exposure limit is </75 dBA. ADB existing airport projects[18] in PRC followed this standard.

In the absence of Philippine noise standards specific to residential areas within airport vicinity, the most widely-used international standard (i.e. FAA standard, DNL 65dBA) is adopted in this project for comparison purposes of the resulting noise predictions.

Noise Model

Integrated Noise Model (Version 7.0) was used in this study to model the noise levels in the airport and the surrounding communities. It was developed by the US Federal Aviation Administration (FAA), Office of Environment and Energy, Noise Division (AEE-100) with support from the ATAC Corporation and the Department of Transportation Volpe National Transportation Systems Center.

The FAA Integrated Noise Model is widely used by the civilian aviation community for evaluating aircraft noise impacts in the vicinity of airports. The model is typically used in the U.S. for Federal Aviation Regulation (FAR) Part 150 noise compatibility planning, for FAR

[16] special housing; living, cultural and educational areas
[17] Living areas except for Category 1
[18] ADB Loan Central and Western Airports Development Project

Part 161 approval of airport noise restrictions, and for environmental assessments and environmental impact statements under the current version of FAA Order 1050.1E (INM User's Guide, 2007)

The software was designed for the development of the graphical interface, and methods for computing aircraft flight profiles and constructing flight paths, which are processed by the acoustics module.

In the technical manual, the core technical components in INM Version 7.0 are discussed which includes the flight-path methodology , along with the basic methodology employed by the software to compute noise levels or time-based metrics at a single, user-specified observer, or at an evenly-spaced, regular grid of observers.

The case study is referenced at the navigational location Airport Reference Point (ARP) of the MCIA. INM 7.0 has designated this as the origin of the X-Y coordinate system of the graphics output of the contours. The details of this reference are indicated in **Table 9-4**.

Table 9-4
Case Study Reference

Study Reference	Mactan Cebu International Airport ARP
Latitude, Longitude	10.307540 N, 123.978400 E
Elevation	31.3 ft above Mean Sea Level (MSL)

Source: Aeronautical Information Publication (AIP, 7th Edition)

Runway details such as length, width, coordinates and elevations as shown **Table 9-5** provide details about the study as it is setup in INM. The input of coordinates automatically generates graphics showing the location and length of the runway.

Table 9-5
Runway Details of 04/22

Runway	Description	
Runway Orientation	04/22	
Runway Length	3300 meters	
Runway Width	45 meters	
Runway 04 Threshold Coordinates	10° 17' 49.081" N	123° 58' 07.6737" E
Runway 22 Threshold Coordinates	10° 19' 05.2495" N	123° 59' 24.1558" E
Runway 04 Threshold Elevation	5.553m from MSL	
Runway 22 Threshold Elevation	8.510m from MSL	

Meteorological data of the area were also incorporated in the model. **Table 9-6** below shows the annual average temperature, pressure and wind speed considered in the study. The annual change of prevailing wind direction was also considered in the model as it shifts from north-east from October to May and to south-west from June to September.

The track segments were drawn with reference to the traffic circuit chart as provided by Aeronautical Information Publication (AIP, 7th Edition). The tracks are identified from arrival and departure origin (from runway) information of aircrafts when aircraft operations are inputted in the software. This information was assigned to the aircraft type and frequency whether day (7AM to 7PM), evening (7PM to 10PM), or night (10 pm to 7PM) represented by D, E, and N respectively.

Table 9-6
Annual Average Temperature, Pressure and Wind Speed at MCIA

Parameters	Values
Temperature (^{0}F)	83.3
Pressure (in Hg)	29.82
Wind Speed (knots)	5.4

Figure 9-2 below shows aircraft flight tracks departing from or arriving at runway threshold 04 or 22. The flight tracks are identified as DEP-04R, ARR-04R, DEP-22L and ARR-22L (DEP, ARR, R, and L represent departure, arrival, right side, and left side respectively).

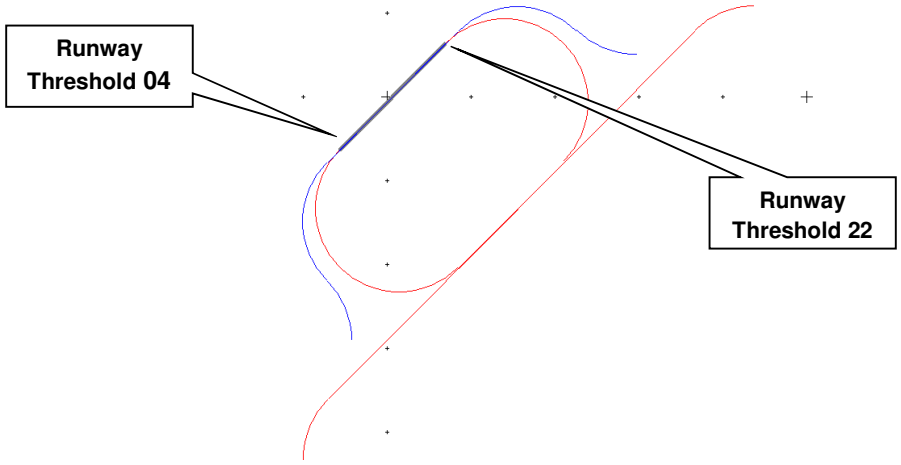


Figure 9-2
Flight Tracks of Aircraft Arrival and Departure

Table 9-7 below presents the daily traffic of aircrafts in MCIA on an Annual Average Daily Basis[19] . The total flights per aircraft were annualized based on the October 2014 to March 2015 flight schedules, averaged in a day, and distributed to the day (D), evening (E), and night (N) departure and arrival schedules.[20]

Table 9-7
Annual Average Daily Arrival and Departure (DEP) Frequency of Aircrafts (2014)

Aircraft Type[21]	D/E/N	DEP-04R	ARR-04R	DEP-22L	ARR-22L
A319	D	1.9250	2.4514	3.9083	4.9771
	E	0.7857	0.6679	1.5952	1.3560
	N	1.5636	1.1550	3.1745	2.3450
A320	D	7.2364	9.4286	14.6921	19.1429
	E	4.2664	1.9564	8.6621	3.9721
	N	3.6379	3.7007	7.3860	7.5136

[19] This concept of Annual Average Daily is in consonance with the definition of FAA's yearly DNL as the 365-day average, in decibels, day-night average sound level based from Sec. A150.205 of FAR 150 promulgated by FAA.

[20] The November 2014 to March 2015 flight data were doubled to represent a 365-day data (hence annualized) and divided by 365 to represent the one-year flight data as the average flight data in a day.

[21] Examination of these list reveals that no Chapter 2 aircraft was utilized. This is most likely in conformance with the ICAO Recommendation to Member States specifying that all Chapter 2 aircrafts shall be phased out beginning 1995 and ending in 2002 for developed nations and 2005 for developing nations.

Aircraft Type[21]	D/E/N	DEP-04R	ARR-04R	DEP-22L	ARR-22L
A321	D	0.8250	0.6600	1.6750	1.3400
	E	0.0000	0.1650	1.0000	0.3350
	N	0.9900	0.9900	2.0100	2.0100
A330	D	0.0943	0.0943	0.1914	0.1914
	E	0.0000	0.0000	0.0000	0.0000
	N	0.0000	0.0000	0.0000	0.0000
A333/A343	D	0.1729	0.2671	0.3510	0.5424
	E	0.1179	0.0236	0.2393	0.0479
	N	0.0908	0.2750	0.1843	0.5583
B737	D	0.0000	0.0000	0.0000	0.0000
	E	0.0000	0.0000	0.0000	0.0000
	N	0.4243	0.3300	0.8614	0.6700
738/B737-800	D	0.1414	0.2279	0.2871	0.4626
	E	0.0393	0.0943	0.0798	0.1914
	N	0.4007	0.3064	0.8136	0.6221
744/B747-400	D	0.0000	0.0000	0.0000	0.0000
	E	0.0550	0.0550	0.1117	0.0479
	N	0.0314	0.0314	0.0638	0.0638
772/B777-200	D	0.0000	0.0157	0.0000	0.0319
	E	0.0157	0.0000	0.0319	0.0000
	N	0.0236	0.0236	0.0479	0.0479
77W/B777-300ER	D	0.0550	0.0629	0.1117	0.1276
	E	0.0079	0.0000	0.0160	0.0000
	N	0.0000	0.0000	0.0000	0.0000
ATR	D	4.0621	5.3193	8.2474	10.7998
	E	0.4400	0.4400	0.8933	0.8933
	N	1.2650	0.0079	2.5683	0.0160

After incorporating all the necessary parameters to INM 7.0, the noise levels surrounding MCIA was determined. The output graphics is overlayed to the Land Use Map[22] of Lapu-Lapu City as shown in **Figure 9-3** below. The graph shows noise contours expressed in yearly DNL with grid intervals for X and Y coordinates equivalent to one (1) nautical mile.

[22] This map was obtained as a jpg file from the Lapu-Lapu City Comprehensive Land Use Plan (CLUP). Since it was not geo-referenced, any conclusion derived will be susceptible to a considerable margin of error. However, the current output, which is a rough approximation of the reality, may still provide a certain extent of usefulness.

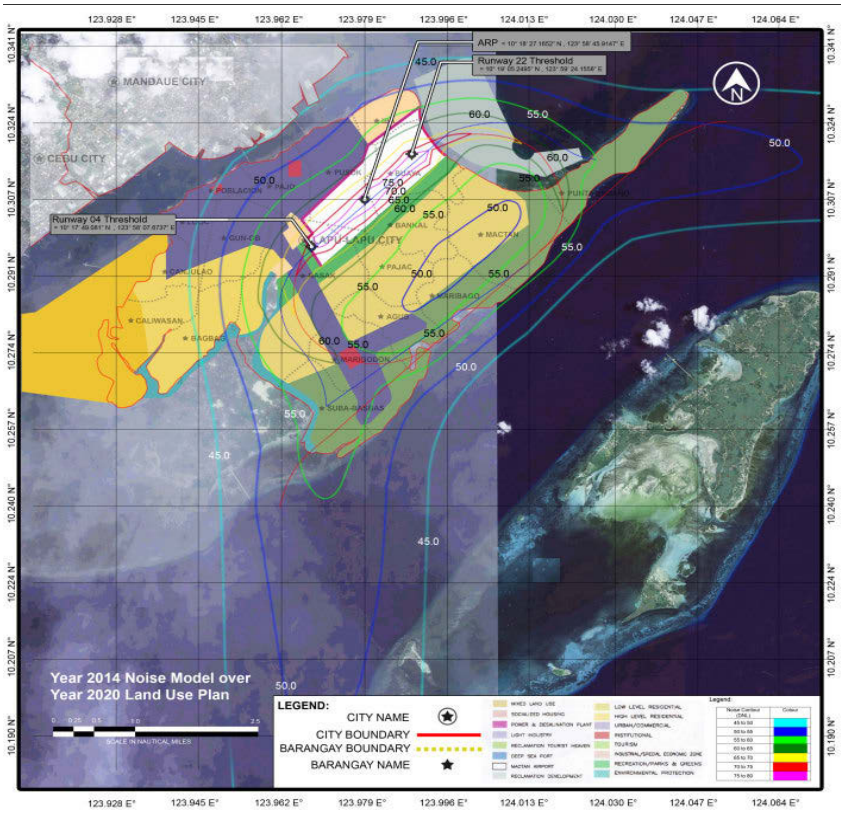


Figure 9-3
Noise Contours at MCIA for 2014 over 2020 Land Use Plan

For Year 2024, the Noise Model takes into consideration the 96.5 % increase in flight frequency from 2014 to 2024 based on business projections. The proposed fleet mix is composed of A319, A320, A321, A330, A333/A343, B737, 738/B737-800, 744/B747-400, 772/B777-200, 77W/B777-300ER, and ATR all classified as Chapter 3 and 4 aircrafts[23].

Table 9-8 below summarizes the projected frequency of arrival and departure flights at runway thresholds 04 and 22 for Year 2024 while **Figure 9-4** shows the resulting noise contours overlayed on the Year 2020 Comprehensive Land Use Plan (CLUP) of Lapu-Lapu City.

Table 9-8
Annual Average Daily Arrival and Departure (DEP) Frequency of Aircrafts (2024)

Aircraft Type	D/E/N	DEP-04R	APP-04R	DEP-22L	APP-22L
A319	D	3.7826	4.8171	7.6799	9.7801
	E	1.5439	1.3123	3.1346	2.6644
	N	3.0724	2.2696	6.2379	4.6079
A320	D	14.2196	18.5271	28.8701	37.6157
	E	8.3835	3.8444	17.0211	7.8053
	N	7.1484	7.2719	14.5134	14.7642
A321	D	1.6211	1.2969	3.2914	2.6331

[23] Similarly, no Chapter 2 aircraft was identified.

Aircraft Type	D/E/N	DEP-04R	APP-04R	DEP-22L	APP-22L
	E	0.0000	0.3242	1.9650	0.6583
	N	1.9454	1.9454	3.9497	3.9497
A330	D	0.1853	0.1853	0.3762	0.3762
	E	0.0000	0.0000	0.0000	0.0000
	N	0.0000	0.0000	0.0000	0.0000
A333/A343	D	0.3397	0.5249	0.6896	1.0658
	E	0.2316	0.0463	0.4702	0.0940
	N	0.1783	0.5404	0.3621	1.0971
B737	D	0.0000	0.0000	0.0000	0.0000
	E	0.0000	0.0000	0.0000	0.0000
	N	0.8337	0.6485	1.6927	1.3166
738/B737-800	D	0.2779	0.4477	0.5642	0.9090
	E	0.0772	0.1853	0.1567	0.3762
	N	0.7874	0.6021	1.5987	1.2225
744/B747-400	D	0.0000	0.0000	0.0000	0.0000
	E	0.1081	0.1081	0.2194	0.0940
	N	0.0618	0.0618	0.1254	0.1254
772/B777-200	D	0.0000	0.0309	0.0000	0.0627
	E	0.0309	0.0000	0.0627	0.0000
	N	0.0463	0.0463	0.0940	0.0940
77W/B777-300ER	D	0.1081	0.1235	0.2194	0.2508
	E	0.0154	0.0000	0.0313	0.0000
	N	0.0000	0.0000	0.0000	0.0000
ATR	D	7.9821	10.4524	16.2061	21.2215
	E	0.8646	0.8646	1.7554	1.7554
	N	2.4857	0.0154	5.0468	0.0313

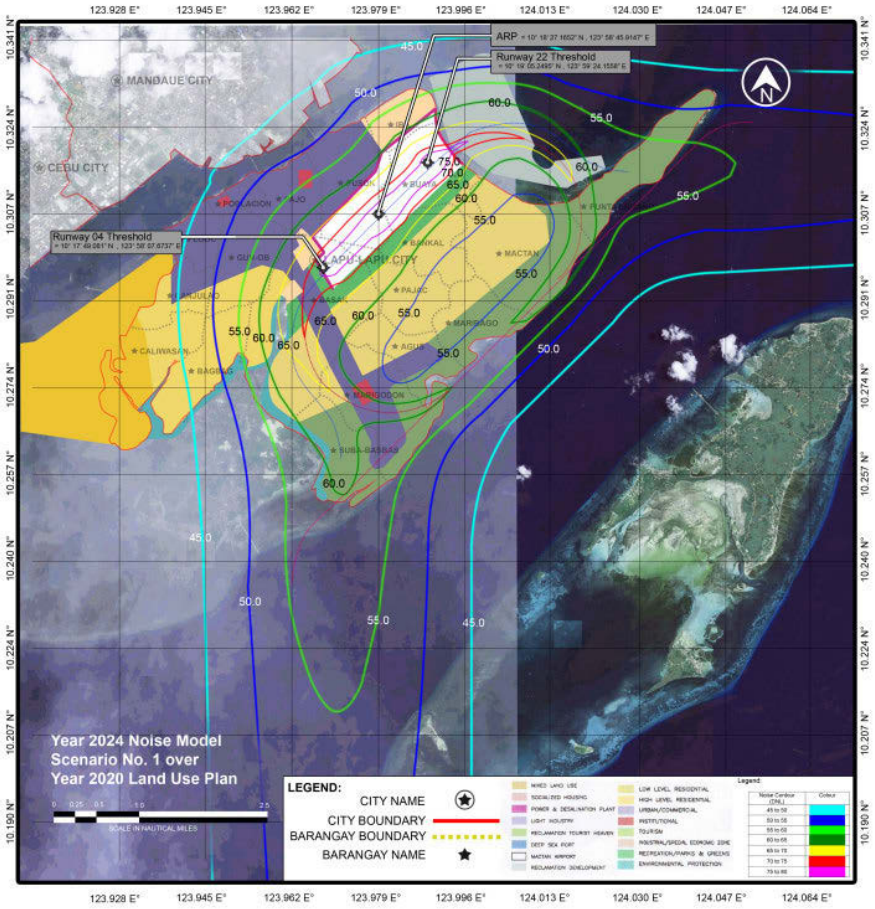


Figure 9-4
Noise Contours at MCIA for 2024 over 2020 Land Use Plan

Noise Model Analysis

So far there were two noise models produced in this study: 2014 and 2024. The 2014 Noise Model considers the Winter Flight Schedule while the 2024 Noise Model considers the 96.5% increase in flight frequency based on the 2014 data.

Comparing the two, there was an observable and significant widening of the area affected by the 65 DNL contour line (yellow line). The issue on the projected increase in flight frequencies for 2024 will therefore have a significant impact to the noise levels surrounding the airport community.

In February 2013, the ICAO Committee on Aviation Environmental Protection during its ninth meeting (CAEP/9) issued a recommendation guideline that by 2017 new large civil aircraft types must be at least 7 EPNdB (Effective Perceived Noise in Decibels) quieter than the current Chapter 4 standard. This guideline will also be applicable to smaller aircraft types of less than 55 tonnes by 2020. This development will therefore usher in the introduction of new aircrafts in the market, and as a consequence, airport noise is expected to diminish over time.

The same projection is being held by Sustainable Aviation (SA), a United Kingdom's (UK) cross-industry association of the main players in the airlines, airports, manufacturers and air

navigation service providers formed in 2005. In its Noise Road Map: A Blueprint for Managing Noise from Aviation Sources to 2050 released in April 2013, it's pool of experts demonstrated that aviation noise in the UK will not increase from 2010 to 2050 even with the near doubling of flights because of the introduction of less noisy aircrafts. **Figure 9-5** below describes this noise projection which may generally be applicable also in the case of Mactan-Cebu International Airport.

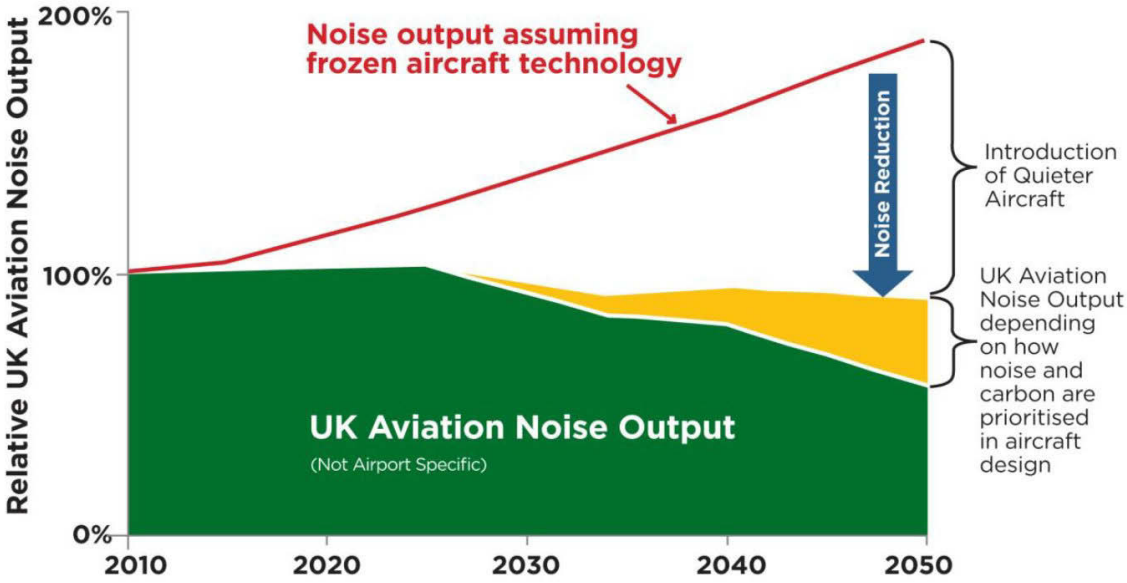


Figure 9-5
Projection of Aviation Noise in UK based from Sustainable Aviation Noise Road Map

Noise Monitoring

To validate the noise model developed, 5 monitoring stations were chosen based on the presence of sensitive communities such as schools near the airport and the proximity of these potential receptors to the 65-70 DNL contour lines. The locations of these stations are summarized in the following table and in the figure below:

Table 9-9
Location of the Monitoring Stations around MCIA

Station	Name	Latitude	Longitude	Land Use
NS1	STEC 1	10°17'50.06"N	123°57'55.88"E	Recreation/Parks and Greens
NS2	Evangelista	10°17'35.34"N	123°58'6.47"E	Recreation/Parks and Greens
NS3	Helenville	10°18'4.68"N	123°58'44.81"E	Recreation/Parks and Greens
NS4	EMD	10°19'8.79"N	123°59'39.13"E	Recreation/Parks and Greens, Light Industry
NS5	STEC 2	10°17'47.05"N	123°57'58.81"E	Recreation/Parks and Greens

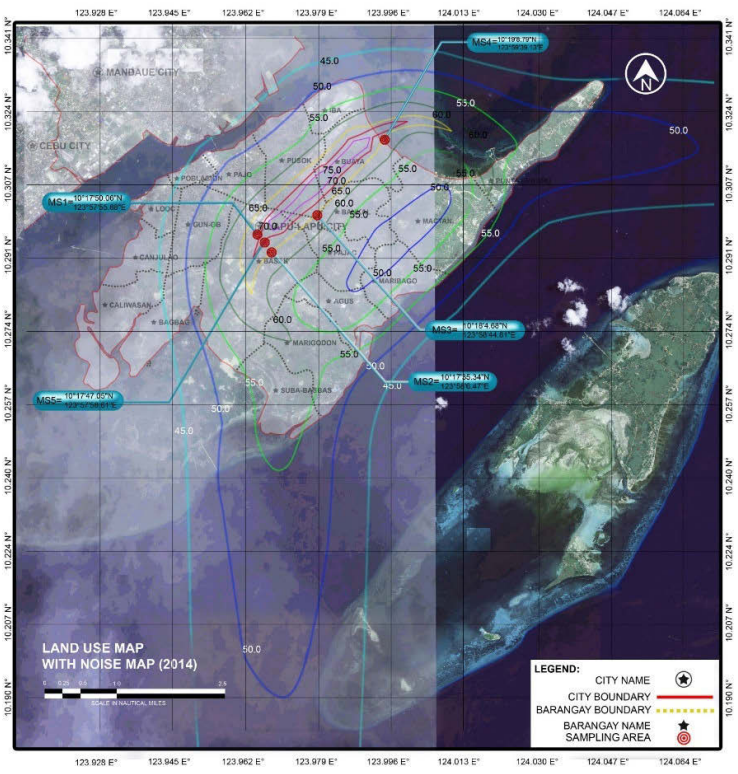


Figure 9-6
Location of the Monitoring Stations

The first station is found inside the Science and Technology Educational Center (STEC) near the airport perimeter and Runway 04. It belongs to Barangay Basak and the area is classified as Recreation/Parks and Greens in CLUP. Based from the 2014 Noise Model, the level in this station is close to 70 DNL.

The second station is located inside the house compound of Col. Evangelista. This station is facing the airport perimeter fence and is located near a busy road and at the back of St. Augustine International School. The area belongs to Barangay Basak and is classified as Recreation/Parks and Greens in the CLUP. It is expected that the level in this area is close to 65 DNL based on the 2014 Noise Model.

The third station is situated within Helenville Subdivision, and is a few blocks away from the Holy Infant School. This monitoring area is approximately 150 meters from the airport fence. It is within the border of Barangay Pajac, Bankal, and Pusok and is classified as Recreation/Parks and Greens in CLUP. The noise level in this station is projected to be 65 DNL.

The fourth station is located within a residential area at the back of EMD Carmelite School, and is fronting the airport perimeter fence. This area belongs to Barangay Buaya and is within the classification of Recreation/Parks and Greens and Light Industry Zone in CLUP. Based from the 2014 Noise Model, the DNL value in this area is close to 65.

The last station is also located within STEC and is very near Runway 04. This station was chosen because of its proximity to the runway 04 (RWY 04) where noise is perceived to be

the loudest prior to the departure of aircrafts. Based from the 2014 Noise Model, the level in this station should be close to 70 DNL.

Results of the monitoring are summarized in **Table 9-10** below. Values are presented in chronological order[24] and expressed as either DNL, L_{eq} (24-hour average), L_d (7AM-10PM average), L_n (10PM-7AM), L_{max}, L_{min}, L_{10} (10^{th} percentile rank value), L_{50} (50^{th} percentile rank value), and L_{90} (90^{th} percentile rank value). **Figures 9-8** to **9-112** below represent the plotted data.

Table 9-10
DNL Values of the 5 Monitoring Stations

Monitoring Station	DNL (dBA)	Sampling Date	Time Period	Noise Level in dBA					
				Ave	Min	Max	L_{90}	L_{50}	L_{10}
NS1 STEC 1	59.13	9pm 5Nov (W) to 9pm 6Nov (Th)	24Hrs	55.4	43.2	80.4	46.3	56.4	64.5
			L_d	58.9	46.2	80.4	52.9	58.3	66.0
			L_n	49.5	43.2	77.0	45.4	47.6	56.9
NS3 Helenville	54.98	10pm 6Nov (Th) to 10pm 7Nov (F)	24Hrs	49.5	37.9	85.5	43.3	48.0	58.2
			L_d	50.3	40.5	85.5	44.7	48.7	58.6
			L_n	48.2	37.9	77.1	42.0	46.2	57.3
NS5 STEC 2	53.94	7am 8Nov (Sa) to 7am 9Nov (Su)	24Hrs	48.6	39.0	83.2	42.6	55.1	60.5
			L_d	49.5	39.0	83.2	42.5	46.8	61.7
			L_n	47.1	40.5	82.3	42.7	44.7	57.0
NS4 EMD	57.46	9am 9Nov (Su) to 9am 10Nov (M)	24Hrs	53.6	42.0	89.0	44.1	53.2	62.5
			L_d	56.6	43.7	89.0	48.3	56.0	63.9
			L_n	48.6	42.0	88.9	43.5	45.8	56.7
NS2 Evangelista	59.78	12nn 10Nov (M)to 12nn 11Nov (Tu)	24Hrs	55.3	42.1	84.5	46.3	55.2	62.3
			L_d	57.0	46.6	84.5	52.4	56.2	62.4
			L_n	52.3	42.1	84.4	44.4	50.9	61.8

For the first station, monitoring was conducted from 9PM of Wednesday to 9PM of Thursday. There was a basketball event inside the barangay gym approximately 100 m from the station which contributed to a noticeable background noises coming from the Public Announcement System and the cheering crowd. During daytime, there were a number of busy school activities. Noticeable in the graph of **Figure 9-7** are a number of peaks that represent the landing and take-off of aircrafts near RWY04 most especially during the early morning of Thursday.

[24] *Note: Permit to conduct a 24-hour monitoring to all 5 stations was not given simultaneously, as such conduct of monitoring did not follow by station number.*

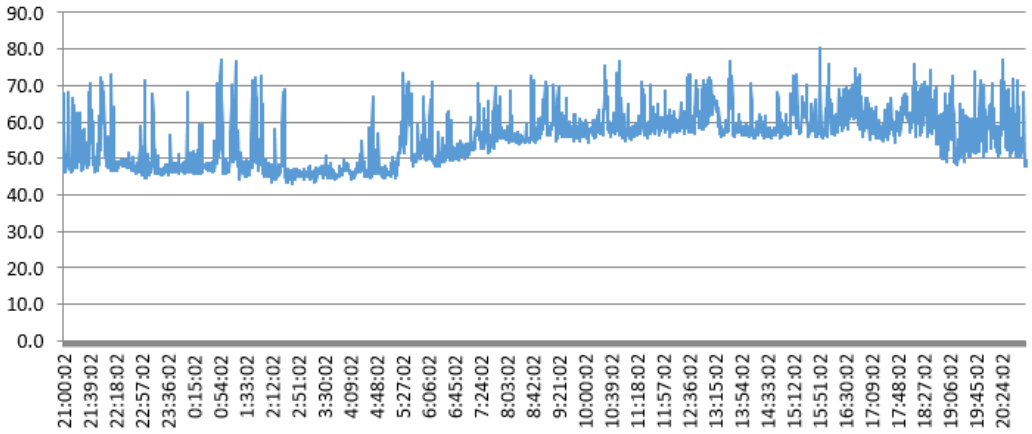


Figure 9-7
Noise Data for Monitoring Station No.1: STEC 1

For the 2nd station, monitoring started from noon time of Monday to noon time of Tuesday. The station is near a busy road due to school servicing in the nearby St. Augustine Industrial School. Near the station was a small restaurant a significant number of customers during the night. As evident from the graph of **Figure 9-8**, there was a significant number of flights that occurred during the night time of Monday.

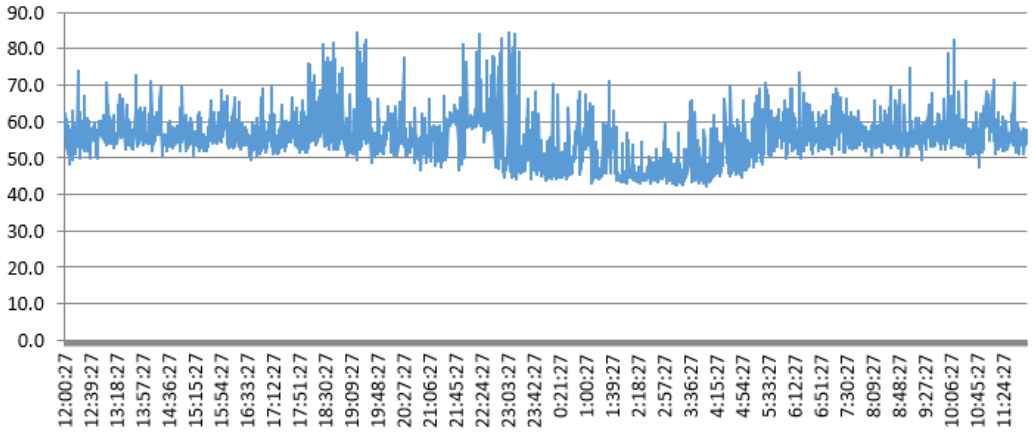


Figure 9-8
Noise Data for Monitoring Station No.2: Evangelista

For the third station, which was located in Helenville Subdivision, an upper-middle class subdivision with partially distributed trees surrounding the small community, the noise monitoring started at 10PM of Thursday up to 10PM of Friday. The quiet place was interrupted with occasional barking of dogs from nearby houses. From the graph of **Figure 9-9**, there are more pronounced series of peaks that can be identified towards the afternoon of Friday. These peaks relating to a more frequent series of flights may be argued as the time when passengers would leave Cebu after a week of work, or passengers from other places starting to arrive in Cebu after a week of work.

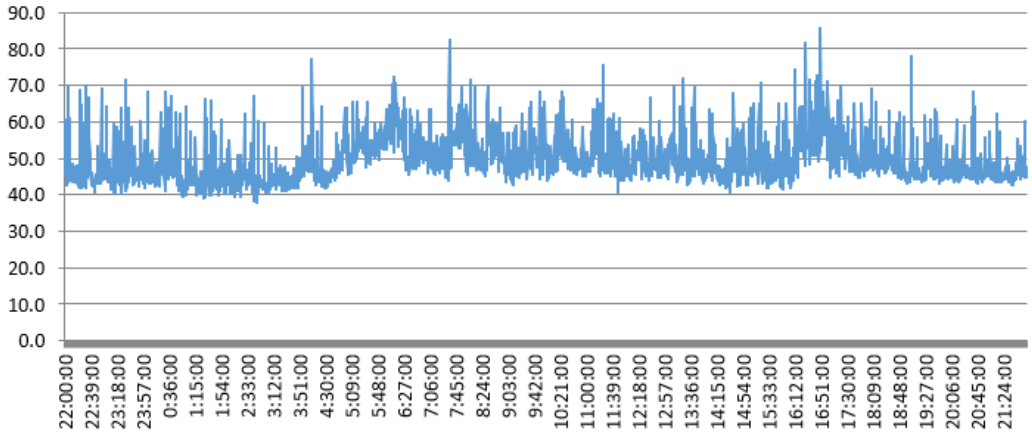


Figure 9-9
Noise Data for Monitoring Station No.3: Helenville

For the 4th station, which is near the EMD Carmelite School, the monitoring started 9AM of Sunday up to 9AM of Monday. The area, classified as a light industry zone, is fronting the airport parameter fence and located at the back of the school. Although a relatively secluded area, it susceptible to background noise due to its proximity to the main road intersection. It can be observed from the graph of **Figure 9-10** that a number of peaks are gradually increasing in frequency towards Monday early morning. It can also be argued that this is the time when people from other places are starting to arrive in Cebu, and a number of passengers from Cebu starting to travel outside because of the start of weekly work.

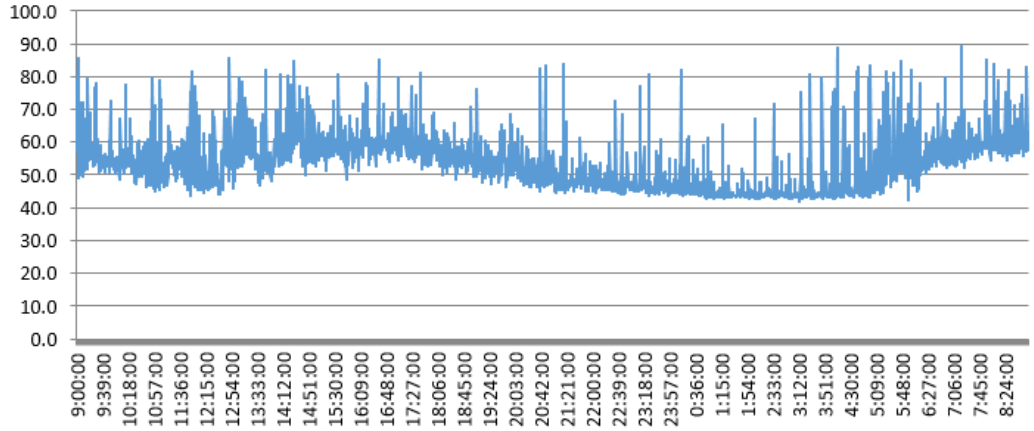


Figure 9-10
Noise Data for Monitoring Station No.4: EMD

For the 5th station, which is located inside STEC but nearer towards RWY04, the monitoring started 7AM of Saturday up to 7PM of Sunday. There was a waterpump near the station, and the place was relatively quiet typical of a school during weekends. There is an apparent sparsity of peaks from Saturday late in the evening towards Sunday early morning, which may be argued as relatively fewer flights that occurred during that period.

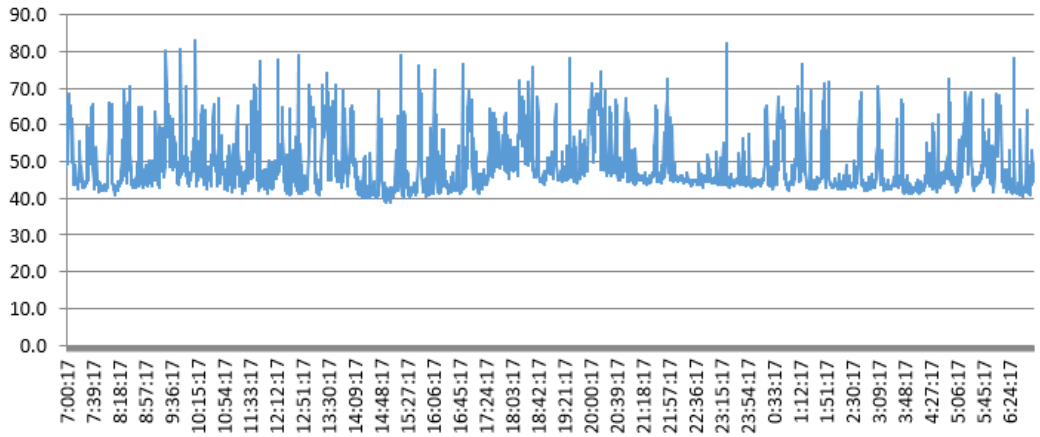


Figure 9-11
Noise Data for Monitoring Station No.5: STEC 2

The raw noise values were eventually re-processed for comparison with the NPCC standards. The measured DNL values were also compared with the results of the 2014 Noise Model. These values are presented in **Table 9-11** below.

Table 9-11
Noise Levels compared with the NPCC Standards

Sampling Points	NPCC Category	L_{eq} (dBA)				DNL value (actual)	DNL value 2014 Noise Model
		Morning 5AM-9AM	Daytime 9AM-6PM	Evening 6PM-10PM	Night time 10PM-5AM		
NS1 STEC1	C	54.6	60.2	57.4	48.6	59.1	70
NS2 Evangelista	C	56.9	56.8	57.6	51.1	59.8	65
NS3 Helenville	C	53.6	51.0	47.6	46.5	55.0	65
NS4 EMD	C	57.9	57.5	52.8	46.6	57.5	65
NS5 STEC2	C	48.7	48.7	51.4	46.6	53.9	70
NPCC Standards by Category	AA	45	50	45	40	-	-
	A	50	55	50	45	-	-
	B	60	65	60	55	-	-
	C	65	70	65	60	-	-
	D	70	75	70	65	-	-

The land segment next to the airport classified as recreational/greens and parks serves as a buffer zone to attenuate the extreme noise brought about by airport operation and to provide a navigational safety distance from the nearby communities. Since the airport is classified as a heavy industry (D), it is safe to assume that the buffer zone is one class lower or Class C. In such a case, all the areas where the monitoring stations are located are within the NPCC standards in all the four time segments of the day.

With respect to the observed DNL value and the US FAA Standards, all areas covered by the monitoring stations have noise levels below 60 DNL, lower than the 65 DNL limit but incompatible for residential use.

Comparing the monitoring DNL values with the projected 2014 Noise Model suggest that the 2014 Noise Model projects a noisier airport community than it actually was. Some

parameters have been considered that may play significant effect to the difference between the noise model and the observed values. These parameters are summarized in **Table 9-12** below.

Table 9-12
Theoretical and Observed Noise Levels vs Actual Ground Conditions

Parameters of Comparison	Monitoring Conditions per station					Modelling Assumptions
	Station 1 STEC1	Station 2 Evangelista	Station 3 Helenville	Station 4 EMD	Station 5 STEC2	
Monitoring/ Flight Schedules	Nov5-6 (W-Th) 9PM-9PM	Nov10-11 (M-Tu) 12NN-12NN	Nov6-7 (Th-F) 10PM-10PM	Nov9-10 (Su-M) 9AM-9AM	Nov8-9 (Sa-Su) 7AM-7AM	Average peak winter Traffic[25]
Noise Model values (dBA)	70.0	65.0	65.0	65.0	70.0	-
Observed L_{10} values (dBA)	64.5	62.5	58.2	62.3	60.5	-
Observed DNL values (dBA)	59.1	59.8	55.0	57.5	53.9	-
No. of Arrival Flights[26]	78	67	80	80	72	87
% Deviation of the no. of flights compared to modelling assumption	10%	23%	8%	8%	17%	-

The modelling assumptions used are conservative which in return may have predicted noise levels higher than the actual noise levels. Based on the noise monitoring conducted, the number of flights to some extent has established that at lower aircraft traffic the noise environment is also lowered. Hence, noise monitoring results are within FAA standards as well as the NPCC light industry standard.

In addition every aircraft has its own signature noise which may mean some aircrafts are considered inherently "more noisy" than the others. The flight paths may also contribute to the difference in noise levels as some aircrafts arrive or depart at RWY 04 or RWY 22 and they are all not captured in the nearby monitoring stations.

Meteorological conditions may also had an effect to the observed noise levels, although weather data obtained were within the assumed values of the noise model.

All things considered, the noise model, based on flight frequencies of the winter peak season, provided an overestimation[27] of the actual airport community noise levels but

[25] Considered as peak winter traffic as tourists coming from countries experiencing winter travel by groups to tropical areas such as Cebu to escape the biting cold season. In addition, a number of activities prevail in Cebu during Christmas and New Year, and during the Sinulog Festivities from 2nd week to 3rd week of January. This peak winter traffic was used as during the time of study the only available schedules were from October 2014 to March 2015 only.

[26] These values are based on the actual time of arrival only. It is assumed that departure flight frequencies fall within the same values as aircrafts' time within the airport premises is limited.

[27] In comparing measured data and INM calculations however, it should be noted that "INM is not designed for a single-event noise prediction, but rather for estimating long-term average noise levels using average input data" (INM User's Guide, 2007). Hence the noise level measured in one station for 24 hours may not best

conservative enough to identify the measures to minimize noise impacts to the surrounding airport community.

MITIGATING MEASURES

In consideration of the expected expansion of MCIA, airport noise is also expected to increase as evident by the output of the 2024 Noise Model. This projection is not only true to MCIA but to almost all airports in the world. In anticipation, the ICAO Committee on Aviation Environmental Protection during its ninth meeting (CAEP/9) issued a recommendation guideline in February 2013 that by 2017 new large civil aircraft types must be at least 7 EPNdB (Effective Perceived Noise in Decibels) quieter than the current Chapter 4 standard, and by 2020 will also be applicable to smaller aircraft types of less than 55 tonnes. This new standard called Chapter 14 was arrived at after careful consideration of the cost-effectiveness of the measures to be undertaken.

With this development, new aircrafts start getting introduced in the market, and as a consequence, airport noise in the country will diminish over time.

By method of approximation, considering that noise aircrafts are expected to be less noisy by the year 2020 and the increase in air traffic is less than two times, it estimated that the proposed expansion will increase in overall noise level by approximately 2 dBA.

This use of quieter aircrafts or noise reduction at source strategy, is actually based on the 1st Principle of ICAO's "balanced approach" on noise reduction.

The other principles are: land-use planning and management, noise abatement operational procedures, and aircraft operating restrictions.

Since the "balanced approach" will involve all key stakeholders within MCIA, GMCAC will recommend to MCIAA, as the authority in charge of airside operations, to create an MCIA Noise Management Committee (MNMC), composed of MCIAA, GMCAC, airline operators, Lapu-Lapu CityPlanning and Development Office (CPDO), and community representatives. MNMC will review, assess, and address all aviation-related noise complaints within MCIA.

The above mentioned noise reduction measures will be brought for discussion within MNMC for a more concerted effort in reducing the airport noise.

MCIAA and GMCAC will require airline operators to use Chapter 3 or quieter aircrafts.

MCIAA and GMCAC will review the land use plan and work closely with the CPDO and local stakeholders on how to minimize exposure to aircraft noise.

MCIAA to suggest with airline operators in following the noise abatement flight procedures (NAP) such as Constant Descent Approach (CDA), Standard Instrument Departures (SIDS), Standard Terminal Arrival Routes (STARS), and Required Navigation Performance (RNP).

In addition, GMCAC will set up a periodic meeting with MCIAA to discuss noise reduction measures.

represent the averaged data for 6 months entered as an input to the noise model. The recommendation therefore is to use an annual average flight data and the monitoring should be done on a long term basis.

Currently, GMCAC is holding an Airport Facilitation Committee Meeting with airline operators and MCIA every third Wednesday of the month. Among other matters, noise reduction measures subject for implementation have been temporarily brought up in this meeting.

For the ground noise, MCIAA will ensure that equipment and vehicles (GSE, APUs, landside vehicles, etc.) will be properly operated and maintained.

Planting of trees and/or provision of adequate barriers may also be worked out to further mitigate the propagation of noise from aircraft and ground operations.

MONITORING

During the process of implementation of the balance approach strategy, noise monitoring will be conducted within the vicinity of the airport. The location of the monitoring stations will include the baseline stations and additional residential and sensitive receptor areas, which may be identified through continuous stakeholder consultation. The long-term monitoring regime will be conducted to strengthen the statistical correlation with the predictive model and be able to calibrate the model based on further data to be collected. A Noise Monitoring Plan will be formulated by MCIAA assisted by GMCAC.

9.2 Landscape Character

POTENTIAL IMPACTS

Earthworks and site clearance operations during construction phase will have a temporary and localized impact to the landscape character of the area. Appropriate wall screens will be used to envelope all development sites to mitigate the visual impact of construction.

During the operational phase, the project area will be visually enhanced with the well-designed new terminal building and of the appealing structures of the nearby Airport Village Mall at the landside.

MITIGATION MEASURES

Specific areas within the airport will be landscaped according to landscape engineering and architectural design befitting a resort-type airport.

9.3 Seismic Design

POTENTIAL IMPACTS

The project will not have a significant impact to the seismic character of the surroundings since MCIA is already a built-up area with an almost flat terrain, and the buildings to be constructed will be considered low-rise.

Although the existing seismicity records of the area show no major earthquake[28]experienced from 1907 to the present, it still belongs to the Pacific Ring of Fire and therefore considered geologically at risk.

[28] Magnitude greater than or equal to 5.0 in Richter Scale.

MITIGATION MEASURES

The new terminal building (T2) will be constructed with due consideration of the seismic activities of the area following the National Building Code of the Philippines and of the AASHTO (American Association of State Highway and Transportation Officials)Standards to withstand (or with reduced impacts associated with) any earthquake events.

9.4 Biodiversity

POTENTIAL IMPACTS

The impact of the project to the biodiversity of the area is low as the allotted area for expansion houses a very limited tree cover, which limits the impacts to all other life forms.

The tree inventory carried out in the Project area shows a number of tree species, such as acacia, agoho, alim, bagalunga, bitanghol, bo tree, breadfruit, breadnut, ficus, fire tree, gmelina, indian tree, ipil-ipil, jackfruit, lanete, mahogany, mango, nara, neem, pandan, star apple, talisay, and tamarind.

MITIGATION MEASURES

DENR permits will be obtained for all trees that will be removed, either by tree cutting or earth-balling. Earth-balled trees will be transplanted according to the specifications detailed out in the DENR Memorandum entitled “Guidelines and Procedures on the Planting, Maintenance and Removal of Trees in Urban Areas and in Areas Affected by Government Infrastructure Projects.”

There will be areas in the airport where biodiversity will be promoted following the local resort-theme of the Project. In landscape planting around the site, mature, and a mix of native and non-native trees, will be used, where appropriate, to provide opportunities for biodiversity to flourish in the area.

9.5 Groundwater

POTENTIAL IMPACTS

The use, transport, and storage of fuels, motor oils, and chemical solvents during construction and operation of airport pose a negative impact to the groundwater. If these toxic substances are not stored or handled properly, they can contaminate the land surface. From the soil, these substances will eventually seep down into the groundwater and contaminate it.

Aside from groundwater contamination, construction and operational activities in the airport will require significant volumes of water. It is projected that by 2017, both airport terminals will be requiring approximately 1,032 m^3 per day of water.

The project will not be sourcing groundwater for its operations and is expected not to contribute to groundwater depletion in Cebu-Mactan area.

MITIGATION MEASURES

To mitigate the impacts to the groundwater, all fuel, motor oil, and chemical solvents must be sited on an impervious base within a bund and properly secured. The base and bund walls must be impermeable to the material stored. Leaking or empty containers of these materials must be removed from the site and properly disposed of by a DENR-accredited third party contractor.

9.6 Surface water

POTENTIAL IMPACTS

Mactan Island has no notable surface water, and all storm water eventually drains to the surrounding sea. In the case of MCIA, storm water is channeled at the buffer regions adjacent to the runway, leading towards Mactan Bay. Smaller channels are also found within the airport premises and are all inter-connected to the discharge point.

Construction activities within the airport may have an eventual impact to Mactan Bay in the form of sediments reaching the built-up channels and then the Mactan Bay during a heavy rainfall event. Sediment runoff can come from exposed ground surfaces, stockpiles of excavated areas, and concrete and cement products attached to construction tools and equipment.

MITIGATION MEASURES

To mitigate contamination of Mactan Bay brought about by sediment transport from surface run-off, sediment traps or basins will be provided to channel storm water from the work areas and to diminish the energy of the storm water flow. This kind of mitigating measure controls the movement of sediments that can affect the quality of Mactan Bay.

9.7 Ambient Air Quality

POTENTIAL IMPACTS

Construction equipment and vehicles emit air pollutants such as NO_X, SO_X, and Particulate Matters (PM) that can be both harmful to health and to the environment. Vehicles passing on dry and windy areas can generate dust and increase the ambient Total Suspended Solids (TSP). Demolition of apron, MIP, and paved areas can increase the ambient TSP due to the release of fine debris particles and the increase in exposed (unvegetated) ground areas.

CUMULATIVE IMPACTS (impacts of aircraft emissions brought by airport expansion)

The air quality modeling of aircrafts emission was carried out using the AERMOD air quality dispersion model, and the emission factors of UK-NAEI and/or USEPA emission factors for SO_2, NO_2, PM_{10} and $PM_{2.5}$. AERMOD is an internationally recognized modeling tool that uses an atmospheric dispersion modeling system.

Isopleths are generated for the predicted ground level concentrations of aircraft emissions for years 2013 and 2024 around the Mactan International Airport, which are compared to the DENR standards for ambient air quality as shown in **Table 9-13**.

Table 9-13
DENR standards for Ambient Air Quality Parameters

Parameters	DENR Standards
PM_{10}, µg/Ncm	150
$PM_{2.5}$, µg/Ncm	50
NO_2, µg/Ncm	150
SO_2, µg/Ncm	180

The following information and assumptions were used to run the model for all the above-mentioned parameters:

- Data sources for Airport Emission Inventory and Data input for Air Quality Modeling
- Aircrafts flight frequency for year 2014 and 2024
- Fuel consumption during Landing and Take-off (LTO)
- Emission factors by type of aviation fuel from the United Kingdom - National Atmospheric Emissions Inventory (UK NAEI) for NO_2, SO_2, PM_{10} and $PM_{2.5}$ as shown in **Table 9-14**.
- Airport runway orientation.
- Meteorological Data from Cebu Synoptic Station

Table 9-14
Emission factor by type of fuel

Pollutant	Fuel Name	Emission Factor
Nitrogen Oxides as NO2	Aviation turbine fuel	12.59801596
Nitrogen Oxides as NO2	Aviation spirit	4.47768451
PM10 (Particulate Matter < 10µm)	Aviation turbine fuel	0.09977879
PM10 (Particulate Matter < 10µm)	Aviation spirit	0.11006788
PM2.5 (Particulate Matter < 2.5µm)	Aviation turbine fuel	0.09977879
PM2.5 (Particulate Matter < 2.5µm)	Aviation spirit	0.11006788
Sulphur Dioxide (SO_2)	Aviation turbine fuel	1.26400000
Sulphur Dioxide (SO_2)	Aviation spirit	1.26400000

Figures 9-13, -14, -15 and **-16** show the isopleths for SO_2, PM_{10}, $PM_{2.5}$ and NO_2 for the 2014 air quality projections. The maximum ground level concentrations of SO_2, PM_{10}, $PM_{2.5}$ and NO_2 for 2014 are 3.1 µg/Ncm, 0.3 µg/Ncm, 0.3 µg/Ncm and 32.1 µg/Ncm, respectively.

Figure 9-12
SO_2 Concentrations for Year 2014

Figure 9-13
PM_{10} Concentrations for Year 2014

Figure 9-14
$PM_{2.5}$ Concentrations for Year 2014

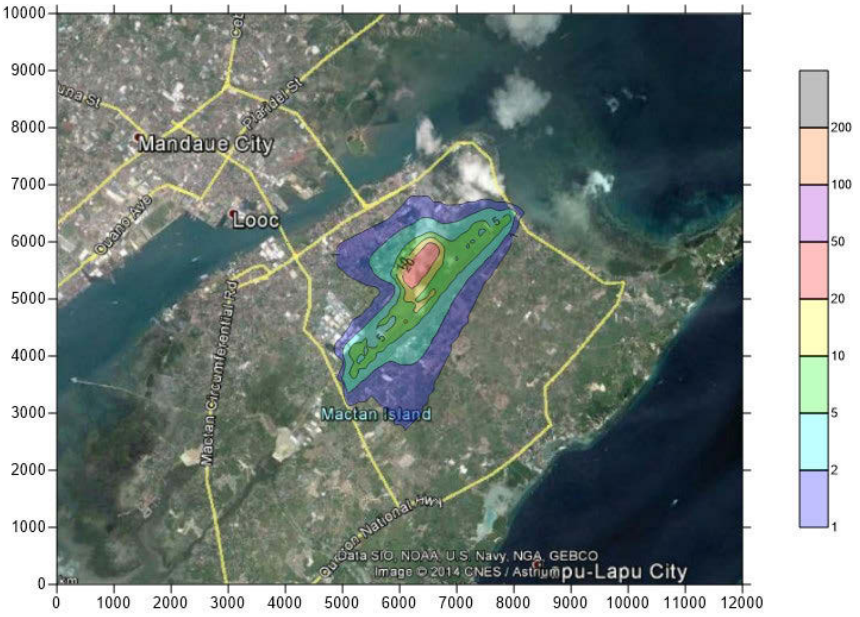


Figure 9-15
NO_2 Concentrations for Year 2014

Based on the results of the air quality modeling for 2014, the ground level concentrations of the emissions coming from the aircrafts during LTO will not exceed the ambient air quality standards of the DENR. The results of the ambient air quality baseline survey, carried out in

September 2014, consistently shows that the air quality along the sampling stations do not exceed DENR's permissible values.

For ground transports, the number of vehicles arriving and departing from the airport is expected to increase by about 100% in 2024 and 200% in 2039 based from the current 2014 volume of traffic. As presented in Table 9-18 (see Section 9.11, Road Network Traffic), each lane during peak hour is projected to carry 578 vehicles in 2024 and 1,013 vehicles in 2039. These expected vehicular volumes are below the estimated capacity of 1,400 to 1,500 vehicles per hour designed for the road lanes leading to MCIA. Traffic congestion is directly related to higher vehicle fuel consumption and emissions. Hence the capacity of the existing road network to accommodate the increase in vehicles brought about by the increase in airport flights is important in this aspect.

In addition, under DAO 2015-04, the Implementation of Vehicle Emission Limits for Euro IV and In-Use Vehicle Emission Standards, the emission standards for CO, hydrocarbon, NOx, and PM for new passenger, and light - and heavy - duty vehicles will become more stringent effective July 2015. This order also mandates that all new vehicles to be used or introduced into the Philippine market by January 2016 shall be equipped with Euro 4 engine and compliant with Euro 4 emission standards. This development is expected to gradually lessen the impact of vehicular emissions to the ambient air quality in MCIA.

Figures 9-16, -17, **-18** and **-19** show the isopleths for SO_2, PM_{10}, $PM_{2.5}$ and NO_2 for the 2024 air quality projections. The maximum ground level concentrations of SO_2, PM_{10}, $PM_{2.5}$and NO_2 for 2014 are 6.5 μg/Ncm, 0.6 μg/Ncm, 0.6 μg/Ncm and 66.5 μg/Ncm, respectively.

Based on the results of the air quality modeling for 2024, the ground level concentrations of the aircraft emissions during LTO will still not exceed the ambient air quality standards of the DENR. This indicates that the proposed expansion of the airport will not significantly contribute to the air quality issues along the surrounding communities of MCIA.

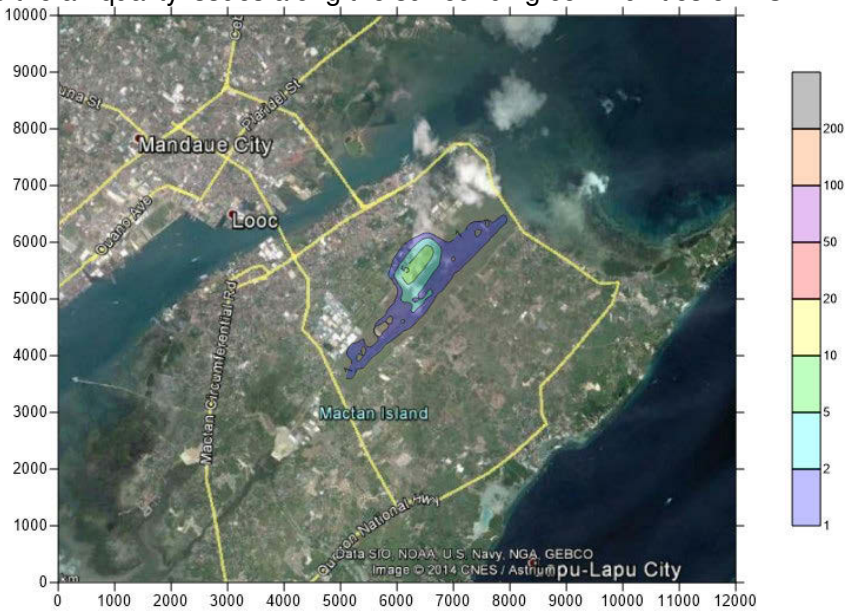


Figure 9-16
SO_2 Concentrations for Year 2024

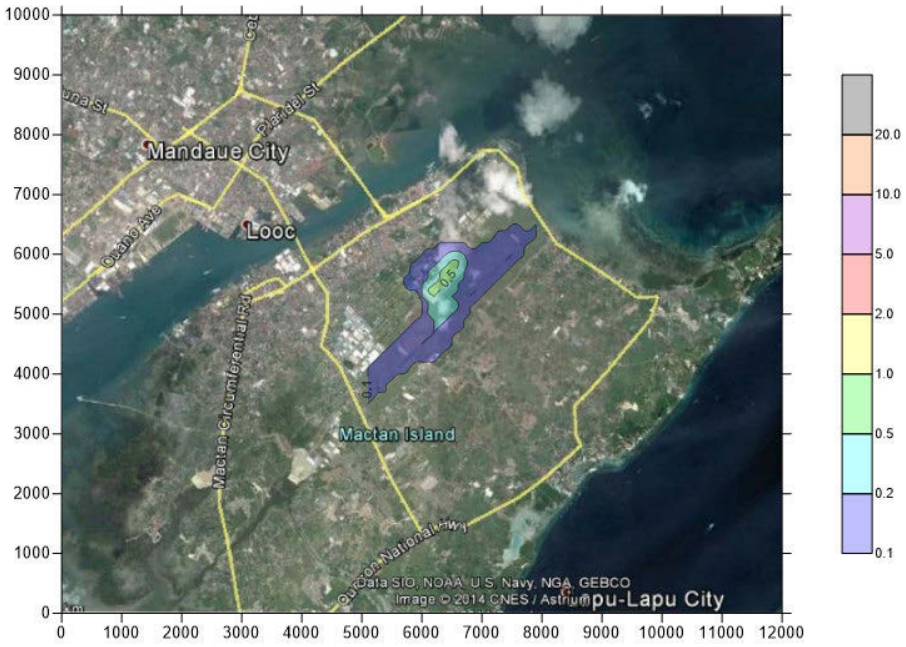


Figure 9-17
PM_{10} Concentrations for Year 2024

Figure 9-18
$PM_{2.5}$ Concentrations for Year 2024

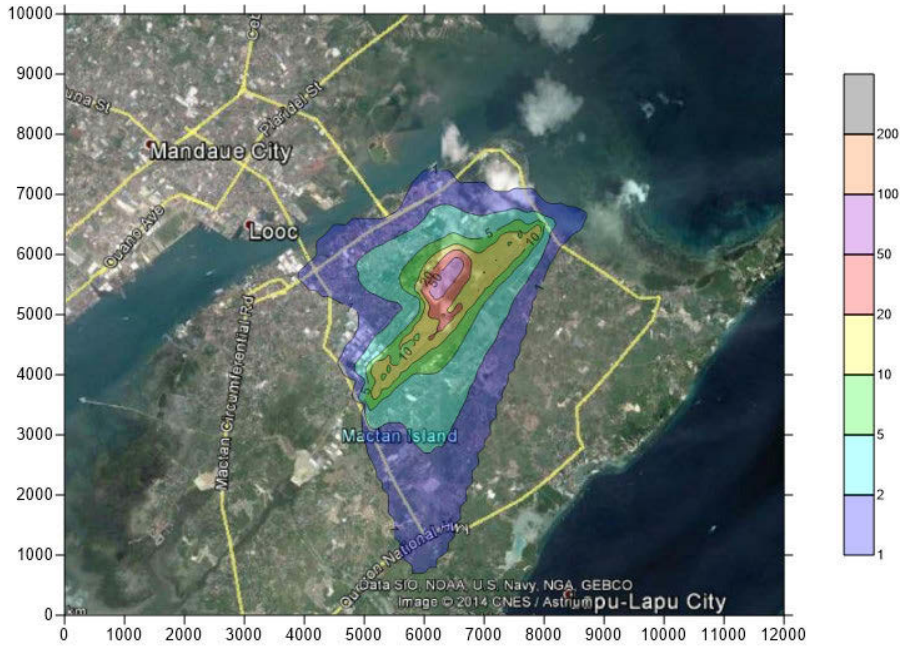


Figure 9-19
NO_2 Concentrations for Year 2024

MITIGATION MEASURES (non-aircraft emissions)

To mitigate the impacts of air pollutants, GMCAC will require contractors that the vehicles and equipment to be used must first pass mandatory emissions testing based on DENR/DOTC standards. Vehicles and equipment to be used must first pass mandatory emissions testing based on DENR/DOTC standards. Vehicles and equipment that did not pass the emission testing should be repaired or replaced while those that passed and are used in operation should undergo periodic maintenance. During construction areas considered vulnerable to dust generation will be sprayed with uncontaminated water on a periodic basis to suppress proliferation of dust particles.

It is assumed that an increase in PM_{10} and TSP will occur during the construction phase due to the movements of processing and construction equipment. Among particulates, dust has the biggest size thus its effect is more on the nuisance side rather than on health. The effect of dust is on the visibility and the aesthetic aspect of the surrounding areas where it may settle. Visibility is vital to the operation of airports and air bases while aesthetic value is very important for industries catering to tourism like hotels and resorts. Thus the dust generated during construction may pose impact to the surrounding areas, but is expected to be short term and temporary. Dust control, such as spraying can be employed during construction. Processing equipment that may emit significant amount of dusts may be located at a distance or off-site the construction area. This impact is considered short-term, likely insignificant, and temporary.

9.8 Climate Change Impact

According to the joint study of the Manila Observatory and the DENR[29], Mactan Island is one of the few areas in the Philippines assessed to have a low impact risk to typhoons. This study was based on the 1945 to 2003 historical data on the number of tropical cyclones (tropical depressions, tropical storm, typhoon, and super-typhoon) that visited the Philippines. **Figure 9-20** below describes the overall typhoon risk assessment of the different areas in the Philippines. In the past 5 years, two typhoons went over Cebu: Typhoon Bopha in December 2012, and Typhoon Haiyan in November 2013, two of the Philippines' worst storms in recent history. In both events, no significant damage has been reported in MCIA, nor in any of its immediate surroundings.

For the projected change in rainfall, Mactan Island is projected to face low susceptibility risk as shown in **Figure 9-21.**This figure used the 1960 to 1990 wet season conditions as baseline data and the change in rainfall for years 2066 to 2096.

[29] Manila Observatory and DENR, "Mapping Philippine Vulnerability to Environmental Disasters," *Manila Observatory*, Accessed October 14, 2014, http://vm.observatory.ph/hazard.html.

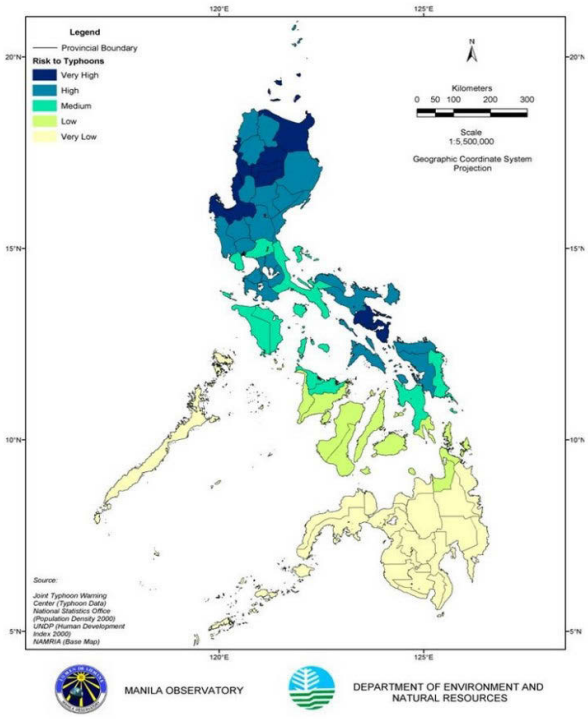


Figure 9-20
Philippine Typhoon Risk Map

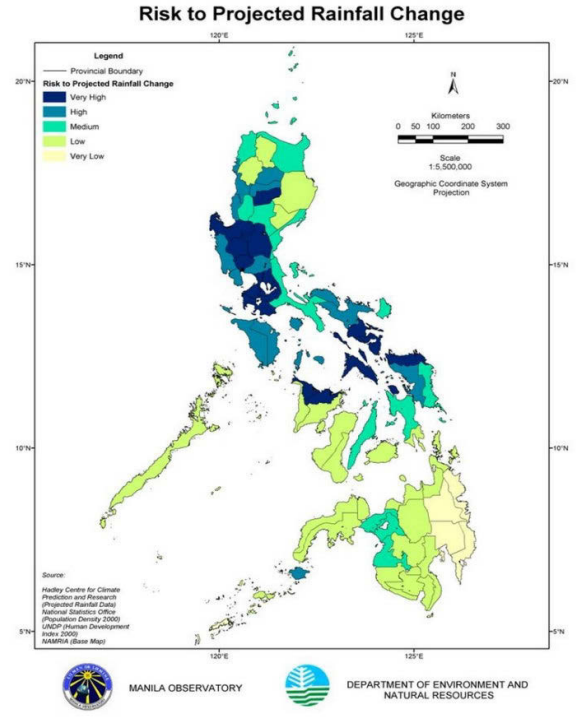


Figure 9-21
Philippine Risk to Projected Rainfall Change Map[30]

[30] Manila Observatory and DENR, "Mapping Philippine Vulnerability to Environmental Disasters," Manila Observatory, Accessed October 14, 2014, http://vm.observatory.ph/hazard.html.

For flood hazard assessment, Mactan Island is considered to be at moderate risk. The output of the flood simulation[31]in **Figure 9-22** shows that majority of the airport area is at moderate risk when it comes to flooding, with a few segments within the airport at high risk.

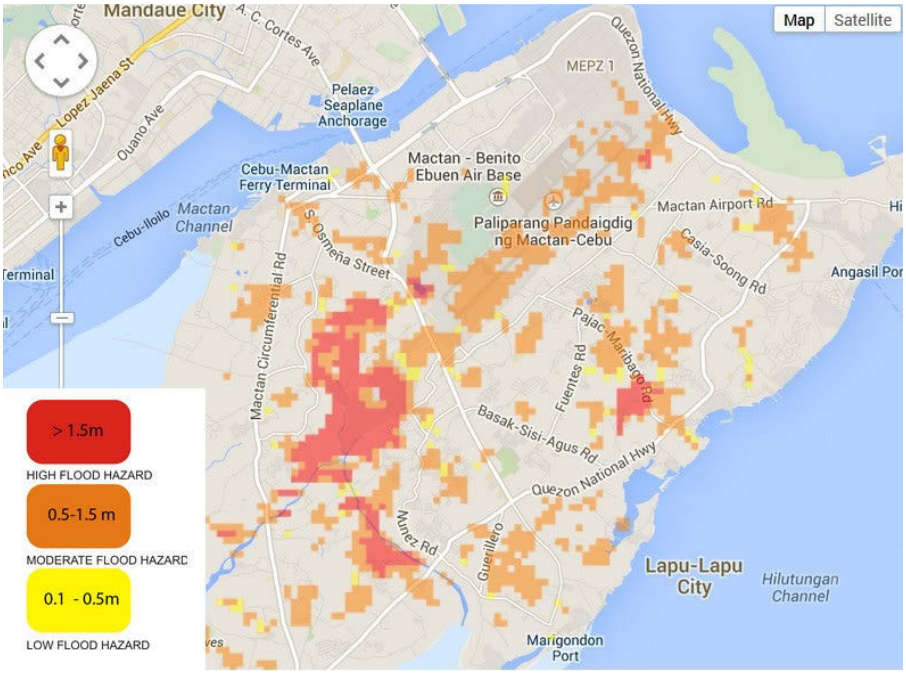


Figure 9-22
Flood Hazard Map of MCIA

Overall, considering the topography of Mactan Island, meteorological historical data, and the projected effect of climate change, MCIA is assessed to face low to moderate risks.

Flood Analysis:

This assessment however did not consider the presence of storm water drains that are located within the airport. It only considered the terrain of Mactan Island, characterized as nearly flat (0 - 10 meters above mean sea level) that falls in the one-slope category of 0 to 3%.A flood analysis was then conducted to ascertain that the installed canals have a carrying capacity that can withstand the heaviest rainfall within a 50-yearrecurrence interval.

The discharge levels (Q) of the MCIA's drainage area were determined using a Rational Method for flood analysis at 10-, 20-, 30- and 50- years return periods. The computed Q values were then compared with the discharge capacity of the receiving open drain/channel to determine the carrying capacity of the drainage area. The open channel is ungauged, thus to estimate its carrying capacity, actual measurements of its dimensions were used.

[31] *The Flo2d Team of the University of the Philippines National Institute of Geological Sciences performed the flood simulation using Flo2d software, a Federal Emergency Management Agency (FEMA)-approved flood routing application software. Source: Philippine Flood Hazard Maps, Accessed October 14, 2014, www.nababaha.com/flood/mactan/mactan.htm.*

The following equations were used to determine the discharge levels of the drainage area:
Kirpich Formula for Time of Concentration (SI Units):

$$t_c = \frac{L^{1.15}}{51H^{0.385}}$$

Where:

t_c = time of concentration
L = overland flow distance
H = elevation difference (Highest Elevation – Lowest Elevation)

Rainfall Intensity (using Gumbel variate):

$$I = \frac{a - b\ln\left[-\ln\left(1 - \frac{1}{T_x}\right)\right]}{(T_c + K)^N}$$

Where:

I = rainfall Intensity
T_x = return period
T_c = time of concentration
a, b, K and N = parameter constants

Discharge formula:

$$Q = CiA_D$$

Where:

Q_D = discharge level
C = run-off coefficient
i = rainfall intensity in the Mactan Island
A_D = Estimated discharge/ drainage area

Table 9-15 shows the information were obtained for the Mactan Airport

Table 9-15
Data inputs for the flood analysis

A_D =	2.2 sq.km (including peripheral sub-drainage areas)	**a =**	713.4007
L =	2.9 km	**b =**	230.2591
Highest Elevation =	10 m	**N =**	0.6414
Lowest Elevation =	6 m	**K =**	11.1
Runoff Coefficient (C) =	0.95 (generally paved areas)		

Note: the constants were derived based on 30 years rainfall records from PAGASA

The computed discharge levels by return periods are shown in **Table 9-16**

Table 9-16
Computed rainfall intensities and discharge by return periods

Return Period, yr	T_c, min	I, mm/hr	Q_p, m^3/s	1.1 x Q_p m^3/s
10	110.25	56.72	32.93	36.22
20	110.25	64.35	37.36	41.10
30	110.25	68.75	39.91	43.90
50	110.25	74.24	43.10	47.41

The existing channel (discharging to Mactan Bay) has an estimated carrying capacity of at least 50 m^3/s, which is enough to carry the peak flood flow coming from the drainage area (which includes the MCIA and MEPZA) for a 50-yr return period[32].

MITIGATION MEASURES

To mitigate the risks associated with climate change events and natural disasters, GMCAC will design T2 in accordance with design standards.

During the operational phase, GMCAC will perform regular maintenance of the storm water drain network to effectively channel all storm waters towards the Mactan Bay.

GMCAC shall collaborate with MCIAA and the Lapu-Lapu City Planning and Development Office to mitigate the impacts of flooding in the area.

As often as necessary, GMCAC will review all weather forecasts and respond based on the up-to-date Disaster Management Plan.

9.9 Health and Safety hazards

POTENTIAL IMPACTS

Construction activities within the airport have the potential to negatively impact the health and safety of both workers and passengers. Unsafe activities and improper use of tools and equipment may result to accidents. People will also be exposed to high noise, vibrations, and air pollution while construction and renovation are on-going. There is also a possibility that fire, explosion, or chemical spillage will happen due to the presence of fuel storage area.

MITIGATION MEASURES

To mitigate the impacts of these hazards, construction workers will be given the necessary training in Health and Safety applicable to their respective line of work. They will be provided the necessary PPEs (Proper Protective Equipment) such as ear muffs, safety shoes, masks, and goggles.

Baseline noise and air quality will be determined and monitored periodicallyto determine exposure levels of pollution to workers during the construction period.

[32] DPWH guidelines require a design capacity of 50-yr return period for open channels.

Fire fighting plan will be developed and fire fighting facilities will be provided in the fuel storage area to mitigate the hazards associated with the presence of the fuel storage area.

Health and Safety Policies will be developed, practiced, and reviewed regularly. A Health and Safety Officer will be deputized to ensure conformance of the project to Health and Safety standards.

To mitigate the impact to health and safety of airport staff and passengers during the operational phase, all buildings (T1, T2, and support facilities) will be designed in such a way that the impact of fire, earthquake, and extreme weather events will be minimized. Proper evacuation plan during emergencies will be developed for every building.

9.10 Energy Efficiency

POTENTIAL IMPACT

Based on the Visayas Power Supply-Demand Outlook for 2012 to 2030[33], the Visayan region has a peak demand growth rate of 4.45%. If the demand is projected and compared against the future power supply in 2024, the estimates indicate that there will be power shortage in the whole of the Visayan region. While the Philippine Government search for solutions to mitigate the impending power crisis, GMCAC shall ensure that necessary steps are taken to reduce its overall power consumption throughout the span of its operation.

MITIGATION MEASURES

As a member of the community, GMCAC will strive to commit to the principles of sustainable development by minimizing the environmental impacts of its daily operations through continuous improvement.

One of the best ways to reduce its environmental impact is by reducing its overall energy consumption. GMCAC is planning to apply for at least a LEED[34]Silver Certification Rating for the new Terminal. The certification follows the LEED-US Green Building Rating System, an internationally accepted benchmark for the design, construction and operation of high performance green buildings.

Table 9-17 shows the broad rating criteria for this certification is as follows:

Table 9-17
Rating criteria for LEED rating criteria

Criteria No.	Criteria	Max. Points
1	Sustainable Sites (SS)	26
2	Water Efficiency (WE)	10
3	Energy and Atmosphere (EA)	35
4	Materials and Resources (MR)	14
5	Indoor Environmental Quality (IEQ)	15
6	Innovation in Design (ID)	6

[33] http://www2.doe.gov.ph

[34] LEED stands for Leadership in Energy and Environmental Design developed by the U.S. Green Building Council to help building owners and operators to be environmentally responsible and be able to use resources efficiently

Criteria No.	Criteria	Max. Points
7	Regional Priority (RP)	4
Total		110

GMCAC is planning to achieve at least 50 points for Terminal 2 to achieve the LEED Silver Certification Rating. Replacement of equipment in Terminal 1 by more energy efficient ones shall be implemented at the start of the concession.

9.11 Road Network Traffic

POTENTIAL IMPACT

During the construction phase, it is expected that there will be an increased road usage coming from construction vehicles that may result to short-term increase in vehicular traffic and inconvenience to other road users.

During the operational phase, the expansion of the passenger terminal of MCIA, and the increase in flight services would definitely increase the number of incoming and outgoing passengers, which, as a direct result, would increase the number of transportation vehicles plying the roads leading to and from MCIA. Thus, this increase in traffic volume would effectively reduce the capacity of the road network.

Each lane of the access roads leading towards MCIA has an estimated capacity of 1400 to 1500 vehicles per hour. The Peak Hour volumes of arriving and departing vehicles for 2024 and 2039 are shown in **Table 9-18. Figure 9-23** illustrates the effect of passing vehicles to a single lane.

Table 9-18
Peak Hour Volumes for 2024 and 2039

Vehicle Type	2024		2039	
	Peak Hour Departure	Peak Hour Arrival	Peak Hour Departure	Peak Hour Arrival
Cars	143	198	280	347
Vans	35	48	68	84
Buses	6	8	12	14
Taxis	234	324	457	568
Total	418	578	817	1013

As seen in the total number of vehicles in the projection, the maximum capacity of the road lanes is still far from being exceeded, thus the impact of the expansion of MCIA on the road network capacity will not be significant, even in the long-term. However, measures to ensure and maintain the efficiency of traffic flow, especially in all intersections, must be put in place.

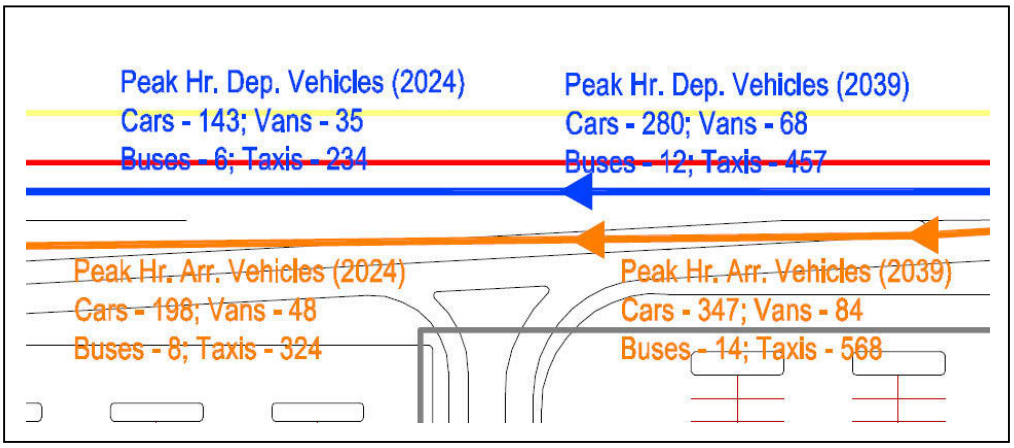


Figure 9-23
Illustration of the passing vehicles on a single-lane road near MCIA

MITIGATION MEASURES

The issue of the impact of road use of the construction equipment and trucks was brought up in the November 26, 2014 Consultation Meeting. As a mitigating measure, GMCAC will coordinate with the City Engineer's Office for compliance with road use policies.

During operational phase, GMCAC will regularly coordinate with the City Traffic Management System for the traffic management plan for roads leading to and exiting from the airport. GMCAC may also collaborate with MCIAA in formulating airport landside policies to limit the loading and unloading time of passenger vehicles at the arrival and departure areas. Parking of vehicles in all roadways should not be allowed, and all road obstructions must be removed.

9.12 Domestic Water Discharge

POTENTIAL IMPACTS

The expansion of the passenger terminal would entail increase in water demand, which in turn would increase the domestic water discharge. The existing STP has a capacity of 900 m^3 /day, and the present discharge of the existing terminal is less than 300 m^3 /day. **Table 9-19** shows the projected water discharge rate of T1 and T2 for years 2017, 2022, 2027 and 2039.

Table 9-19
Projected Water Demand and Discharge Rates of T1 and T2

Terminal	Water Demand Rate (m^3/day)				Discharged Water Rate (m^3/day)			
	Year 2017	Year 2022	Year 2027	Year 2039	Year 2017	Year 2022	Year 2027	Year 2039
T2	432	575	730	1100	345.6	460	584	880
T1	600	750	900	1200	480	600	720	960

Total	1032	1325	1630	2300	825.6	1060	1304	1840

By 2017 the total daily water discharge rate would be 825.6 m^3/day, which is already near the maximum design capacity of the STP. By 2022, the daily water discharge rate would increase to 1060 m^3/day, an amount way beyond the capacity of the existing terminal. Failure to treat the wastewater would lead to environmental non-compliance, and may result to dire environmental consequences, particularly on the water quality (BOD, COD and coliform) of Magellan Bay. Thus, the perceived impacts can be considered cumulative, significant and high in magnitude, but reversible if addressed.

MITIGATION MEASURES

Based on Part 2 (Grantors Operations & Maintenance (O&M) Minimum Specifications and Standards (MPSS)) of the GMCAC-MCIAA MOA, "the STP shall be maintained by MCIAA to allow for the capacity of international and domestic passengers and associated employees for the duration of the Concession Period".

9.13 Greenhouse Gases (GHGs)

POTENTIAL IMPACTS

The planned expansion of the Mactan-Cebu International Airport (MCIA) is predicted to contribute to the increase of GHGs emitted to the environment due to airport-related activities. To assess the environmental impacts of the planned expansion of airport operations at the MCIA the magnitudes of CO_2, CH_4 and N_2O emissions that will be potentially released were calculated using IPCC methods. The aviation industry has been identified as one of the major sources of greenhouse gases that significantly contribute to global warming[35]. Airport-specific emissions are important since these directly contribute to the local air quality and have the potential to affect climate at the global level.

Postorino and Mantecchini[36] identified four sources of carbon emissions specific to airport operations, namely; emissions due to ground access modes, emissions due to electrical energy consumption and generation for airport operations, emissions due to landing, take-off and taxiing of on-ground aircraft (LTO) and emissions due to ground service equipment operations. The emissions due to ground access modes refer to the GHGs generated by the transportation used by passengers to get to and leave from the airport. The emissions due to landing, take-off and taxiing of on-ground aircraft (LTO) refer to the GHGs produced by aircraft travelling within the operational LTO cycle. The LTO cycle includes all aircraft activities 1000 meters from the ground level (**Figure 9-25**) namely: the descent/final approach, taxi-in, taxi-out, take-off and climb out[37].

[35] Pham VV, et al. 2010. Environmental Modeling & Software. 25, pp. 1738-1753.
[36] Postorino M. and L. Mantecchini. 2014. Journal or Air Transport Management.37, pp. 76-86.
[37] Song SK and ZH Shon. 2012. Atmospheric Environment. 61, pp. 148-158.

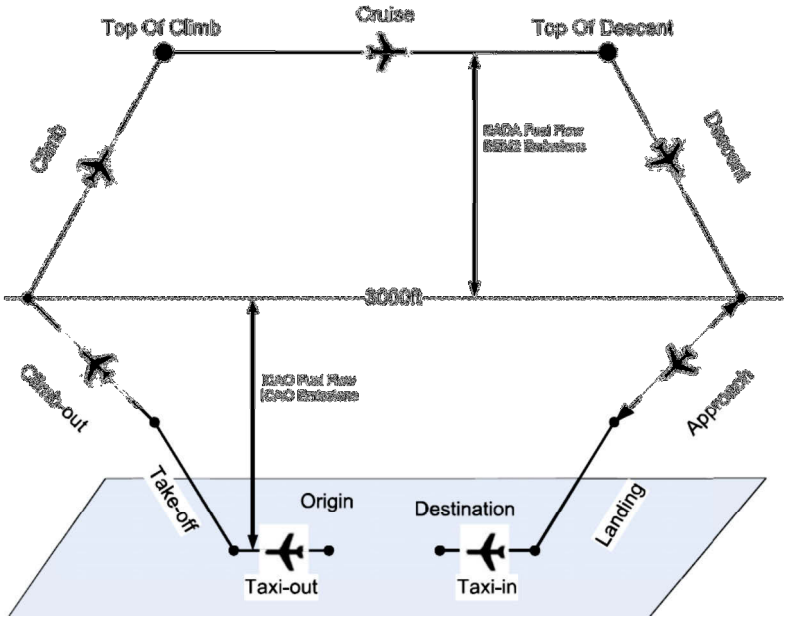


Figure 9-24 The aviation emission computation
(Source: J. Environmental Modeling & Software)

Methodology

Four distinct sources of GHG emissions as outlined by Postorino and Mantecchini were considered for the present inventory. Only the following major GHGs were included in the analysis: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).

A. Preliminary Calculations

Preliminary calculations were performed to determine the baseline for 2014, and projected values for the passenger volumes, number of vehicles for passenger transport, aircraft LTO volumes, ground service vehicle fuel usage and the annual electricity consumption.

The passenger volumes for international and domestic flights were estimated separately. Available and projected passenger volumes for the years 2014, 2024 and 2039 were used to generate second-order polynomial models (R^2 = 1) to approximate the number of passengers for both international and domestic destinations between the aforementioned years.

The projected number of vehicles arriving and leaving from the airport for the years 2015 to 2039 were calculated based on the predicted domestic and international passenger volumes. It was assumed that the proportions of the modes of transportation used to ferry the passengers into and out of the airport will not change significantly within the next 25 years. Ratios of the number of vehicle types per total number of passengers were calculated for the baseline year 2014. These ratios were used to estimate the volumes for each of these vehicle types for the years 2015 to 2039.

The annual LTO cycles were estimated using available and estimated volumes of international and domestic-bound aircraft. Regression analysis (R^2 = 1) was used to interpolate LTOs for international flights between the years 2014, 2025 and 2039. The volume of domestic LTOs for the years 2015 – 2039 were calculated by multiplying the

respective annual passenger estimates to the ratio of the LTO volume per total number of domestic passengers for the year 2014. It was assumed that the percentages of the aircraft models in the year 2014 will not significantly change within the next 25 years.
For the calculation of the volume of fuel consumed by ground service equipment, it was assumed that each aircraft is serviced by the same set of ground vehicles. Furthermore, it was assumed that the proportions, fuel type and vehicle mileage will not change significantly from its year 2014 profile. An LTO- specific ratio of the fuel consumption for a single deployment of a ground service fleet was calculated for the year 2014. The fuel consumption for ground service activities for the years beyond 2014 was calculated by multiplying the LTO-specific ratio to the corresponding total LTO volumes.

Finally, for the estimation of the annual electricity consumption due to MCIA terminal operations, estimated data for the years 2014, 2016, 2017, 2022, 2027, 2029 and 2039 were used in a regression analysis (R^2 = 0.91) to obtain the values of electrical consumption due to airport terminal operations for the periods between the aforementioned years.

B. Greenhouse Gas Calculations

Source 1: Emissions due to ground access modes

Data from a 2014 traffic survey was used to estimate the number and percentages of vehicle types entering and leaving the MCIA grounds. The vehicles were further classified into the type of fuel used – gasoline, diesel fuel or liquefied petroleum gas (LPG). The average road length traversed by either a vehicle entering or leaving from the departure and arrival areas was estimated at 1 km. The GHG emissions were computed using Equation 1 where E_{GHG} is the CO_2, CH_4 or N_2O emissions, $N_{VEHICLE}$ is the total number of vehicle type per year, $FC_{VEHICLE}$ is the amount of fuel consumed by a unit vehicle and EF_{GHG} is the IPCC emission factor for a specific GHG given the type of fuel used (diesel, gasoline or LPG).

$$E_{GHG}(kg) = N_{VEHICLE} * FC_{VEHICLE}(TJ/Vehicle) * EF_{GHG}(kg/TJ) Eqn.\ 1$$

Source 2: Emissions due to electrical energy consumption for airport operations

The emission factors for CO_2, CH_4 and N_2O specific to the Visayas power grid which supplies MCIA's electricity requirements, were computed using the fuel mix (**Figure 9-25**) as reported by the Department of Energy. The CO_2, CH_4 and N_2O emissions due to combustion (coal, diesel oil, natural gas) or energy extraction (geothermal, hydropower) were determined using factors specified by the IPCC and other publications[38]. Ratios of the total emissions per GHG to the total dependable installed capacity (2,103 MW) were computed and constituted the Visayas grid-specific emission factors (EF_{GHGv}). To determine the GHG emissions that can be attributed to MCIA's terminal operations, ratios of the annual projected consumption (EC_A) to the total installed capacity were multiplied to the emission factors generated (Eqn. 2).

$$E_{GHG}(kg) = EC_A(MVA) * (1/2{,}103\ MVA) * EF_{GHGv}(kg/TJ) Eqn.\ 2$$

[38] Geothermal energy reduces greenhouse gases. Retrieved from: http://www.geothermal.org/PDFs/Articles/greenhousegases.pdf

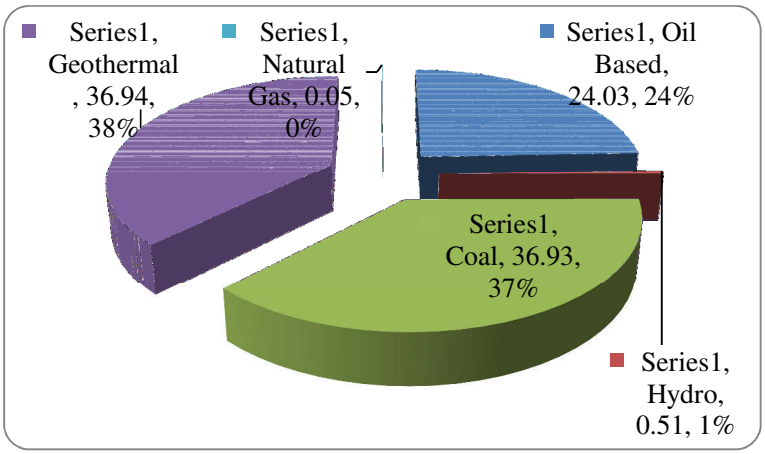


Figure 9-25
Fuel mix for the Visayas power grid
(Source: Department of Energy)

Source 3: Emissions due to landing, take-off, taxiing on-ground aircraft (LTO)

Aircraft-specific emission factors[39] were used to estimate the amounts of GHGs that are produced due to the combustion of jet fuel during the landing and take-off (LTO) cycle. The GHG emissions were calculated for both international and domestic aircrafts using Equation 3 where $N_{AIRCRAFT}$ is the annual total number of a specific aircraft model and $EF_{GHG\text{-}AIR}$ is its emission factor for CO_2, CH_4 or N_2O.

$$E_{GHG}(kg) = N_{AIRCRAFT} * EF_{GHG-AIR}(kg/LTO) Eqn.\ 3$$

Source 4: Emissions due to ground service equipment

The emissions due to the ground service equipment were computed based on the total amount of diesel fuel consumed by the set of vehicles (**Table 9-20**) deployed for aircraft maintenance and other LTO-related services/activities. The annual fuel consumption per LTO was computed for the year 2014 (FC_{2014}) and the value was used to estimate the required amount of diesel fuel for the succeeding years by multiplying the value to the corresponding projected total LTOs (N_{LTO}) as shown in Equation 4. The emissions due to the deployment of ground service equipment was then estimated using the IPCC factors specific to diesel ($EF_{GHG\text{-}DIESEL}$).

$$E_{GHG}(kg) = N_{LTO} * FC_{2014}(TJ/LTO) * EF_{GHG-DIESEL}(kg/TJ) Eqn.\ 4$$

Table 9-20
The set of ground service vehicles and their corresponding number of units.

Ground Service Vehicle	Number of Units
Refuelers	1

[39] 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Ground Service Vehicle	Number of Units
Tugs and tractors	3
Ground power units	1
Airport bus	3
Container loader	2
Potable water trucks	1
Lavatory service vehicle	1
Catering vehicle	1
Belt loaders	3

C. Results and Discussion

Source 1 Emissions

The results of the traffic survey which formed the basis for the calculation of GHG emissions due to ground access vehicles are shown in **Figure 9-26**. The annual total emissions of the major GHGs considered in the inventory for several representative years are as shown in **Figure 9-27**. The GHGs emitted were mostly due to gasoline which makes up 60% of the total fuel consumed per year. Although gasoline has a slightly lower emission factor for CO_2 compared to diesel, its CH_4 emission factor is almost ten (10) times as much as diesel fuel. LPG has been touted as a cheaper replacement to gasoline; however the N2O emission factor specific to this fuel is highest at 60 kg/TJ.

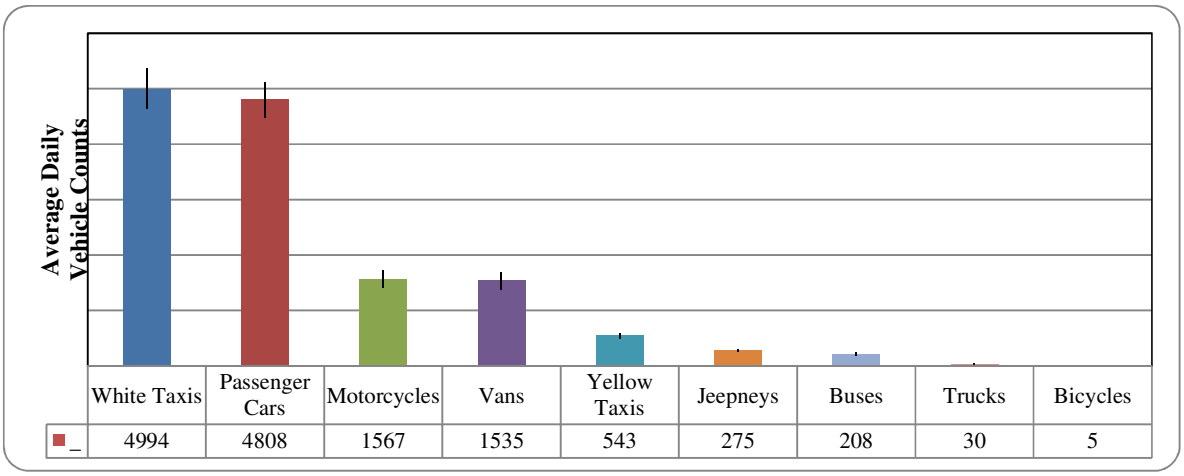
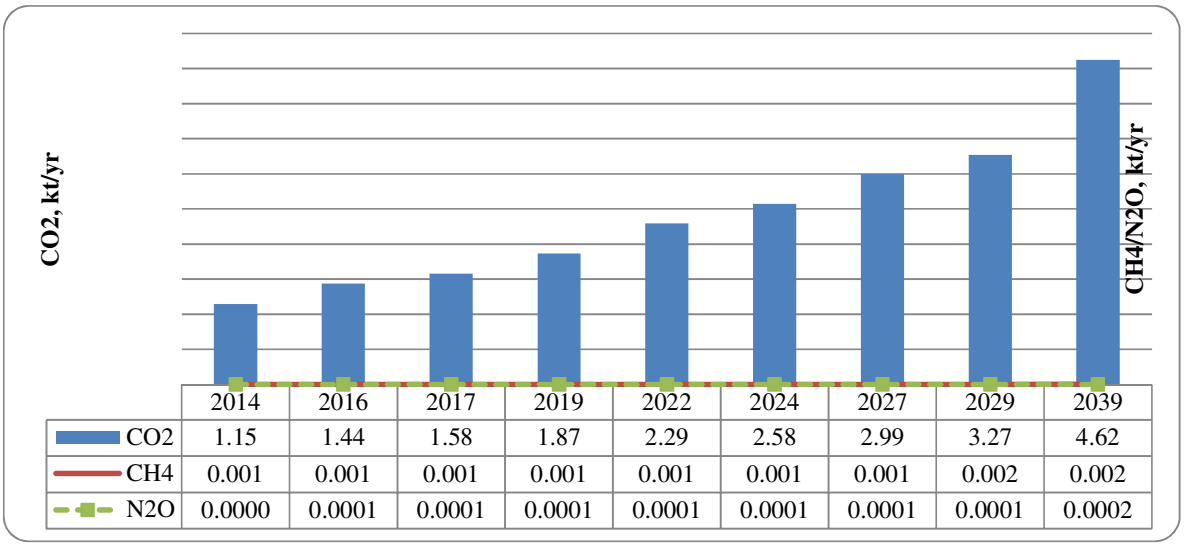


Figure 9-26
The types of vehicles with their corresponding average daily counts observed at the arrival and departure areas at the MCIA from August 18 – 24, 2014.



	2014	2016	2017	2019	2022	2024	2027	2029	2039
CO2	1.15	1.44	1.58	1.87	2.29	2.58	2.99	3.27	4.62
CH4	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002
N2O	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002

Figure 9-27
The CO_2, CH_4 and N_2O emissions (kT/yr) due to vehicular traffic inflow and outflow at the MCIA for the years 2014, 2016, 2017, 2019, 2022, 2024, 2027, 2029 and 2039.

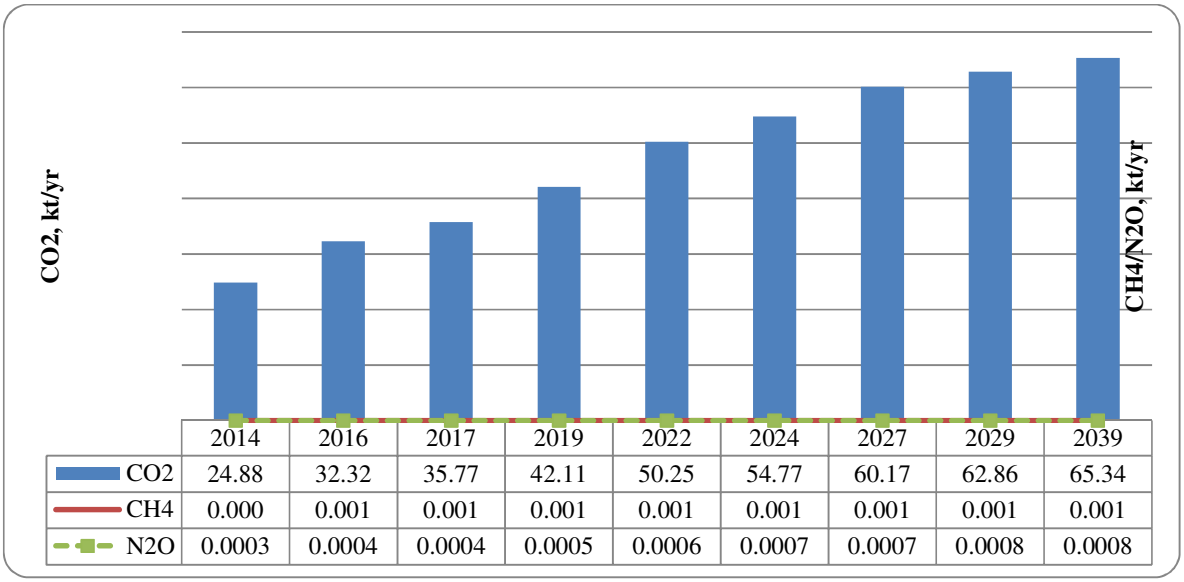
Source 2 Emissions

The calculated emission factors specific to the Visayas grid-sourced electricity were 13,004.95 kg CO_2/MW, 0.216 kg CH_4/MW and 0.162 kg N_2O/MW. These values were calculated taking into account the possible GHG contributions of geothermal and hydroelectric power plants. In comparison, the emission factors specific to the Philippines as reported in a document prepared by the US EIA[40] were 12,624 CO_2/MW, 372.96 kg CH_4/MW and 186.48 kg N_2O/MW. The discrepancies in the calculated and reported values further justify the necessity of determining the area-specific emission factors. It is important to point out that the fuel mix used to generate electricity in Luzon, Visayas and Mindanao vary significantly[41].

It must be stressed that some countries, Italy and Iceland for example, have elected not to include CO_2 emissions from geothermal power plants[42]. The reason for the exclusion is that the CO_2 emissions from these power plants are components of the carbon dioxide cycle and that, unlike fossil fuel-fired power plants, no new CO_2 is being produced. Furthermore, technological advancements can be used to degas steam from geothermal areas to lessen CO_2 emissions to negligible levels. However, the GHG emissions of geothermal power plants are dependent on several factors including the process used to extract thermal energy for electricity generation[43]. GHG emissions from geothermal power generation were therefore included in the present calculations
Nevertheless, the non-inclusion of geothermal and hydroelectric GHG contributions in the present work does not significantly alter the results since the bulk of the emissions can be traced to the usage of coal for electricity generation.

The MCIA-specific emissions for the baseline year 2014 and several representative years are shown in **Figure 9-28**. These estimates were calculated with the assumption that the Visayas grid will not significantly increase its current dependable capacity.

[40] Instructions for Form EIA-1605 Voluntary Reporting of Greenhouse Gases.
[41] Energy Situationer 2013
[42] International Geothermal Conference, Reykjavík, Sept. 2003.
[43] Geothermal Resources Council Transactions. 23, pp. 221-223.

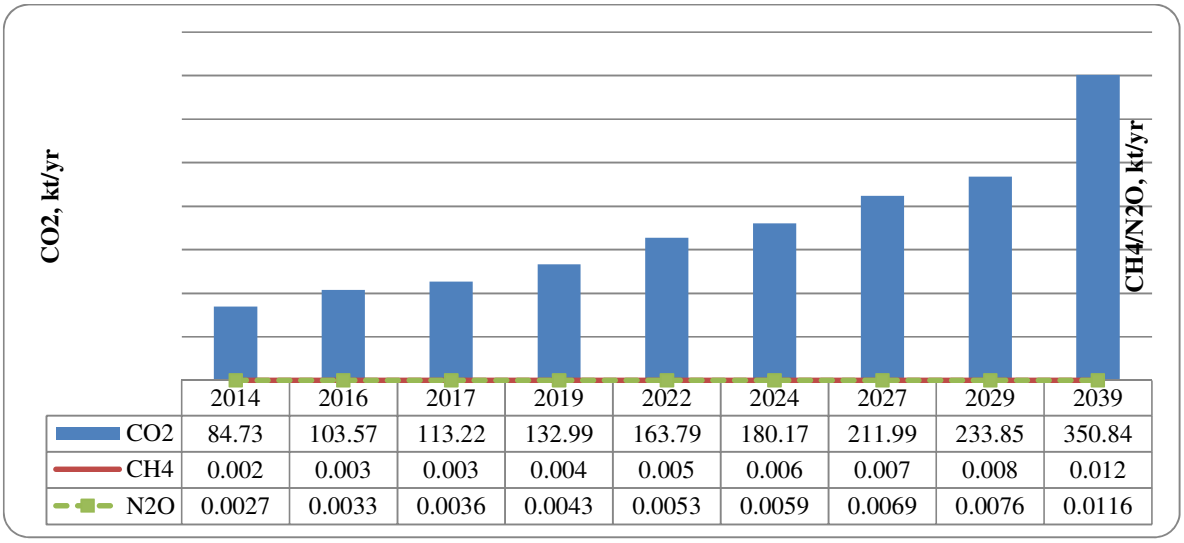


	2014	2016	2017	2019	2022	2024	2027	2029	2039
CO2	24.88	32.32	35.77	42.11	50.25	54.77	60.17	62.86	65.34
CH4	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
N2O	0.0003	0.0004	0.0004	0.0005	0.0006	0.0007	0.0007	0.0008	0.0008

Figure 9-28
The CO_2, CH_4 and N_2O emissions in kT/yr due to electricity consumption for airport operations at the MCIA for the years 2014, 2016, 2017, 2019, 2022, 2024, 2027, 2029 and 2039.

Source 3 Emissions

The GHG emissions due to LTOs for the year 2014 and several representative years are shown in **Figure 9-29**. The domestic flights contributed most (up to 79%) of the GHG emissions due to LTOs, as is to be expected since they comprise most of the air traffic. The LTO-sourced emissions were made with the assumption that the types and percentages of aircraft models used for domestic flights in 2014 will not change significantly over the next 25 years. With this assumption, it is interesting to point out that there is a progressive increase in the relative contribution of the LTOs for international flights to the total GHG emissions.

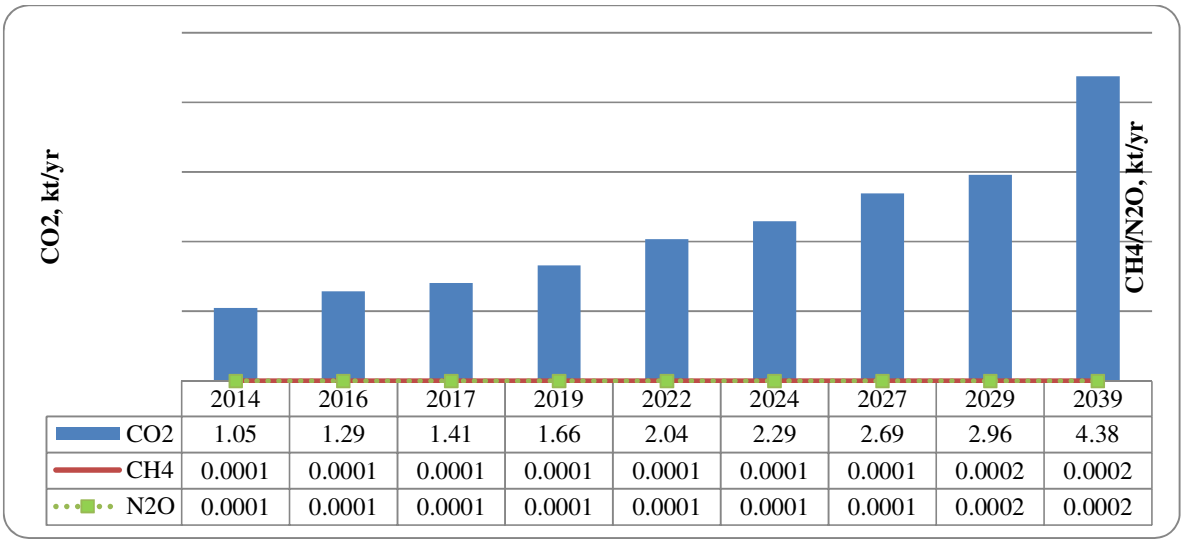


	2014	2016	2017	2019	2022	2024	2027	2029	2039
CO2	84.73	103.57	113.22	132.99	163.79	180.17	211.99	233.85	350.84
CH4	0.002	0.003	0.003	0.004	0.005	0.006	0.007	0.008	0.012
N2O	0.0027	0.0033	0.0036	0.0043	0.0053	0.0059	0.0069	0.0076	0.0116

Figure 9-29
The CO_2, CH_4 and N_2O emissions (kT/yr) due to LTO cycles for airport operations at the MCIA for the years 2014, 2016, 2017, 2019, 2022, 2024, 2027, 2029 and 2039.

Source 4 Emissions

The emissions due to ground service equipment deployment for the year 2014 and other representative years are shown in **Figure 9-30**. The results show an increasing trend which parallels that of the emissions due to LTOs (**Figure 9-29**).



	2014	2016	2017	2019	2022	2024	2027	2029	2039
CO2	1.05	1.29	1.41	1.66	2.04	2.29	2.69	2.96	4.38
CH4	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002
N2O	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002

Figure 9-30
The CO_2, CH_4 and N_2O emissions due to ground service vehicles in MCIA for the years 2014, 2016, 2017, 2019, 2022, 2024, 2027, 2029 and 2039.

Table 9-21 shows the summary of the total equivalent CO_2 emissions from the four sources considered in the analysis. The results show that LTOs have the highest contribution (from 75 to 82%) which is consistent with previous reports[44].

The total emissions for CO_2, CH_4 and N_2O for the year 2014 were 111.80 kT, 0.00348 kT and 0.00314 kT, respectively. These emissions correspond to a total CO_2e of 112.825 kT/year. For the year 2039 wherein the total terminal floor area at the MCIA would be 105,860 m^2, the emissions are 425.177 kT CO_2, 0.01596 kT CH_4 and 0.01279 kT N_2O which correspond to a total CO_2e of 429.389 kT/year. In comparison, the average annual CO_2 emission (due to LTOs alone) for Incheon International Airport with a total terminal floor area of about 496,000 m^2 was 1,110 kT/yr. The Bologna International Airport, on the other hand, with a total terminal area of 36,100 m^2 emitted approximately 91.53 ktons CO_2 in 2012. The projected GHG emissions at the MCIA in the next 25 years are therefore comparable to other international airport emissions.

Table 9-21
The annual CO_2e produced from the four sources of airport-specific GHG emissions from years 2014 – 2039.

	CO_2e (metric tons)				
Year	***Source 1**	***Source 2**	***Source 3**	***Source 4**	**Total**
2014	1,172.89	24,986.35	85,600.27	1,065.82	112,825
2015	1,321.72	28,812.16	95,041.76	1,187.49	126,363
2016	1,470.00	32,454.58	104,638.58	1,310.30	139,873
2017	1,617.74	35,913.58	114,390.71	1,434.25	153,356
2018	1,764.93	39,189.18	124,298.15	1,559.35	166,812
2019	1,911.58	42,281.38	134,360.92	1,685.60	180,239
2020	2,057.69	45,190.17	144,578.99	1,812.99	193,640
2021	2,203.25	47,915.55	154,952.38	1,941.52	207,013
2022	2,348.27	50,457.53	165,481.09	2,071.21	220,358
2023	2,492.74	52,816.10	176,165.11	2,202.03	233,676
2024	2,636.67	54,991.27	182,059.24	2,334.00	242,021
2025	2,780.05	56,983.03	192,652.39	2,467.12	254,883
2026	2,922.89	58,791.38	203,375.35	2,601.38	267,691
2027	3,065.19	60,416.33	214,228.13	2,736.79	280,446
2028	3,206.94	61,857.87	225,210.72	2,873.34	293,149
2029	3,348.15	63,116.01	236,323.14	3,011.04	305,798
2030	3,488.81	64,190.74	247,565.37	3,149.88	318,395
2031	3,628.93	65,082.06	258,937.42	3,289.87	330,938
2032	3,768.51	65,789.98	270,439.28	3,431.00	343,429
2033	3,907.54	66,314.49	282,070.97	3,573.28	355,866
2034	4,046.02	66,655.60	293,832.47	3,716.70	368,251
2035	4,183.97	66,813.30	305,723.79	3,861.27	380,582
2036	4,321.37	66,787.60	317,744.92	4,006.99	392,861
2037	4,458.22	66,578.49	329,895.87	4,153.85	405,086
2038	4,594.53	66,185.97	342,176.64	4,301.85	417,259
2039	4,730.30	65,610.05	354,597.60	4,451.00	429,389

*Note: Source 1 – Ground access vehicles; Source 1 – Electricity consumption for airport terminal operations; Source 3 – Aircraft Landing and Take-off (LTO) cycles; Source 4 – Ground service vehicles

MITIGATION MEASURES

For Source 1

Survey results indicate that taxis make up 40% of the vehicular traffic at the arrivals and departure areas while passenger cars at 34% came a close second. Private vehicles on the other hand must be strictly discouraged from lingering in the airport premises with their engines turned on.

For Source 2

To control or minimize the GHG emissions due to electricity consumption, the MCIA should implement power-saving guidelines and invest in energy-efficient equipment and devices.

For Source 3

The MCIAA must optimize the duration of the LTO cycle for every aircraft to minimize the corresponding GHG emissions.

For Source 4

Lower GHG emissions may be achieved by utilizing a fleet of vehicles with higher fuel economies. These vehicles must also be selected based on the emission factors of its fuel requirement such that lower GHGs will be produced. Proper vehicle maintenance should also be strictly observed.

9.14 Other Airside Operations

POTENTIAL IMPACTS

One of the significant hazards associated with airport operation MCIAA has to deal with is on how to mitigate the impact of fuel storage and spillage. The presence of fuel tanks and depots within the airport premises poses incalculable risks to health, safety, and environment due to possible fire, explosion, and fuel spillage.

MITIGATION MEASURES

MCIAA currently addresses that with a Letter of Agreement between MCIAA and all fuel service providers. Contained in the agreement is the Fueling and Spill Control Procedures covering Aircraft Fueling, Spill Prevention, and Spill Control and Clean-up.

10 Summary of Environmental Impact Assessment and Mitigation

Table 10-1 shows a summary matrix of the environmental impact assessment and proposed environmental management plan (EMP) during the construction and operation phase of the project. The first column contains the activities in each project phase, the second column shows the key environmental aspects triggered by each Project activity, the third column shows a summary of environmental impacts, and the fourth column describes the mitigation measures.

On the other hand, **Table 10-2** shows a summary matrix of the environmental monitoring plan (EMoP) during the construction and operation phase of the project. The EMoP ensures that the mitigating measures proposed are undertaken and parameters considered comply with the local environmental laws.

Table 10-1.
Impact assessment and EMP matrix

Key Environmental & Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures	Responsible Party	Time line
PRE-CONSTRUCTION PHASE				
Management of the Environmental and Social Impact during the Construction and Operational Phase	Inadequate knowledge of the Contractors on the E&S requirements of the Project may raise concerns that will cost financial and reputational risk to GMCAC.	GMCAC will deploy E&S staff to oversee that the EHS measures and monitoring requirements during construction are properly implemented. The E&S staff will have Environmental educational background and experience in handling E&S matters during Construction Staff.	GMCAC	60 days after initial financial close but not later than 30 days prior to start of construction
CONSTRUCTION PHASE[45]				
Hazardous Materials and Wastes	Paints, solvents, fuels, motor oils, batteries, and fluorescent lamps will be used during the construction phase. Improper use, handling and storage of these may contaminate the ground surface and percolate down into the groundwater, resulting to health and environmental risks.	A hazardous management Plan will be established which will specify that all hazardous materials will be stored in a special facility appropriate for hazardous materials. Every type of item will have an MSDS (material safety data sheets) label attached. Fuels and motor oils must be sited on an impervious base within a suitable bund and properly secured, with the base and bund walls impermeable to the material stored. All wastes generated, including leaking or empty containers, will be removed from the site and properly disposed of by a DENR-accredited hazardous waste treater.	GMCAC Pollution Control Officer (PCO) and Contractor	15 working days prior to construction and follow throughout the construction phase
Solid Waste	Solid wastes coming from the construction such as scrap wood, packaging materials, scrap metal, building rubble, gypsum wall board, asphalt, and concrete will be accumulated through time.	A strategic solid waste management plan, which gives priority to the recycling and reuse of materials, will be required from the contractor. All building rubble and other suitable organic-free solid wastes will be used as backfill materials. Waste containers will be placed at specific points for	GMCAC PCO and Contractor	15 working days prior to construction and follow throughout the construction

[45]To be updated by the Contractor and the GMCAC PCO prior to and throughout the construction phase as required.

Key Environmental & Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures	Responsible Party	Time line
		the segregation and collection of solid wastes. Other solid wastes not recycled/reused will be handled and disposed by the contractor/ subcontractor.		phase
Air Quality	Construction equipment and vehicles emit air pollutants that can be harmful to health and the environment such as CO, NO_X, SO_X, PM_{10}, and $PM_{2.5}$. Vehicles passing by dry and windy areas generate dust which can increase the ambient Total Suspended Solids (TSP). Demolition of apron, MIP, and paved areas can increase the ambient TSP due to the release of fine debris particles and the increase in exposed (un-vegetated) ground areas.	Require contractors that all vehicles and equipment to be used must first pass mandatory emissions testing based on DENR/DOTC standards. Areas considered vulnerable to dust – generation will be sprayed with uncontaminated water on a periodic basis.	GMCAC PCO and Contractor	15 working days prior to and throughout the construction phase and tested for emission annually. Availability of the water source and determination of routes to be sprayed are already defined 15 days prior to start of construction.
Noise	Construction activities such as the movement of heavy equipment and the delivery of construction materials to and from the site may cause noise and vibration to the surrounding communities.	Noise generating activities will be minimized during the night time period (10PM – 5AM). During the renovation of Terminal 1, passenger traffic inside the building will be designed in such a way that noise will be far from the people in transit. Delivery of materials will be properly scheduled such that traffic is minimized during night time.	GMCAC PCO and Contractor	15 working days prior to construction and follow throughout the construction phase
Surface Water	Sediments reaching surface water via runoff during rainfall events can come from exposed ground surfaces, stockpiles of excavated areas, and concrete and cement	Sediment traps / sediment basins / energy dissipating areas will be installed to channel storm water from the work areas and to diminish the energy of the storm water flow and thereby control the movement of sediments that can affect the quality of the nearby	GMCAC PCO and Contractor	throughout the construction phase

Key Environmental & Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures	Responsible Party	Time line
	products attached to construction tools and equipment.	body of water.		
Terrestrial Biology	A number of trees will be affected in the construction of Terminal 2. Initial tree inventory shows the presence of the following tree species in the area: fire tree, gmelina, bo tree, nara, talisay, mahogany, acacia, agoho, ipil-ipil, and neem.	The complete inventory of trees in map form will be incorporated to the over-all design of the new passenger terminal building. This way, some trees may still be possibly saved and be part of the landscaped area. All trees to be removed/balled will be addressed as per DENR standards.	GMCAC PCO and Consultant	30 working days prior to construction
Public Health and Safety	Construction activities pose a serious impact to public health and safety since there is a high possibility that accidents can occur within and about the surrounding construction site.	A Health and Safety Management Plan (HSMP) will be required from the 3rd Party Contractor to reduce the associated risks (such as accidents) in the construction area.	GMCAC Health and Safety Officer (HSO) and Contractor	throughout the construction phase
Occupational Health and Safety	Unsafe activities and improper use of tools and equipment may result to accidents. Workers will be exposed to high noise, vibrations, and air pollution while construction and renovation are on-going. Risk from Exposure to fire, explosion, or chemical spillage from fuel storage area.	Construction workers will be given the EHS trainings, health and safety protocols and emergency responses. Workers will be provided with personal protective equipment (PPEs)	GMCAC Health and Safety Officer (HSO) and Contractor	throughout the construction phase
Traffic Management	Delivery of construction materials will cause a short-term increase in vehicular traffic that may produce inconvenience to other road users. Heavy construction vehicles passing by road lanes beyond the required load limit may have the potential to damage road infrastructures.	Contractor will coordinate with the City Traffic Management System (CTMS) and the City Engineer's Office of Lapu-Lapu City for the appropriate traffic management of construction vehicles.	GMCAC Construction Engineer and Contractor	throughout the construction phase

Key Environmental & Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures	Responsible Party	Time line
Labor	About 300-400 workers are expected to be employed. Influx of workers from other towns/provinces may increase incidence of STDs/AIDs	GMCAC will require Contractor to comply with the national labor laws (mandated wages and benefits, number of hours worked, living conditions, etc.) and undertake measures to comply with the core labor standards (prohibition on child labor, forced labor, discrimination,). Contractor contract to reflect labor clause and ensure monitoring. Contractor and subcontractors will give priority to local labor from nearby barangays based on the qualifications and skills. Contractor, in collaboration with relevant government units, to conduct seminar awareness/trainings on HIV/AIDS/STD.	GMCAC HSO and Contractor	30 working days prior to and throughout the construction phase
OPERATIONAL PHASE[46]				
Hazardous Materials and Wastes	Used batteries, busted fluorescent lamps, and obsolete computers are expected to be generated within the operational phase. Improper disposal of these may result to health and environmental risks.	A hazardous management Plan will be established which will specify that generated hazardous wastes will be properly accounted and stored in a special facility, and disposed by a DENR accredited hazardous waste treater.	GMCAC PCO and DENR accredited treater	15 working days prior to end of construction
Air Quality	Passenger vehicles going to/leaving the airport emit air pollutants that can be harmful to health and the environment such as CO, NO_X, SO_X, PM_{10}, and $PM_{2.5}$. Areas considered vulnerable to dust – generation such as un-vegetated areas may increase the ambient TSP.	Trees and shrubs will be planted within the concession agreement boundary according to the landscape engineering design to enhance the airport's air quality. Areas considered vulnerable to dust – generation will be covered with grass according to the airport landscape engineering design and will be sprayed with uncontaminated water on a periodic basis.	GMCAC PCO	60 working days prior to end of construction
Noise	The major source of noise will be	For GMCAC, planting of trees may be worked out	GMCAC	60 working days

[46]To be updated by the GMCAC PCO during operational phase as required.

Key Environmental & Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures	Responsible Party	Time line
	coming from the take-off and landing of aircrafts at the runway and will further increase with the projected growth in aircraft flights. Ground service equipment (GSE), auxiliary power units (APU), and landside vehicles will all also contribute to the ground noise of the airport.	within the concession agreement boundary to further mitigate propagation of noise from aircraft and ground operations. GMCAC to set up a periodic meeting with MCIAA to discuss noise reduction measures on a monthly basis. Discussion will revolve on Noise reduction strategies such as the use of quieter aircrafts, landuse planning and management, noise abatement operational procedures, and aircraft operating restrictions, following the ICAO "balanced approach", will be brought for discussion within MNMC MCIAA to establish the MCIA Noise Management Committee (MNMC) composed of MCIAA, GMCAC, airline operators, Lapu-Lapu City Planning and Development Office (CPDO), and representatives of affected communities. MNMC will review, assess, within MCIA. The following will be discussed with the MNMC : Noise reduction strategies such as the use of quieter aircrafts, landuse planning and management, noise abatement operational procedures, and aircraft operating restrictions, following the ICAO "balanced approach", will be brought for discussion within MNMC. MCIAA and GMCAC will conduct Airport Facilitation Committee Meeting with airline operators, including use of Chapter 3 or quieter aircrafts. MCIAA and GMCAC will review the land use plan and	MCIAA and GMCAC MCIAA, GMCAC, other members of the MNMC MCIAA, GMCAC, other members of the MNMC MCIAA, GMCAC, airline operators MCIAA, GMCAC, CPDO, affected communities MCIAA and	prior to end of construction First meeting 120days after initial financial close or Within 180 working days after start of construction Within 180 working days after start of construction Within 180 working days after start of construction Within 180 working days after start of construction

Key Environmental & Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures	Responsible Party	Time line
		work closely with the CPDO and local stakeholders on how to minimize exposure to aircraft noise. MCIAA to discuss with airline operators in following the noise abatement flight procedures (NAP) such as Constant Descent Approach (CDA), Standard Instrument Departures (SIDS), Standard Terminal Arrival Routes (STARS), and Required Navigation Performance (RNP). MCIAA to conduct periodic noise monitoring in the nearby communities to calibrate the noise model results and determine the affected communities. MCIAA to ensure that equipment and vehicles as sources of ground noise (GSE, APUs, landside vehicles, etc.) will be properly operated and maintained, and will be used at appropriate operating hours.	airline operators MCIAA MCIAA	Within 180 working days after start of construction Within 180working days after start of construction
Water Supply	There is a projected increase in water demand that might be a source of water competition.	Require a number of water meters in the different sections of the airport terminal buildings and landside facilities to monitor water usage and adopt appropriate water conservation measures.	GMCAC PCO	15 working days prior to end of construction
Water Discharge Quality	There is a projected increase in BOD load due to sanitary discharges.	GMCAC will meet with MCIAA to discuss operational efficiency of the STP	GMCAC PCO	Semiannual (Initial meeting to start 90days after initial financial close)
Solid Wastes	There is a projected increase in the quantity of solid wastes with an increase in the number of passengers entering and leaving the airport.	Ensure efficiency and capacity of the private hauler to segregate, recycle, and dispose solid wastes. Promote the 3-R (reuse, reduce, and recycle) concept within the airport.	GMCAC PCO and 3rd Party Hauler	15 working days prior to end of construction and monthly monitoring throughout

Key Environmental & Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures	Responsible Party	Time line
Biodiversity	It is expected that the airport will have a low biodiversity value since it is considered a built environment. With the airport expansion, biodiversity may be affected if no mitigating measures will be put in place.	GMCAC and MCIAA will develop a long-term sustainable biodiversity plan that is compatible with the airport operational constraints and commercial development.	GMCAC and MCIAA	60 working days prior to end of construction
Energy Use	There is a projected increase in the energy demand with an increase in the number of passengers entering and leaving the airport.	GMCAC will strive to commit to the principles of sustainable development by minimizing the environmental impacts of its daily operations through reduction of its overall energy consumption. GMCAC will apply for a LEED (Leadership in Energy and Environmental Design) Silver Certification Rating and monitor the reduction in the carbon footprint during operations.	GMCAC (Top Management)	Started at engineering design phase
Labor	There is an expected increase in labor force with the airport expansion.	GMCAC to comply with national labor laws, will give hiring priority to qualified local residents.	GMCAC (HR Department)	60 working days before operation
Labor restructuring resulting from the handing over of the Terminal operations	The wide gap in male-female employees' ratio under the MCIAA operation is now greatly reduced with GMCAC's "equal opportunity" policy, i.e. percentage of female employees increased from 20% to 42%.	GMCAC to conduct appropriate trainings to increase the female employees' capability to handle their assigned tasks if required in the new operational set-up required.	GMCAC	30 working days before operation
Public Health and Safety	Airport facilities that cater specifically to the needs of women, elderly, and disabled persons may not be sufficient enough to address them with the expected increase in the number of passengers. The increase in tourist influx may	GMCAC will implement design features that will cater to the needs of women and disabled including separate toilet facilities for women and disabled people, baby changing and breast feeding rooms, rest area suitable for persons with disability, separate security checks for women, among others. GMCAC, in collaboration with the relevant government	GMCAC HSO	30 working days before construction for the design features Semi-annual for

Key Environmental & Social Aspects	Impact Assessment	Mitigation/Beneficial/Measures	Responsible Party	Time line
	result to specific activities that may compromise their health and other people's well-being. There will be an increase in risk to public safety with more passengers entering the airport.	agencies, will organize orientation and training programs on specialized topics such as HIV/AIDS awareness and anti-trafficking of women and children among airport personnel especially those who are assigned to ground terminal operations. Safety management manual to be constantly updated and strictly implemented.		the conduct of training and for the updating of the safety management manual.
Occupational Health and Safety	Improper handling and segregation of fuel containers may increase fire and explosion risks.	Health and Safety Policies will be developed and practiced regularly Training on Health and Safety will be provided to workers. Fire Fighting Plan will be developed as early as the engineering design to mitigate fire hazards	GMCAC HSO	Policies will be in place 60 days prior to Operations. Staff training will be given 15 days prior to his/her start of work.
Traffic Management	There will be an increased road usage coming from passengers vehicles.	Traffic management plan, in coordination with the City Traffic Management System, to be implemented to alleviate traffic volume.	GMCAC	30 working days before operation

Table 10-2
Environmental Monitoring Plan

Key Environmental & Social Aspects	Impact Assessment	Parameters	Sampling Station	Methodology	Responsible Party	Frequency
CONSTRUCTION PHASE[47]						
Solid Waste Management	Construction and hazardous wastes will accumulate through time. Improper use, handling and storage may result to health and environmental risks.	Solid Waste (construction and hazardous)	Areas designated as collection points for materials recovery and storage of hazardous materials and wastes	Visual inspection of the segregation scheme	GMCAC PCO, Contractor	Weekly
Air Quality	Emissions from construction equipment and vehicles as well as the increase in airborne dust from vehicles passing dry and windy areas and demolition activities may be harmful to health and the environment.	Emissions from construction vehicles Dust	Construction site	Visual inspection	GMCAC PCO, Contractor	Weekly
Noise from construction equipment and vehicles	Movement of heavy equipment and delivery of construction materials may increase the ambient noise.	Noise levels (dBA) from construction equipment and vehicles	Construction site and residential areas within the construction traffic route	Noise monitoring at 4 time periods as specified in NPC MC002	GMCAC PCO, Contractor	Monthly
Surface Run-off	Sediments from construction site after a heavy rainfall event,	Turbidity	Stormwater drain near construction	Visual inspection	GMCAC PCO,	After a heavy

[47]To be updated by the Contractor and the GMCAC PCO prior to and throughout the construction phase as required.

Key Environmental & Social Aspects	Impact Assessment	Parameters	Sampling Station	Methodology	Responsible Party	Frequency
	may be transported via surface water runoff		site,		Contractor	rainfall event
Labor	About 300-400 workers are expected to be employed. Influx of workers from other towns/provinces may increase incidence of STDs/AIDs	Hiring plan (to prioritize qualified local residents) Conduct of seminar awareness/trainings on HIV/AIDS/STD	Construction site and office	Compliance with national labor laws, hiring plan, and seminar awareness/ training plan	GMCAC Human Resources (HR) Department, Contractor	Monthly
Occupational Health and Safety	Unsafe activities and improper use of tools and equipment may result to accidents. Workers will be exposed to high noise, vibrations, air pollution, and risks from fire, explosion, or chemical spillage.	Wearing of Personal Protective Equipment (PPE) Knowledge of Health and Safety Management Plan	Construction site	Visual Inspection and Worker's Training Log	GMCAC Health and Safety Officer (HSO), Contractor	Weekly
Traffic Management	Delivery of construction materials will cause a short-term increase in road traffic, heavy vehicles passing by road lanes beyond load limit may have the potential to damage road infrastructures.	Schedule of delivery of construction materials Traffic signs	Lapu-Lapu Airport Road	Traffic Management Plan in coordination with the City Traffic Management System and the City Engineer's Office	GMCAC Construction Engineer, Contractor	Weekly
OPERATIONAL PHASE[48]						

[48]To be updated by the GMCAC PCO during operational phase as required.

Key Environmental & Social Aspects	Impact Assessment	Parameters	Sampling Station	Methodology	Responsible Party	Frequency
Solid Waste Management	With the increase in the number of passengers, higher quantity of domestic and hazardous wastes is expected. Improper disposal may result harm to health and the environment.	Solid Waste Disposal (domestic and hazardous) Proper Segregation	Areas designated as collection points for materials recovery and storage of hazardous materials and wastes	Tracking of 3rd Party Hauler Contractual Schedule Visual Inspection	GMCAC PCO	Weekly
Air Quality	Emissions from passenger vehicles can be harmful to health and the environment. Un-vegetated areas may increase the ambient TSP.	TSP, CO, NO_2, SO_2, PM_{10} and $PM_{2.5}$	Lapu-Lapu Airport Road: ▪ Barangay Ibo ▪ Barangay Pusok	Procedures specified in the DENR Administrative Order (DAO) 2000-81	GMCAC PCO	Annual
Noise	Most noise emissions will be coming from the take-off and landing of aircrafts at the runway and will further increase with the projected growth in aircraft flights. Ground service equipment (GSE), auxiliary power units (APU), and landside vehicles will all also contribute to the ground noise of the airport.	DNL Noise Level (dBA)	Ends of the Runway (for model calibration) ▪ RWY 22 (EMD, Brgy Buaya) ▪ RWY 04 (STEC, Brgy Basak) Communities near the Mid-sections of the Runway ▪ Barangay Pusok ▪ Barangay Bankal	DNL values to be compared with US FAR 150 Guideline, Leq values (at 4 time zones) will be compared with NPC MC002.	MCIAA (Not in the scope of GMCAC)	Semi-annual (peak and off-peak seasons during the change in prevailing wind directions)

Key Environmental & Social Aspects	Impact Assessment	Parameters	Sampling Station	Methodology	Responsible Party	Frequency
Water Supply	There is a projected increase in water demand that might be a source of water competition.	Water conservation measures	Passenger terminal buildings	Measurement of Water Consumption	GMCAC Facilities Management Office	Monthly
Water Quality (STP Discharge)	There is a projected increase in BOD load due to sanitary discharges.	DO, BOD, COD, TSS, TN, TP, pH	Barangay Ibo (Discharge point leading to Mactan Bay)	Procedures specified in DAO 2008-XX (Water Quality Guidelines & General Effluent Standards) Effluent Data Collection from MCIAA which will be reported to ADB semi-annually.	MCIAA (Pollution Control Officer)	Monthly
Biodiversity	Low biodiversity value as the airport is considered a built environment. With the expansion, biodiversity may be affected if no mitigating measures will be put in place.	Vegetation cover Long term sustainable biodiversity plan	Designated landscaped areas	Visual inspection	GMCAC and MCIAA	Annual
Energy Use	There is a projected increase in the energy demand with an increase in the number of passengers entering and leaving the airport.	LEED Silver Rating-Energy conservation measures	Terminal 2	Measurement of Energy Consumption	GMCAC Facilities Management Office	Annual

Key Environmental & Social Aspects	Impact Assessment	Parameters	Sampling Station	Methodology	Responsible Party	Frequency
Labor	There is an expected increase in labor force with the airport expansion.	Hiring plan (to reflect "equal opportunity" policy and priority to qualified local residents)	GMCAC Offices	Compliance with national labor laws, hiring plan, employment contracts, and training plan	GMCAC HR Manager	Semi-annual
Public Health and Safety	With the expected increase in the number of passengers, needs of women, elderly, and disabled persons may not be well addressed. Increase in tourist influx may result to occasions that may compromise their health and other people's well-being. There will be an increase in risk to public safety with more passengers entering the airport.	Ability to address special needs of women, elderly, and disabled persons Training on sensitive issues such as HIV/AIDS/STD awareness and anti-trafficking of women and children Updating of Safety Management Manual to address safety risks in the airport	Passenger Terminal Buildings	Compliance of the Special Passenger Services Program to address the special passenger needs of women, elderly, and disabled persons. Compliance of the Airport Training Program to address sensitive health issues and anti-trafficking of women & children Review of updates and implementation of the Safety Management Manual	GMCAC (Passenger Service Center, HR Manager, Safety Manager)	Semi-annual
Occupational Health and Safety	Improper handling and segregation of fuel containers may increase fire and explosion	Wearing of Personal Protective Equipment (PPE)	Passenger Terminal Buildings and airport vicinity	Visual Inspection	GMCAC Health and Safety	Weekly (during maintenance

Key Environmental & Social Aspects	Impact Assessment	Parameters	Sampling Station	Methodology	Responsible Party	Frequency
	risks.	Knowledge of Health and Safety Management Plan			Officer (HSO), Contractor	and repair)
Traffic Management	There will be an increased road usage coming from passengers vehicles.	Implementation of Traffic Management Plan in coordination with the City Traffic Management System Presence of Traffic Signs	Lapu-Lapu Airport Road	Compliance with the Traffic Management Plan	GMCAC	Quarterly

11 Preliminary Information, Education and Communication (IEC) Plan

At present, the Project has no existing IEC Plan. A preliminary IEC plan is developed as part of this IEE. In the IEC plan, target sectors were identified with corresponding areas of concern. Most of the areas of concerns were determined during the consultation meetings. The IEC is designed to enhance the stakeholders' awareness pertaining to the proposed Project. The IEC plan also includes recommendations for IEC strategies, medium of information dissemination, timelines and frequency of IEC, indicative expenses, and source of funding. **Table 11-1** summarizes the proposed preliminary IEC plan.

12. Indicative Social Development Plan (SDP)

An indicative social development plan was prepared as an initial step in establishing a full Social Development Plan. In this plan, the concerns of each identified beneficiary will be addressed by assigned task proponent, supported by certain concerned government or non-government agencies. Source of funds for the SDP shall be from the LGU/IRA.

Table 12-1 summarizes the indicative social development plan for the proposed Project.

13. Institutional Plan for Environmental and Social Monitoring Implementation

GMCAC shall closely coordinate with the EMB Central Office and EMB Region VII. For an effective coordination, the proponent shall designate an Environmental Officer who shall be responsible for all environmental matters regarding the project. This is in compliance with DAO 26, Series of 1996 that requires the appointment/designation of an Environmental Officer.
Specifically, the following are the responsibilities of the Environmental Officer:

- Coordinate with EMB on the environmental aspects of the pre-construction, construction and operation activities of the project.
- Monitor and maintain records of the potential effects of the facility installed and other information for the project.
- Monitor all activities relative to compliance with the conditions stipulated in the Environmental Compliance Certificate (ECC) and Environmental Management Plan

Since noise impact is a major impact from the airport project, GMCAC will in general follow the Philippine Noise Regulations. Upon enactment of the Bill on Aviation Noise Limit, MCIAA will be required to take part in the development of medium-term plan to reduce the number of individuals residing in areas within the vicinity of the airport who are exposed to yearly DNL of 60 dBA.

ADB will provide a TA (Technical advisory and financial assistance) to ensure that the MCIA will have sufficient technical capabilities and resources to address the potential increase in noise levels within the project area.

Table 11-1
Preliminary INFORMATION, EDUCATION AND COMMUNICATION (IEC) PLAN

Target Sector Identified as Needing Project IEC	Major Topic/s of Concern in Relation to Project	IEC Scheme/ Strategy Method	Information Medium	Indicative Timelines/ Frequency	Indicative Expenses	Source of Funding
1.LGU of Lapu-Lapu City; (City Planning and Development Council, Tourism Council)	1. General project orientation 2. Project implementation status 3. Project Impacts and Benefits 4. Roles & Responsibilities of concerned agencies in the implementation of the project 5. Social development program (CSR) 6. Job opportunities during construction and operating stages of the project	- Meeting with local officials - GMCAC Information/ and Inquiry Desk	- Handouts - Audio-Visual Presentations	Prior to start of project construction; Construction, and Operation phases	Supplies/ Communication Cost Design/Layout/ Printing costs Publication costs	GMCAC
2.Barangay leaders and residents from Bankal, Buaya, Basak;	1. Project status. 2. Project Impacts and Benefits 3.Social Development Program (CSR) 4. Job opportunities during construction and operating stages of the project	-Barangay assemblies	-Hand-outs -Audio Visual presentations	Prior to start of project construction/ once in two months until CSR Program/ Plan is developed	FGD logistics	GMCAC
3.Business sector representatives from Lapu-Lapu City	1.Potential business gains 2.Roles and responsibilities of concerned business operators in the implementation of the project 3.Investment potentials	GMCAC Information/ Inquiry Desk	Hand-outs	during construction and during project operation	Printing and publication costs	GMCAC
4.Women's groups and local entrepreneurs from Bankal, Buaya,	Social Development Program (CSR) Small-scale business opportunities	FGD; Barangay assemblies	-Hand-outs -Audio visual presentation	Prior to start of project construction	FGD expenses like food and venue; Printing costs	GMCAC

Target Sector Identified as Needing Project IEC	Major Topic/s of Concern in Relation to Project	IEC Scheme/ Strategy Method	Information Medium	Indicative Timelines/ Frequency	Indicative Expenses	Source of Funding
Basak						
5.MCIAA employees to be affected by the project	Scope of GMCAC operations in MCIA	Office assemblies within MCIAA	Posters; Bulletin Boards; Audio visual presentation			GMCAC
6.GMCAC employees	HR Policies such as those consistent with ILO core labor standards (Safety Management; Employee benefits and responsibilities; Position/job description and salary scales; policies and procedures for promotion)	Orientation meetings with individual employees	Posters Bulletin Boards Audio-Visual Presentations Employees' Handbook Memorandum circulars or staff directives.			GMCAC

Table 12-1
Indicative Social Development Framework/ Corporate Social Responsibility

CONCERN	Government Agency/ Non-government Agency and Services	PROPONENT	Indicative Timeline	Source of Funds
Support services for the tourism sector in Lapu-Lapu City in particular, and Cebu Province in general. Potential support areas: 1) Promotion of Cebu cultural heritage. Initial discussion with Lapu-Lapu City Tourism Office indicated their much needed support for the management and maintenance of Mactan Shrine.	City and Provincial Tourism Council	Lapu-Lapu City Tourism Office (Mr. Hembler Mendoza)	During project construction phase, hold coordination meetings with City Tourism Office for potential CSR planning.	GMCAC
2) Facilitation of training program with tourist transport operators to facilitate safe and easy access of tourist transport requirement	City Tourism Council; Local tourist transport operators	Local Tourist Transport Operators	During project construction phase, hold consultation meetings with City Tourism Office and representatives of Local Tourist Transport Operators to develop appropriate training program.	GMCAC
3) Capability upgrading of hotel management operations particularly in Lapu-Lapu City	City Tourism Council; Local hotel operators	Local Hotel Operators	During construction phase, hold consultation meetings with City Tourism Office and representatives of Local hotel operators to develop	GMCAC

			appropriate training program.	
4) Social development project(s) in Bankal, Buaya, Basak, Pajo, Pusok, Pajac, and Ibo	Relevant government agency	Bankal, Buaya, Basak, Pajo, Pusok, Pajac, and Ibo barangay officials; homeowners associations, women and youth groups	Construction and operations phase	Govt. Agency

GMCAC will conduct follow-up consultations with various stakeholders including nearby communities to prepare the Social Development Plan for implementation during the construction and operations phases. GMCAC may update the SDP on an annual basis.

14. Grievance Redress Mechanism (GRM)

GMCAC has established its Grievance Management Policy contained in the Human Resources Policy Manual (**Annex 7**). Specifically, it applies to individual employee's grievances and complaints which are primarily a manifestation of dissatisfaction about working conditions and managerial decisions, that, if not promptly addressed may affect morale and productivity.

Such grievances for the purpose of this Policy cover only the following:

- Interpersonal Conflicts/Issues with the Superior or team members
- Payment of Salary
- Recovery of dues etc.
- Working Conditions/ Health and Safety
- Leave and Attendance
- Medical Insurance/ Facilities
- Non- extension of benefits under rules
- Transfer
- Field management support related Issues (telephone, mobile, transport, food, guesthouse etc.).
- HR Policy Administration
- Loan Administration

The procedures for addressing the above grievances are laid out in three stages as described in **Annex 7**.

However, there is a need for GMCAC to establish a Grievance Redress Mechanism to cater to grievances and complaints that are directly related to the project cycle in its various stages. Although the safeguard policies are not triggered by the project, it is likely that some environmental impacts like noise and dust pollution, among others, may trigger complaints from nearby settlements even if they are located outside of the airport boundaries.

The following benefits based on good international practice and as recommended by ADB, justify the need for an internal GRM for GMCAC.

Benefits to Project

- Provides information about project implementation
- Provides an avenue to comply with government policies
- Provides a forum for resolving grievances and disputes at the lowest level
- Resolves disputes relatively quickly before they escalate to an unmanageable level
- Facilitates effective communication between the project and affected persons
- Helps win the trust and confidence of community members in the project and creates productive
- relationships between the parties
- Mitigates or prevents adverse impacts of the project on communities and produces appropriate corrective or preventive action
- Helps avoid project delays and cost increases, and improves quality of work

Benefits to Affected Persons and Other Stakeholders

- Provides a cost-effective method to report their grievances and complaints
- Establishes a forum and a structure to report their grievances with dignity, and access to a fair hearing and remedy
- Provides access to negotiate and influence decisions and policies of the project that might adversely affect them
- Facilitates access to information

In order to address external grievances and complaints, a typical Grievance Redress Mechanism is therefore proposed to GMCAC, which can be modified appropriately as needed. The GRM implementing unit within GMCAC shall be a Grievance Redress Committee (GRC). The GRC shall be composed of GMCAC officers and technical staff, and MCIAA officer-representative.

Grievance Redress Committee Procedures and Time Frame:

1. Written complaints from individuals, groups or institutions are filed with the GRC.
2. GRC holds discussion meeting within two weeks from receipt of complaint.
   - GRC verifies documents.
   - GRC conducts field inspections to verify the authenticity and eligibility of the grievance reported.
3. GRC holds discussion meeting with parties involved.
4. GRC and parties involved arrive at a solution within two weeks after discussion meeting.
5. GRC implements the solution agreed upon.

In cases where no solution is mutually agreed upon by GRC and parties involved, the project may seek assistance from the City Government's Justice Department to provide a special mediation board independent of the project implementers, that can provide a voluntary process that uses well-trained mediators to assist disputing parties to reach an acceptable settlement.

Prior to start of construction, GMCAC will appoint the following office/unit [name of office or staff] to receive grievances and ensure the efficient and effective functioning of the grievance redress committee.