Rahabilitation of Brgy. Little Panay- Katipunan-Kasilak to Farm Market Road in Panabo City

Panabo City, Davao del Norte
April 2014

CHAPTER 1 INTRODUCTION

1.1 PROJECT BACKGROUND

The subproject covers the three barangays namely Barangays Little Panay, Katipunan and Kasilak. These three (3) barangays has attained a technical assistance grant from the Local Government unit of Panabo and Department of Agriculture through Mindanao Rural Development Program (MRDP), a poverty-reduction program for the rural poor, women and indigenous communities in mindanao which is funded largely through a World Bank loan. The proposed subproject has a full stretch of 8.002 Km. starting from Purok 3, Purok 5 of Barangay Little Panay passing Purok 4 to San Miguel of Barangay Katipunan and will end at Purok 3-B of Barangay Kasilak. The road influences the entire area of the subproject barangays that has a total of 2,382 hectares. Rehabilitation of the farm to market road from barangay Little Panay to purok 4 barangay Kasilak play a significant role in rural and agricultural development in such a way that will make the areas and its immediate environs into a more usable and will achieve its maximum potential in terms of agricultural production. Although not all residents utilized this road at present but with the rehabilitation of access, the constituents of the subproject barangays and its neighbors will benefit directly or indirectly with it. This will cause the alteration particularly of its increase in land valuation, increase revenues and farmers' income at least 25% starting year 2013.

1.2 IEE PROCESS DOCUMENTATION

The project will undergo the Environmental Impact Statement System as contained and mandated through Presidential Decree No. 1586. Pursuant to the provisions of this Decree, all development projects planned by any government agency or instrumentality, private corporation, firms, individuals or other entities which fall within the definitions of an Environmentally Critical Project or to be located within an Environmentally Critical Area, are required to secure an Environmental Compliance Certificate (ECC) prior to implementation.

1.3 IEE METHODOLOGY

The IEE methodology undertaken was in consonance with the provisions of the DAO 96-37. Scoping was conducted once. Baseline information was gathered through primary data gathering for air and desk surveys (secondary data gathering) coupled with site inspection and walk-through the proposed FMR.

Formulation of the mitigation measures were undertaken through discussions with the IEE students and proponents.

The formulated mitigation measures were incorporated in an over-all environmental management plan (EMP) which shall be implemented by the proponent and will become the basis of the EMB for subsequent compliance monitoring and environmental audits

1.3.2 IEE Study Schedule

The IEE study proper was proposed to start on April 2014.

CHAPTER 2 PROJECT DESCRIPTION

2.1 PROJECT RATIONALE

The subproject covers barangays Little Panay, Katipunan and Kasilak. The situation of each barangay differs due to varied conditions that they contain such as topography, soil condition, presence of bodies of water and others. There are some aspects they commonly share particularly in road problems and its corresponding consequences.

The existing road to be rehabilitated is generally in bad condition. There are segments that are gravelled road but are affected by constant use without regular maintenance. These conditions resulted to the formation of multiple depressions with stagnant water during rainy days. There is increase in dust generation during consecutive sunny days. Some segments have surface conditions characterized as earth roads. Most parts of earth roads are muddy and slippery during rainy days and have deep potholes that can hold water. These are dangerous situations and could lead to vehicular accidents.

There are two creeks situated in this roadway but are located in different segments. One creek is located in Barangay Katipunan and the other is in barangay Kasilak. The existing old culverts installed long before in these creeks were already destroyed and are not anymore functional. These conditions made the said road junctions to be impassable all year round.

There are portions in some segments of this roadway that have steep slopes that are also not passable anytime of the year. These are aggravated by soil erosion through rain pressure and force caused by constant passing of carabao with sledge loaded with farm products. As a consequence of the described difficult road, the affected residents particularly farmers were indeed in a state of dilemma. Transports of farm products, farm inputs and other basic goods impose high cost of hauling and passenger fee. Some farmers utilize an alternate route which is short cut but will pass through Lasang River. They will load their

farm cargos on a water craft made of bamboo. During sudden heavy rain downpour the water current will become strong and water depth will increase. These are threats to the lives of the farmers, the quality of their products and purchased goods.

Farm productions of some farmers are affected and their yields and income are low. This is an outcome of no capital and unaffordable costs of farm inputs and other requirements. Food shortage and indebtedness to lenders with high interest rates are rampant. There are farmers that have good harvests but their production costs are high contributed by escalating price of farm inputs and high hauling cost. Another contributing factor is the losses due to damage of produce while in transit.

The whole things that are occurring in the aforementioned situations and the chain reactions that are arising are attributed to the bad road settings of the three subproject barangays.Hence, the rehabilitation of the existing road and its corresponding segments that connect barangays Little Panay, Katipunan and Kasilak is essential to help them in their plight.

Like the other barangays of Panabo City, Little Panay, Katipunan and Kasilak are blessed with natural resources and favorable weather condition for agricultural production. The soils are fertile and these barangays are among the barangays identified by the City Agriculture Office as most suitable for diversified cropping

There are still 30 hectares idle lands found in barangay Katipunan which are available for agricultural expansions and the areas near creeks can be developed as fishponds.

Agricultural facilities were constructed by the Department of Agriculture in partnership with the City of Panabo. The three subproject barangays are recipients of nine units Multi-Purpose Drying Pavement and five units of farm tractors.

These subproject barangays have stable peace and order situation. The residents are peace loving and responsive to the call for emergency situations. They are receptive to new and modern technologies especially in the field of agriculture. They are active in community involvements particularly in religious, social, environmental and economic endeavours.

The proposed rehabilitation of the farm to market road from barangay Little Panay to purok 4 barangay Kasilak will make the areas and its immediate environs into a more usable and will achieve its maximum potential in terms of agricultural production. Integrated farming

systems like coconut based, livestock and poultry can already be employed particularly in the grasslands.

Farmers will already reside near their farm due to accessibility of basic services and in transporting of their basic goods as well as farm inputs. They can already be closely monitored by concerned government agencies as well as advised whichever necessary operations that are required in order to obtain maximum yield.

Transporting of the products from their farms to the nearest trading points will not anymore be a contributory factor for low profitability. Farm rejects which are caused by bruises of perishable products will be minimized. Hauling cost will be lessened and travel time will be shortened.

2.2 OBJECTIVES

General Objectives

The proposed rehabilitation of farm to market road will lead to the increase in agricultural production and increase in farmers' income by at least 25%.

Specific Objectives:

a. Mass concentration of residential areas along the rehabilitated road and even within the farms.
b. Basic services will be delivered to the subproject areas.
c. Conversion of farming system from traditional to advance and modern way.
d. Cultivation of grassland and idle lands.
e. Increased production of agricultural commodities planted in the area due to access in technology and credit.
f. Lessen damage of agricultural products during transport.
g. Lessen hauling fee and passengers' fee
h. Increased farmers' profit from agricultural products due to timely delivery and reduced travel time.
i. Increased land valuation.
j. Reduced rate of vehicular accidents

2.3 PROJECT LOCATION

The proposed subproject has a full stretch of 8.002 kilometers starting from purok 3-purok 5 of barangay Little Panay passing purok 4 to San Miguel of barangay Katipunan and will end at purok 3-B of barangay Kasilak. Figure 1 below shows the location of the propose site.

2.4 PROJECT INFORMATION

A. Demand-Supply Situation

a.1 Existing Roads, Bridges and Transport System in the Area

Existing Roads of Barangay Little Panay

Road Type	**Road classification in (kms)**						**Total**	
	Gravel		Earth		Concrete			
	Passable	Not Passable	Passable	Not passable	Passable	Not passable	Passable	Not Passable
Brgy.FMR	3.59	1.5					3.59	1.5
City	3.0						3.0	
Provincial								
National								

Source; City Engineering Office Inventory of roads 2008-2009

Barangay Little Panay has 11 barangay roads with a total of 5.09 kilometers of which 3.59 kilometers are passable and 1.5 kilometers are not passable by four wheeled vehicles during inclement weather. Its city roads totaled to three kilometers which are all passable all year round.

Existing Roads of Barangay Katipunan

Road Type	**Road classification in (kms)**						**Total**	
	Gravel		Earth		Concrete			
	Passable	Not Passable	Passable	Not Passable	Passable	Not Passable	Passable	Not Passable
Brgy/FMR		7.0						70
City	5.0						5.0	
Provincial								
National								

Source: City Engineering Office-Inventory of roads 2008-2009

Total length of the barangay roads of Katipunan is seven kilometers .These barangay roads are distributed to different areas of the barangay. Four kilometers is in San Miguel, twokilometers is from purok six to Matignao and one kilometer from purok one to Senajon Road. The city roads have a total length of five kilometers. These are going to Lasang of Davao City and barangay Malativas.

Existing Roads of Barangay Kasilak

Road Type	**Road classification in (kms)**						**Total**	
	Gravel		Earth		Concrete			
	Passable	Not Passable	Passable	Not Passable	Passable	Not Passable	Passable	Not Passable
Brgy/FMR	1.5	6.5					1,5	6.5
City	6.0						6.0	
Provincial								
National								

Source: City Engineering Office-Inventory of roads 2008-2009

The table shows that there are 6.5 kilometers barangay roads of Kasilak which are passable and 1.5 kilometer barangay roads which are not passable. The city road has a total stretch of sixkilometers which is passable all year round.

B. Analysis of Road and Transport System (Without and with road improvement)

B.1 Without road construction

At present, the proposed area is not accessible due to the bad condition of road network. The condition does not warrant the transport of products to the trading points during rainy days. The nearest trading point is in the centers of barangays Little Panay, Katipunan and Kasilak. The major market is in Panacan, Davao City and in public market of Panabo City.

B.2 Availability of Public Transport Vehicles in the Project Area (origin to destination)

The only available public transport vehicle in the project area that can pass directly from Purok 3-5 of barangay Little Panay, to purok 4- San Miguel that will end topurok 3-B of barangay Kasilak is the motorcycle (habal-habal) on a **pakyaw** basis. Another way of direct transport is through carabao with sledge and through manual hauling by individuals near the subproject area.

B.3 Seasonal Impassability of the Road Site

During the rainy season the road is impassable however; despite from the worst condition of the road, during good weather condition the road will be accessible by motorcycles (habal-habal) and trucks transporting banana and other products in the area.

B.4 Alternate/Diversion Routes Used Within the Project Area and Their Conditions

One of the alternate routes used within the project area from Brgy. Kasilak to Brgy. Little Panay is the Malativas-Little Panay road. This is a city road with a gravelled condition at a distance of 12 kilometers. There are foot trails which can be used to serve the purpose along the traversed of the proposed road. There is also another alternate route in purok 4 barangay Katipunan and will traverse the Lasang River using water raft made of bamboo going to a nearby barangay which is barangay Malitbog .

B.5 Availability of Other Modes of Transport Which Tend to Compete with the Road Under Construction

Carabao with sledge can still be used in transporting products even if construction is going on. Water raft can also serve as alternative mode of transport passing through Lasang River towards purok 5 barangay Malitbog.

B.6 Existing Modes of Transport and Hauling Passenger and Cargo

Carabao with sledge is one of the existing modes of transport for cargo but water raft is used by some farmers for hauling of passengers and cargos. There are others who utilized single motorcycle “habal-habal” in hauling of their products as well.

B.7 Current Trip Volumes, Destinations, Travel Times, Volume/Capacity Ratios

The current trip volumes per day, origin & destinations, travel time and load capacity are shown below in matrix form.

Place of Origin	Existing Mode of Transport	No. of Units Based in the Brgy.	Load Capacity	Trip Volumes	Travel Time (minutes)	Place of Destination
Little Panay	Tricycle	1	7 persons	8	30	Brgy-Panabo
	Motorcycle	20	2 persons	200	25	Brgy-Panabo
Katipunan	Tricycle (center car)	3	10 persons	12	45	Brgy-Panabo
	Tricycle (side car)	3	7 persons	12	50	Brgy-Panabo
	Motorcycle	50	2 persons	600	35	Brgy-Panabo
Kasilak	Multicab	10	20 persons	40	45	Brgy-Panabo
	Motorcycle	10	2 persons	160	30	Brgy-Panabo

Source: Interview with key informants

B.8 Analysis of How the Proposed Road Facility Will Close the Gap in Infrastructure Development within the Area in Terms of Generated, Induced and Diverted Traffic

The proposed road rehabilitation facility will divert traffic from the other existing roads in the subproject barangays to its site particularly from Brgy. Kasilak to Brgy.Little Panay to City proper.

B.8.1 <u>With road construction</u>

The presence of rehabilitated access road in the subproject barangays will mean a lot of improvements to the constituents. These barangays will already be accessible for basic services from different government agencies and transport of products from the farm to

nearest trading points which is the center of the barangay or even to the major markets which are Panacan, Davao City and Panabo public market.

Due to this rehabilitated access road there will be influx of public transport vehicles, more trip volumes, shorten travel time which will result to lower hauling fee and passenger fee. In consideration also of the rehabilitation works of the KasilakBridge ,the proposed project will be utilized as a diversion road of all vehicles of the banana plantation traversing the Kasilak Bridge bound to Southern Barangays and to City proper.Increase in land valuation will also be a result of this subproject which in turn adds to the revenue of the concerned barangays as well as the concerned LGU.

B.8.2 Technical Analysis

B.8.2.1 Existing road alignment describing the route, start and terminal points, surface condition, length, major population centers, traversed, road influence area (RIA) and terrain.

The road where the subproject is proposed has a portion with deep slope, some with rolling and undulating areas where there are up hills, down hills and with sharp curves. There is presence of deep potholes with stagnant water especially the areas near the fish pond. The culvert which was installed long before near the pond was already destroyed. The portion with steep slope is an earth road which is very risky and prone to accident. There is small portion of the road segment approximately 30 meters located at barangay Kasilak which is waterlogged and very hard to pass. The production areas of different crops such as coconut, banana, fruit trees, vegetables and other crops are found along this road. Some species of full grown trees can also be found.

The proposed subproject has a full stretch of 8.002 kilometers starting from purok 3-purok 5 of barangay Little Panay passing purok 4 to San Miguel of barangay Katipunan and will end at purok 3-B of barangay Kasilak.

The road influence in the entire area of the subproject barangays has a total of 2,382 hectares. Although not all residents utilize this road at present but with the rehabilitation of access road, the constituents of the subproject barangays and its neighbor will benefit directly or indirectly with it. This will cause the alteration particularly of its increase in land valuation and increase in revenues. The terrain of the direct influence area varies from 0.30% and even reached up to 50% slope.

B.8.2.2 Description and Location/Site of Existing Structures and their Current Physical Condition

The existing road of Little Panay through Katipunan to Kasilak has total length of 8.002 kilometers. At present there are portions that are waterlogged muddy and slippery during rainy days. The roads identified are not all passable directly to ingress and egress; however these roads were being utilized of the barangay folks bound to the city proper and nearby barangays. There are segments that are passable but route is interrupted by impassable segments.

B.9 Design and Analysis of Proposed Works

B.9.1 Description of proposed subproject

B.9.1.1 Road Alignment

The rehabilitation of the FMR will follow the existing road alignment and canal routes of Barangay Little Panay, Katipunan and Kasilak.

B.9.1.2 Terminal Points

The road to be rehabilitated will start at Sta. 0+000 of Purok 3 Little Panay that will traverse portion of the land of Barangay Katipunan at Purok 4 and Purok San Miguel and will end at Sta.8+002 at Purok 3-B of Barangay Kasilak.

B.9.1.3 Road Length

It covers a total of 8.002 kilometers starting from Purok 3 of Barangay Little Panay connected by Purok 4 and Purok San Miguel of Barangay Katipunan going to Purok 3-B of Barangay Kasilak with 8.002 kilometers of PCC pavement road.

B.9.1.4 Minimum and Maximum Side Slopes for Cuts and Fills

Since the FMR subproject passes through some high terrain, the highest elevation road gradient adopted the design based on DPWH standard. However, in some portion where deep cut is necessary, widening is adopted in the design in reference to DPWH standard that is 2:1 meter horizontal and vertical ratio of relative slope in order to avoid sever disturbance of side slopes.

B.9.1.5 Height of Embankment

Per engineering design the maximum height of embankment is 1.83 meters depending on the natural grade line and desired elevation, while the maximum high of excavation is 3.77 meters.

B.9.1.6 Right of Way

The right of way of the road is 10 meters including carriage way and canal routes which are covered by deed of donations by land owners.

B.9.1.6 Direct and Indirect RIA

The direct road influence areas of the road are the lands that falls within the jurisdiction of Purok 3 and Purok 5 of Little Panay traversing the two puroks also of Katipunan bound to Purok 3-B of Kasilak. The total direct road influence area is 359 hectares and the total indirect road influence area is almost 2,023 hectares.

B.9.1.7 Location of Critical Structures

Considered as the critical structure of the subproject is the location of RCPC with a diameter ranging from 36 inches to 60 inches located at stations 0+180, 3+954.12, 4+091.36, 6+545.43, 6+571.65, 6+608.43 and 6+913.

B.9.1.8 Location of Proposed PCCP

Base from the guidelines of MRDP on the spot concreting of the proposed subproject: Sta.0+000 to Sta. 0+600 and Sta. 6+900 to Sta. 8+002 are identified as populated area considering that this stations are the barangay centers of Little Panay and Kasilak. Located in this Purok are the elementary and secondary schools, barangay hall and health center. For Sta. 2+200 to Sta. 2+800 and Sta. 3+900 to Sta. 4+300 these areas are proposed for PCCP in consideration of the banana and mango plantation and the presence of the packing houses within the area as shown on the geo tag photos attached.

The portion of the proposed road that have a slope ranging from 9.0% to 14.3%is also proposed for concreting located at Sta. 5+820 to Sta. 6+680. Along this stations are consider as critical areas where RCPC structure are alsoprovided.

B.9.1.9 Major Road to which the Subproject FMR will Connect

The road connects to the all-weather section of a city road and barangay road of Barangay Little Panay traverse by an old Japanese road of Barangay Katipunan and connect to the city road of Barangay Kasilak.

B. 10 Design Analysis of Major and Minor Structures Including Drainage Crossing for Waterways Traversed by the Road

In the whole stretch of the FMR subproject the major structures considers is the PCCP with a total length of 3.362 kilometers which are provided in consideration of the MRDP guidelines on population density and traffic volume. Minor structures in drainage crossing are installed at a total length of the 70 linear meters of 36, 48 and 60 inches diameter reinforced concrete pipe culvert (RCPC) to be installed in stations 0+180, 3+954.12, 4+091.36, 6+545.43, 6+571.65, 6+608.43 and 6+913.

B.11 Proposed Sources and Locations of Quarries, Borrow Pits and Construction Materials

B.11.1Relative Distance of Quarry and Construction to Project Site

The source of the aggregate sub-base course (item 200) and aggregate base course (item 201) is in Indangan quarry in Davao City which is about 25 kilometers from the construction site. Construction materials can be bought from Panabo City with a relative distance varies to 4 -17 kilometers from the city proper.

Borrow pits/common borrow which shall be utilized as embankment materials shall be generated from cutting of slopes to desired elevation. Hence, common borrow source is within the construction site.

Construction materials can be catered by legitimate construction suppliers in Panabo City and in Davao City which is an adjacent city.

B.11.2 Handling of Materials

The construction materials will be delivered to the site by 2-axle or 3-axle trucks. The loading of item 201 is through a pay loader while common construction materials will be unloaded manually by construction workers.

B.11.3 Dependability and Availability of Required Qualities Dependability

The dependability of item 201 materials was certified by the DPWH as a requirement in the issuance of permit. While the dependability of common borrow shall be subjected to material testing by concerned agency before the start of the project.

B.11.4 Availability of Required Quantities

The required quantities of quarry materials and other commonly used materials are sufficient enough to meet the required volume. While some of the common borrow to be used in embankment will utilized the available materials during downgrading of slopes to recommended elevation to supply the volume requirement.

B.11 Implementation Arrangement

During the rehabilitation of the subproject the office of the City Engineer of the City Government of Panabo will be responsible for the supervision and implementation. The MRDP through the PSO and RPCO will assist the LGU in supervision and construction management.

B.11.1 Implementation Schedule of the Subproject (project duration, estimated start and end of construction)

The estimated project duration is 352 calendar days. It is estimated to start on April 2013 and will end on October 2013.

B.11.2 Implementation Schedule

The implementation schedule of the subproject (bar graph)

Item of Work	May 12				Jun 12				Jul 12				Aug 12				Sep 13				Oct 13			
Removal of Pipe Culvert																								
Surplus Common Excavation																								
Foundation Fill																								
Embankment																								
Sub-grade Prep (com material)																								
Aggregate Sub-Base Course																								
Aggregate Base Course																								
PCC Pavement Plain																								
Reinforcing Steel																								

Structural Concrete																							
Pipe Culverts 1520mm Dia																							
Pipe Culverts 1220mm Dia																							
Pipe Culverts 910mm Dia																							
Stone Masonry																							

2.4 DESCRIPTION OF PROJECT PHASES

2.4.1 Pre-Construction Phase

During the pre-construction stage, the Proponent shall undertake the following activities:

(a) Feasibility Study;
(b) Initial Environmental Examination (IEE) Report and the subsequent securing of an Environmental Compliance Certificate;
(c) Detailed Engineering Design;
(d) Securing of relevant permits, endorsements and clearances, and;
(e) Preparation of Manuals for Planning, Training and Operational Procedures.

2.4.2 Construction Phase

The proposed Panabo City Sanitary Landfill shall be developed into three (3) phases; Phases 1 and 2 on the 4-hectare site and Phase 3 on the 2-hectare site. The construction works include construction of the landfill cells and its structures as specified in Section 2.5.

2.4.3. Operational and Maintenance Phase

Operational Aspects

a. Organization to Implement the Project

The proposed project will be implemented by the city government of Panabo through contract by proper bidding procedure. It is based on the RA 9184 and in accordance with WB procurement guidelines in bidding and awarding of contract.

b. Plan for the Management During Constructions, Key Roles and Responsibilities and Implementation Arrangements

The management during the construction of the project shall be the responsibility of the subproject management office which will be headed by the City Mayor as chief implementing officer. The SPMO will be created through executive orders where the composition, key roles and responsibilities are the following:

a.) Chief project Implementing Officer – the City Mayor

- Enters into contract with MRDP-APL2 for subproject components and ensures compliance of its implementation agreement.
- Ensure the availability of CLGU fund counterpart of the subproject
- Make sure that the implementation, operation and maintenance of the subproject is efficient

b.) Local Project Officer – the City Engineer

- overall coordination, management and monitoring of the subprojects
- report to the Chief Project Implementing Officer on problems that arise from the implementation of the project
- visit regularly the project site to monitor the operation
- submit required reports to the Regional project Office and Project Central Office

c.) Administration Officer – the City Budget officer

- in charge of the processing of payments for the MRDP-APL2 subprojects
- make sure that the disbursement is in accordance with world bank guidelines
- prepares and submits all financial reports to MDFO thru PO

d.) Finance officer – the municipal Treasurer

- open account in the bank for the subproject grant funds upon receipt of notice of go signal from the Project Office (P.O)
- responsible for all matters pertaining to financial transactions of the LGU to the MRDP-APL2 subprojects
- -ensures that the disbursement are in accordance with the approved subproject work and financial plan
- -responsible for the approval of certificate status funds (CSF) and the statement of receipts and disbursements (SORD)

e.) Construction and Operation Officer – the assistant city Engineer

- ensure that construction of the subproject is in accordance with the approved DED and POW
- prepare and submit regularly the required progress report of the subproject to local project officer and to MRDP officer
- f.) Monitoring and Evaluation Officer – the CPDC
- ensure the compliance of the prescribed procedure and guidelines of MRDP-APL2
- consolidate and submit all required reports to the local project central office

f.) Environmental Management Plan and Social Safeguard Implementing Officer – Special Project Action Officer (SPAO)

- make sure that all activities contain in the environmental management plan should be implemented
- -make sure that the IPs are able to participate in the implementation of the subproject
- prepare and submit all required reports to the project manager

Project Monitoring and Supervision

The project monitoring and supervision team of the city government of Panabo will be responsible for project monitoring and supervision. They will be assisted by the technical personnel of MRDP.

Operation and Maintenance Scheme

After the implementation of the subproject and after the turn over to the LGU, the concerned barangay government units will take over the operation. The maintenance of the subproject will be a joint undertaking of the concerned barangays and the city government of Panabo.

Collection of Road Users Fees and Other Operational Policies

The BLGUs will enact an ordinance imposing toll fees to vehicles utilizing the subproject on business purposes and will adopt a policy to allocate 10% of its development fund every year for the maintenance of the subproject.

2.5 MANPOWER REQUIREMENT

The manpower requirement is shown in the table below:

Table 2.5.1 Manpower Requirement

Manpower Requirement	Construction Phase	Operation Phase
Management	3	3
Skilled	10	9
Unskilled	15	12
Total	28	24

2.6 PROJECT COST

The total project cost is **Php68,043,983.76** with a scheme on cost sharing of 80%:10%:10%. The World Bank will share Php54,435,187.01, for the GOP the share will be Php6,804,398.376 and the LGU counterpart will be Php6, 804,398.376.

2.6.1 Total Project Cost Breakdown

a.) Direct Cost

The direct cost of the subproject is Php52, 829,179.94 which includes cost of materials, equipment and labor

b.) Indirect Cost

The indirect cost of the subproject is Php15, 214,803.82 which also includes overhead, contingencies and miscellaneous costs, contractors profit and taxes.

CHAPTER 3 DESCRIPTION OF ENVIRONMENTAL SETTING AND RECEIVING ENVIRONMENT

3.1 PHYSICAL ENVIRONMENT

This section describes the existing physical environment where the proposed project site will be located. Description of the physical environment includes the geographic location, land area and classification, topography, climate and meteorology, regional and local geology, land use and air quality.

3.1.1 Geographic Location

The City of Panabo lies between the two (2) bustling cities of Tagum and Davao City. It lies on latitude of 7º 20' 20" to 7º 15' 21" East and longitude of 125º 34' 50" to 125º 42' 50" North. It is bounded on the North-East and North-West by the Municipality of Carmen, on the South-West by Davao Gulf and on the West by Davao City. The city proper is located along Daang Maharlika (Pan-Philippines Highways) and accessible by land transportation and other vehicles plying the Davao-Butuan and Cagayan routes. It is thirty-two (32) kilometers away from Davao City and twenty-eight (28) kilometers away from Tagum City. It is also forty-five (45) minutes ride from Davao and thirty minutes (30) from Tagum City **(Figure 3.1).**

3.1.2 Topography

Six (6) barangays are located at the hilly southwestern portion of the City with an elevation of 600 feet above sea level. The north western portion which cover five barangays has an elevation of 450 feet to 500 feet above sea level**.**

3.1.3 Site Geology

Slope Classification

Level to moderately rolling areas (0-8%) which is endowed with good soil characteristics are favorable for urban expansion while strong hilly to mountainous areas with percentage of 50 and over are hilly prone to soil erosion. Wich is certainly not favourable for urban

development. These areas cover barangays Kiotoy, Mabunao, San Roque, Buenavista, Katualan and Sta. Cruz with a total area of 3,688 has or 13% of the total area.

An area with slope that ranges 18% - 50% covers about 4,109 hectares or 16% of the total land area are found in barangays Consolacion, Malativas, Kauswagan, Cacao, Waterfall and Katipunan, Gently sloping or undulating areas with a slope range of 8-18% comprise merely 2,203 hectares or 9% of total land area while gently level areas with slope of 0-8% accounts the biggest percentage of 62% of which covers a total of 15,643 hectares.

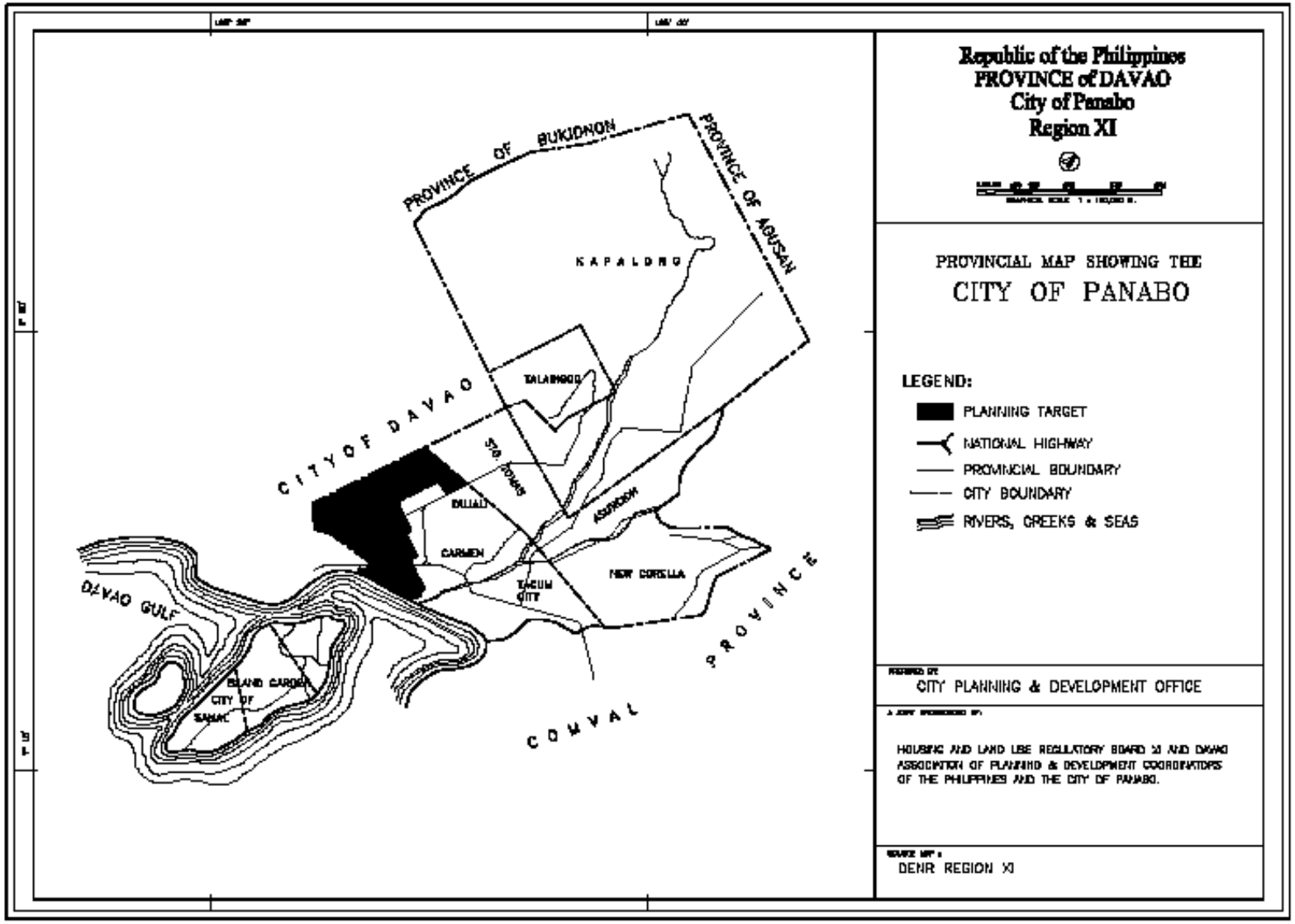


Figure 3.1 Geographic Location of Panabo City

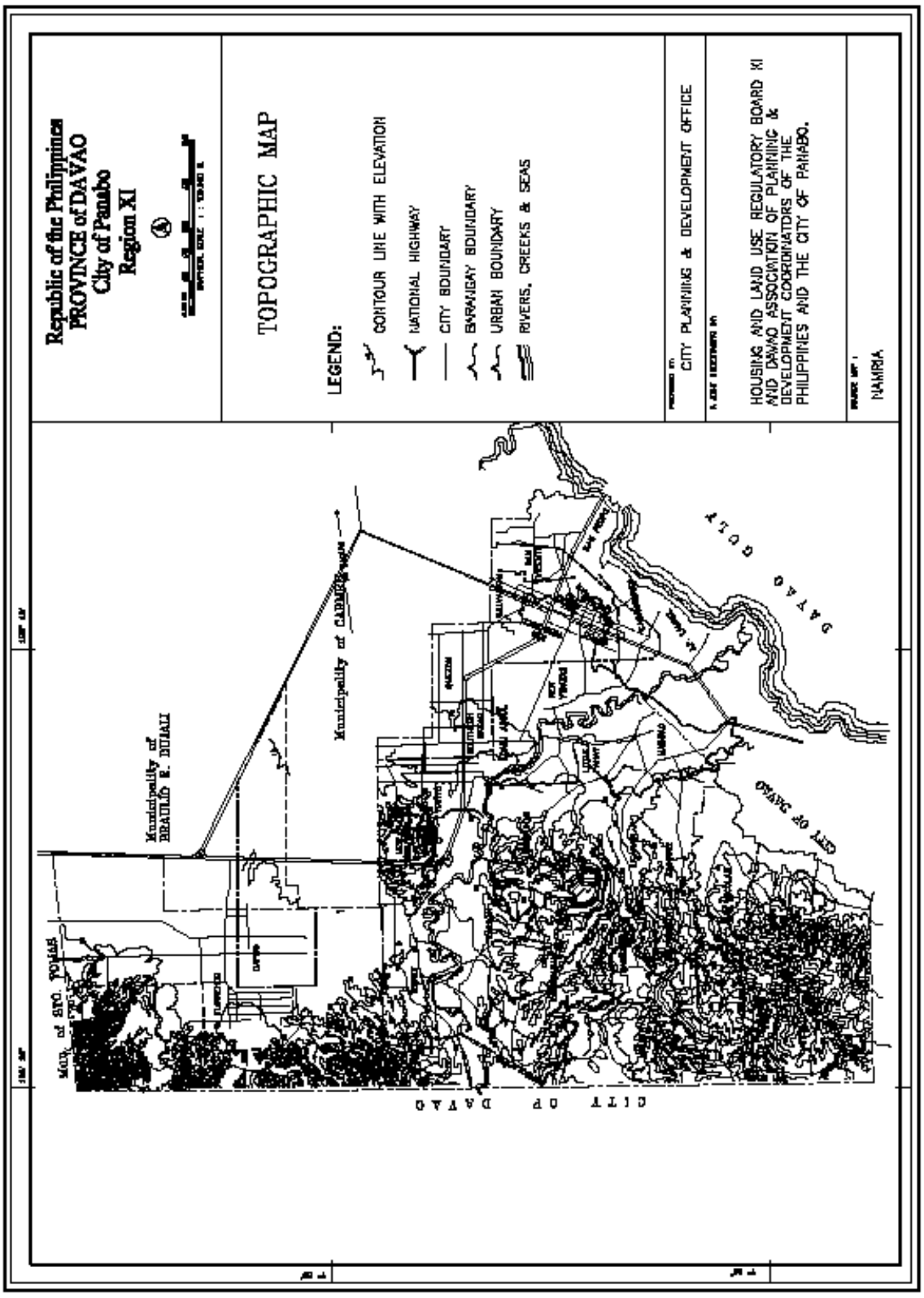


Figure 3.2 Topographic Map of Panabo City

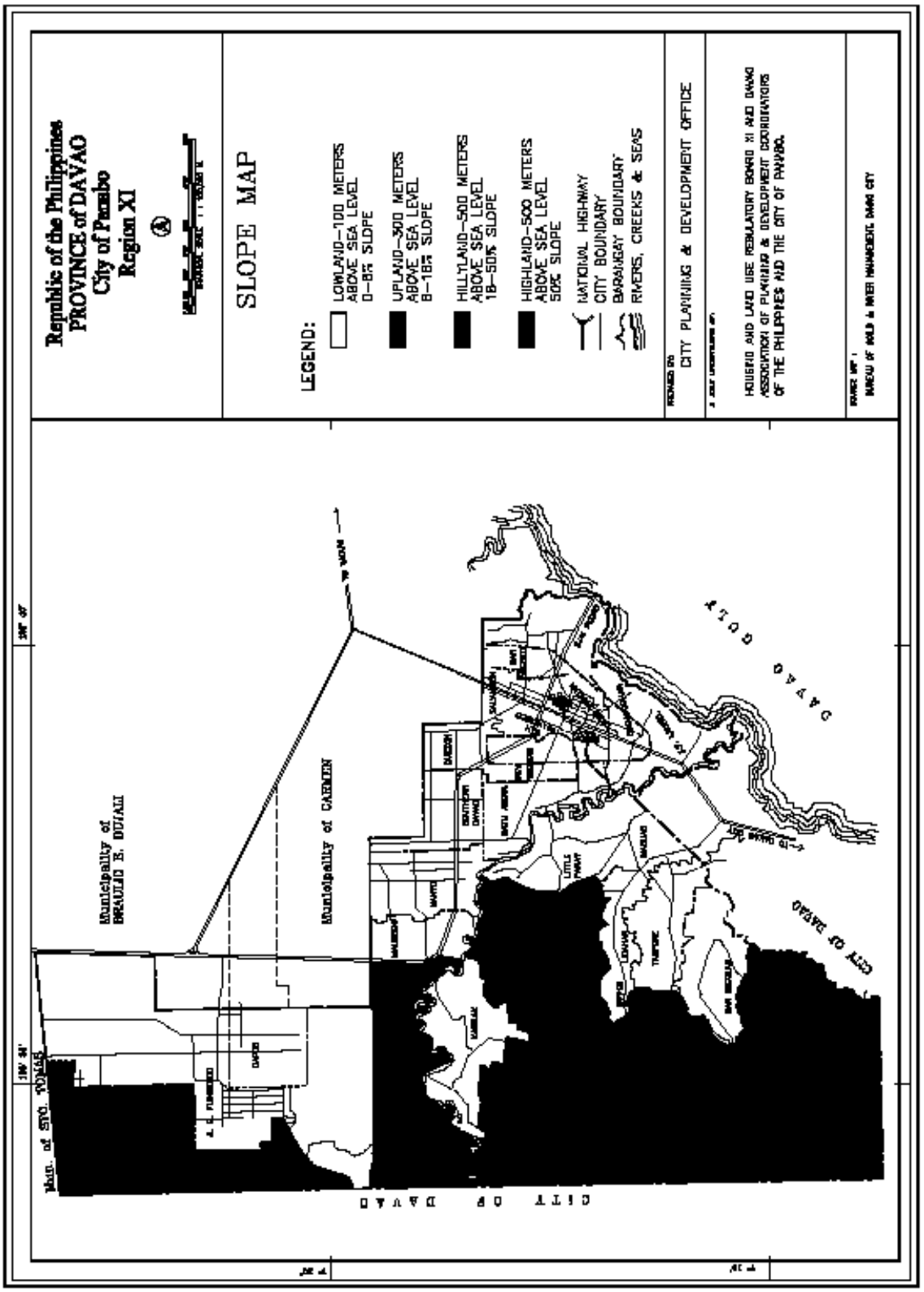


Figure 3.3 Slope Map of Panabo City

Table 3.1

SLOPE CLASSIFICATION

City of Panabo, Davao CY 2000

Type	**Slope Range (%)**	**Characteristics**
A	0-8	Level to nearly level
B	8-18	Gently sloping or undulating
C	18-50	Moderately sloping or rolling
D	50-over	Strongly hilly to mountains

SOURCE: Bureau of Soil and Water Management, Davao City

Basic Soil Type and Its Fertility

There are four (4) basic types of soil which can be found in the different elevation that start up just above the sea level. Clay loam and silty clay are found in areas with elevation from 100 meters to more than 300 meters above sea level while sandy loam and silty clay loam at areas less than 100 meter above sea level. They are characterized as well-drained and moderately drained soil. The soil content also varies from all level but are suitable to different agricultural crops (**Table 3.2**).

The soil content varies according to its depth. Agricultural crop production is best suited to areas with an elevation of 100-300 meters above sea level for they contain more of the basic soil elements needed by the growing plants. They also have a high water-holding capacity.

Areas with elevation of more than 300 meters are best suited for fruit orchard for the prevention of soil erosion. Contour farming is also applicable along these area. Cash crops and annual crops could also be applied through inter-cropping with permanent and deep-rooted crops (**Table 3.2**)

There are portions in the urban area where crops could be grown but could not be sustained to supply for market needs. Fishponds are also best suited along the shoreline and 50 meters thereafter (**Figure 3.4**).

•

Table 3.2

Types of Soil By Barangay

Panabo City, Davao del Norte CY 2003

Type of Soil	Land Area (Has.)	Barangay
1. Clay Loam	383	Sindatun
	548	Tibungol
	1,024	A.O. Floirendo
	2,844	Dapecol Reservation
	934	Dapco
	280	Consolacion
	921	Kauswagan
	376	Dalisay Village
	770	Manay
	821	New Malitbog
	582	Nanyo
Sub-Total	***9,483***	
2. Sandy Loam	821	Kasilak
	774	Cacao
	397	Upper Licanan
	829	Katipunan
	732	Little Panay
	616	Tagpore
	528	Maduao
	875	Datu Abdul
	470	San Vicente
	152	Salvacion
	192	San Francisco
	109	Gredu
	138	New Pandan
	412	Cagangohan
	609	J.P. Laurel
	366	New Visayas

Type of Soil	**Land Area (Has.)**	**Barangay**
	690	So. Davao
	260	Quezon
	98	Sto. Nino
Sub-Total	***9,070***	
3. Silty Clay	224	San Pedro
4. Silty Loam	911	Malativas
	100	Mabunao
	625	San Nicolas
	543	San Roque
	696	Kiotoy
	658	Katualan
	760	Sta. Cruz
	394	Waterfall
	411	Buenavista
	1,249	Lower Panaga
Sub-Total	***6,347***	
TOTAL	***25,123***	

SOURCE : Office of the City Agriculturist, Panabo City, Davao del Norte 2003

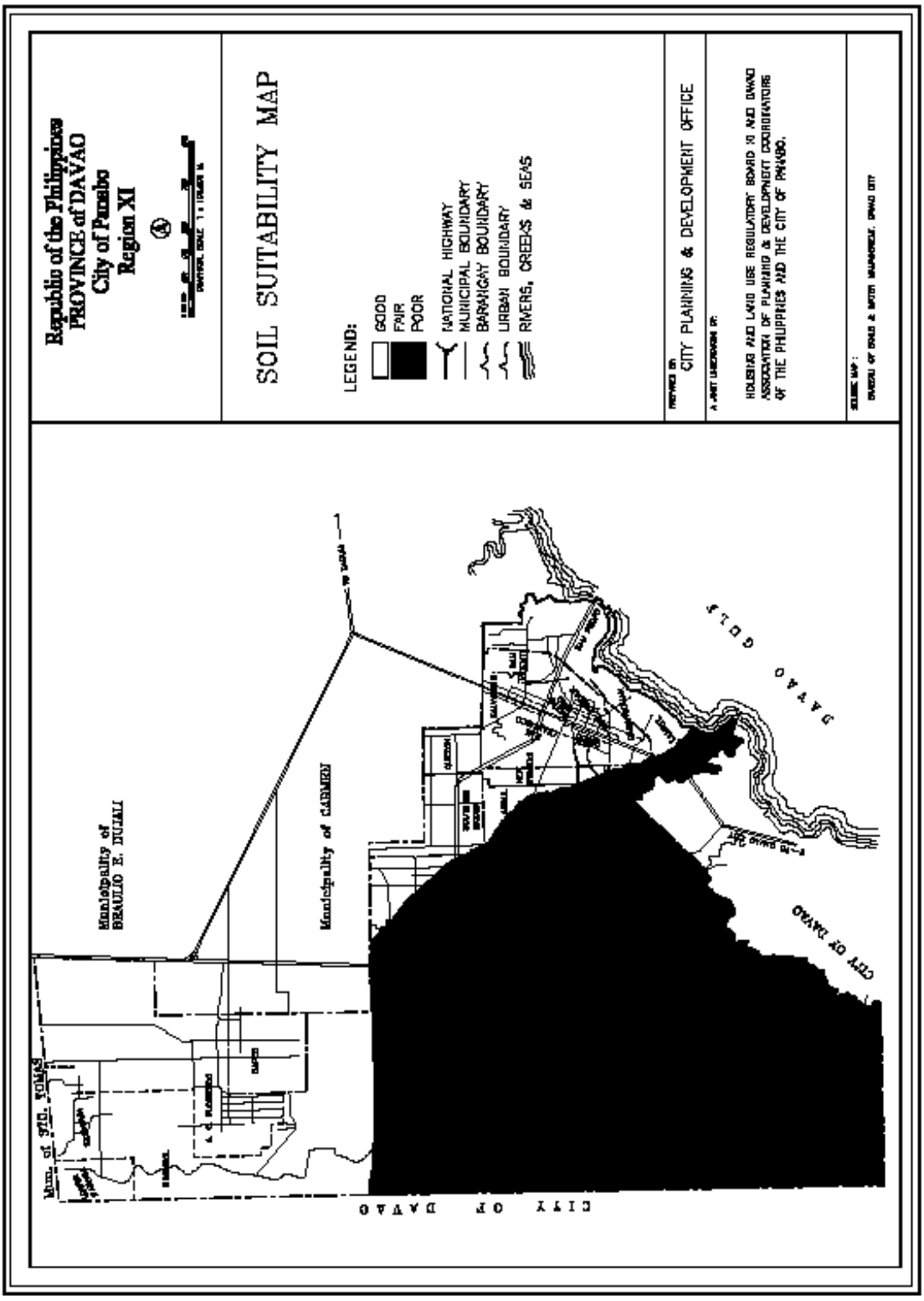

Republic of the Philippines
PROVINCE of DAVAO
City of Panabo
Region XI
SOIL SUITABILITY MAP
LEGEND:
GOOD
FAIR
POOR
NATIONAL HIGHWAY
MUNICIPAL BOUNDARY
BARANGAY BOUNDARY
URBAN BOUNDARY
RIVERS, CREEKS & SEAS
CITY PLANNING & DEVELOPMENT OFFICE
HOUSING AND LAND USE REGULATORY BOARD XI AND DAVAO ASSOCIATION OF PLANNING & DEVELOPMENT COORDINATORS OF THE PHILIPPINES AND THE CITY OF PANABO.
Municipality of BRAULIO E. DUJALI
Municipality of CARMEN
CITY OF DAVAO
DAVAO GULF
CITY OF DAVAO

Table 3.3

Soil Content Analysis

Panabo City, Davao del Norte CY 2003

Elevation	Chemical Analysis	Soil Depth			Description
		0-30	30-40	40-70	
More than 300 m	Nitrogen				First Layer – brown to dark brown
	Phosphorous				Non-sticky – non-plastic friable
	Potassium	sufficient	Deficit	sufficient	Second layer – grayish brown
	PH				Moist, slightly sticky
	Texture	Clay loam	Silty loam	Silty clay	Third layer – grayish brown, moist
100-300 m	Nitrogen				First layer – dark gray, sticky, Plastic firm
	Phosphorous	Medium			Second layer – dark grayish brown, Moist, non-sticky, non plastic, loose
	PH				
	Texture	Silty clay	Silty clay		
Less than 100 m	Nitrogen				First layer – yellowish brown, moist, non-sticky, non-plastic, loose
	Phosphorous	Medium	Medium		
	Potassium	Sufficient	Sufficient		Second layer – gray, moist, non-sticky, non-plastic, loose

Source : Office of the City Agriculturist, Panabo City, Davao del Norte.2003

3.1.4 Land Use

Land Suitable for Cultivation

A large portion of Panabo is suitable to agricultural cultivation with a total land area of 21,196.3030 hectares comprising 84.37% of the total land area. This can be classified as class A & B or level to moderately sloping and undulating areas. Simple farm practices can be applied in these areas (**Figure 3.5**).

Areas with soil suitable for agricultural cultivation are found in barangays A.O. Floirendo, Dapco, New Malitbog, Nanyo, Dalisay Village, Manay, Kasilak, Kauswagan, Cacao, So. Davao, San Nicolas, Little Panay, Tagpore, Upper Licanan, Maduao and Datu Abdul,

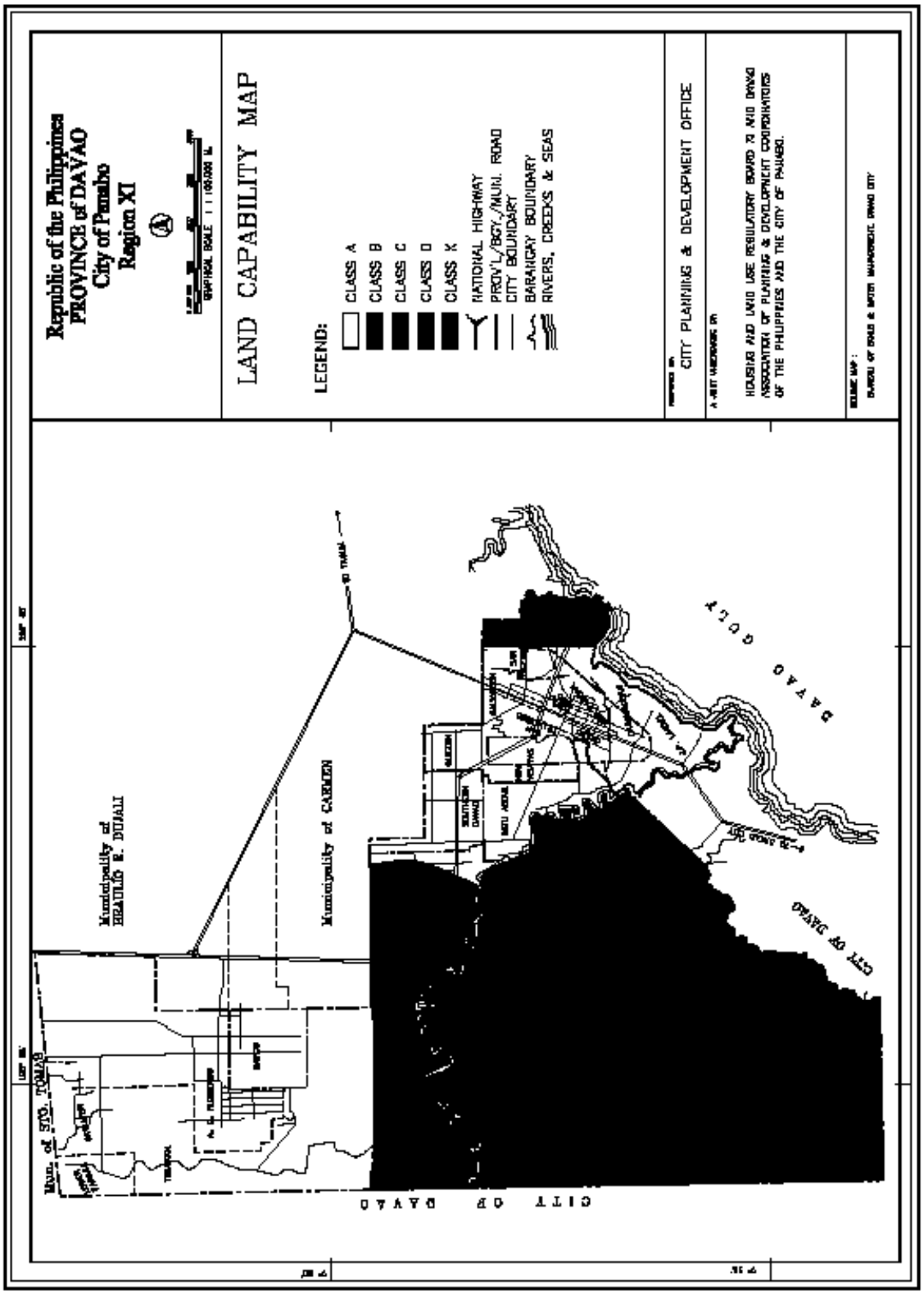
Katipunan, Malativas, Consolacion, Waterfall, Buenavista, Sta. Cruz, Mabunao, Kiotoy, Katualan, San Roque, Tibungol, Sindaton. The soil types within these areas are sandy loam and clay loam.

Land Suitable for Pasture

There are 358.1 hectares that are utilized for grazing. Comprising 0.90% of the City's total land area and generally having a slope range of 8-18%. These are found in Barangays A.O. Floirendo, Tibungol and Sindaton.

Land Limited to Forest

As of CY 2004, there were 225 hectares left for production and protection forest comprising 0.90% of the City's total land area. These are found in barangays Lower Panaga, Cagangohan, J. P. Laurel, San Pedro and San Vicente.


Republic of the Philippines
PROVINCE of DAVAO
City of Panabo
Region XI
LAND CAPABILITY MAP
LEGEND:
CLASS A
CLASS B
CLASS C
CLASS D
CLASS K
NATIONAL HIGHWAY
PROV'L/BGY./MUNI. ROAD
CITY BOUNDARY
BARANGAY BOUNDARY
RIVERS, CREEKS & SEAS
CITY PLANNING & DEVELOPMENT OFFICE
HOUSING AND LAND USE REGULATORY BOARD XI AND DAVAO ASSOCIATION OF PLANNING & DEVELOPMENT COORDINATORS OF THE PHILIPPINES AND THE CITY OF PANABO.
Municipality of CARMEN
Municipality of BRAULIO E. DUJALI
CITY OF DAVAO
DAVAO GULF

3.1.5 Hydrology and Water Resources

Hydro-Geology

Water is one of the basic requirements for a growing city. For the City of Panabo, potable drinking water is supplied by the Panabo Water District but its services are extended only within the urban barangays. Its supply is not enough to meet the demand for incoming industries; thus, there is an urgent need for further expansion.

However, the District had acquired a loan from Local Water and Utilities Association (LWUA) to finance its desired expansion.

Other Natural Features

a. Erosion Potential

The only erosion prone area is fifteen (15) kilometers upstream from Lasang Bridge upstream.

b. Flooding Hazard

Panabo is located in a typhoon free zone but there are areas along the shorelines that sometimes experience tidal wave overflows. Portions of sitio Catumbal, Barangay San Vicente and San Pedro are prone to severe flooding due to monsoon rains that sometimes cause tidal wave overflows. Residents living near creeks also experience slight flooding during heavy rains. Areas with flat terrainexperience flash floods every now and then.

3.1.6 Climate and Meteorology

Climate/Rainfall

The climatological data of Davao City is adopted due to its proximity to Panabo City. (see **Table 3.4**)

Table 3.4

Climatological Data

Davao City, 1999-2002

Month	Total Rainfall (in mm)	Number of Rainy Days	Dew Point (°C)	Relative Humidity (%)	Temperature (°C)		
					Max	Min	Mean
1999	**2,242.90**	**208**	**24**	**82**	**35.5**	**21.8**	**28.1**
2000	**2,357.50**	**208**	**24.1**	**82**	**34.2**	**22.2**	**27.2**
2001	**1,447.90**	**172**	**24.2**	**81**	**34.7**	**21.3**	**28**
2002	**1,637.30**	**159**	**23.9**	**79.5**	**35**	**21.9**	**28.4**
2003	**1,759.30**	**178**	**24.2**	**81.5**	**35.2**	**21**	**28.1**
2004	**1,941.80**	**162**	**24.1**	**79.3**	**35.9**	**21.7**	**28.6**
January	100.1	18	23.5	78	35.9	22.6	28.3
February	169.2	15	23.4	80	34	21.7	27.8
March	172.7	9	24	79	33.9	22.8	28.3
April	171.5	10	24.3	75	34.4	23.2	29.6
May	224.2	17	24.8	82	35.9	23.2	28.6
June	94.2	13	24.2	78	34.1	23.4	29.2
July	184	16	24.2	82	35	22.8	28.6
August	16.2	4	24.3	78	34.5	23.1	28.4
September	280.9	18	24.2	82	33.3	22.8	28
October	181.5	12	24.1	78	34.4	23.8	29.1
November	89	10	24.3	78	34.5	22.1	28.3
December	258.3	20	24.4	81	34.6	23.5	29

a. Wind Direction

There are two (2) prevailing wind directions in the City. From January to April, the predominant wind direction is Northward from the Davao Gulf where the cool air of the sea replaced the warm air mass over the city. From May to December, the prevailing wind direction is southward from Davao Gulf with 3.6 mps maximum wind velocity.

3.1.7 Water Quality

Surface Water (Downstream and Upstream)

Water sample was gathered from the lone sampling station established in a creek. Results of the physico-chemical analysis (**Table 3.6**) show polluted water characteristics. The creek is unable to maintain a high dissolved oxygen concentration that is sufficient to meet aquatic life requirement.

The implementation of the Project may alter the natural regime of this river in particular the natural flow, the volume and capacity of the river and water quality. Water quality alteration may be during the construction and operation phase of the Project. Siltation, sedimentation and local flooding maybe long term effect if no mitigating measures are established prior to construction and during operations.

- ***Surface Water Quality Results***

Based on the DENR Administrative Order (DAO) 34 s. 1990, the creek in the site falls under Class C Water Classification which is prescribed mainly for the following uses:

- Fishery water - for aquaculture uses;
- Recreational Water Class II - for boating, etc.; and,
- Industrial Water Supply Class I – for manufacturing uses after treatment of the water

Oil and Grease

Oil and grease was detected (2.0 and 2.3) in the creek. Its presence in any water may cause blockage of sunlight for photosynthetic activities and may give an unsightly view of the body of water. Their source is normally due to human activity like dumping of waste with oil and grease.

3.1.9 Air Quality and Noise

Air Quality Monitoring

The air quality measurement was conducted during the site validation. The existing air pollution sources in the area are the traffic related emissions from the roadways.

Table 3.11

Population, Household Population and Number of Households by Barangay

City of Panabo, Davao del Norte CY 2000

Barangay	Population	Number of Household
URBAN (UR)		
1. Cagangohan	11,028	2225
2. Gredu	8,938	1883
3. J.P. Laurel	2,736	530
4. New Pandan	6,147	1309
5. New Visayas	13,239	2599
6. Quezon	2,960	608
7. Salvacion	5,463	1086
8. San Francisco	11,444	2332
9. Sto. Nino	5,431	1132
10. San Pedro	3,983	815
11. San Vicente	7,882	1542
TOTAL	***79,251***	**16061**
RURAL (RU)		
12. A.O. Floirendo	6,082	1,360
13. Buenavista	757	153
14. Cacao	984	218
15. Consolacion	1,012	215
16. Dapco	3,971	736
17. Datu Abdul Dadia	3,592	740
18. Kasilak	2,004	402
19. Katipunan	1,176	261
20. Katualan	439	98
21. Kauswagan	1,112	241
22. Kiotoy	965	197
23. Little Panay	1,562	326
24. Lower Panaga	1,171	247

Barangay	Population	Number of Household
25. Mabunao	1,837	397
26. Maduao	1,922	374
27. Malativas	2,207	422
28. Manay	4,135	834
29. Nanyo	2,903	594
30. Dalisay Village	1,319	257
31. New Malitbog	2,173	434
32. San Nicolas	1,568	331
33. San Roque	511	104
34. Sta. Cruz	928	195
35. Sindaton	2,358	465
36. So. Davao	3,628	710
37. Tagpore	1,017	204
38. Tibungol	1,562	303
39. Upper Licanan	1,131	213
40. Waterfall	683	133
SUB-TOTAL	***54,699***	***11,164***
TOTAL	***133,950***	***27,225***

Source: National Statistics Office, Region XI, Davao City

a. Urbanization/Distribution

The city's built-up area is 30.32 sq.km. in the urban area and 7.601 sq.km. in the rural area. The total percent of urbanity or the urbanization level accounts to fifty nine percent (59%).

The total population in the built-up area is 114.865. The total built-up density is 3,029 persons per square kilometer. This shows that a bigger number of people preferred to live in the built-up areas (**Table 3.12**).

●

Table 3.12

Built – up Density

Panabo City, Davao del Norte CY 2003

Barangay	Built-up Area 1/ (Sq.Km.)	Built-up Population	Built-up Density (Persons/Sq.Km.)
URBAN (UR)			
1. Cagangohan	4.12	13,024	2,921
2. Gredu	1.47	9,754	6,636
3. J.P. Laurel	6.09	2,986	490
4. New Pandan	1.00	6,708	6,708
5. New Visayas	3.68	14,447	5,391
6. Quezon	2.60	3,230	1,242
7. Salvacion	1.52	5,962	3,922
8. San Francisco	1.92	12,488	6,504
9. Sto. Nino	0.98	5,927	6,048
10. San Pedro	2.24	4,346	1,940
11. San Vicente	4.70	8,601	1,830
TOTAL	30.32	86,483	43,632
RURAL (RU)			
12. A.O. Floirendo	2.60	3,650	1,404
13. Buenavista	0.03	410	137
14. Cacao	0.03	390	127
15. Consolacion	0.04	805	201
16. Dapco	1.09	1,615	1,481
17. Datu Abdul Dadia	1.60	1,749	1,093
18. Kasilak	1.02	855	838
19. Katipunan	0.04	255	64
20. Katualan	0.02	250	125
21. Kauswagan	0.086	815	95
22. Kiotoy	0.07	435	62
23. Little Panay	0.08	830	104
24. Lower Panaga	0.03	231	77
25. Mabunao	0.08		173
26. Maduao	0.02	1,035	518
27. Malativas	0.06	1,300	217
28. Manay	0.08	2,075	259
29. Nanyo	0.07	955	136
30. Dalisay Village	0.04	795	199
31. New Malitbog	0.08	1,725	216
32. San Nicolas	0.05	1,015	203
33. San Roque	0.03	260	87
34. Sta. Cruz	0.03	330	110
35. Sindaton	0.09	1,725	192
36. So. Davao	0.06	1,945	324
37. Tagpore	0.052	305	61
38. Tibungol	0.05	1,470	294
39. Upper Licanan	0.04	827	207
40. Waterfall	0.33	340	113
SUB-TOTAL	7.601	28,382	9,117
TOTAL	37.92	114,865	52,749

Source: City Planning and Development Office, CY 2004

Population Density by Barangay

The total population of the City is 533 per square kilometers. For the urban area, population density is 2,614 persons per square kilometer and only 247 persons per square kilometer for the rural area. This means that each person in the urban area will be able to occupy only 0.04 square kilometer of land and 0.40 square kilometer at the rural area (**Table 3.13**).

Table 3.13

Population Density by Barangay

Panabo City, Davao del Norte CY 2000

Barangay	Population	% to Total	Area (sq.km.)	Persons per sq.km.
URBAN (UR)				
1. Cagangohan	11,028	8.23	4.12	2,677
2. Gredu	8,938	6.67	1.09	8,200
3. J.P. Laurel	2,736	2.04	6.09	449
4. New Pandan	6,147	4.58	1.38	4,454
5. New Visayas	13,239	9.88	3.68	3,598
6. Quezon	2,960	2.20	2.60	1,138
7. Salvacion	5,463	4.07	1.52	3,594
8. San Francisco	11,444	8.54	1.92	5,960
9. Sto. Nino	5,431	4.05	0.98	5,542
10. San Pedro	3,983	2.97	2.24	1,778
11. San Vicente	7,882	5.88	4.70	1,677
TOTAL	***79,251***	***59.16***	***30.32***	***2,614***
RURAL (RU)				
12. A.O. Floirendo	6,082	4.54	10.24	1,053
13. Buenavista	757	0.56	4.11	172
14. Cacao	984	0.71	7.74	134
15. Consolacion	1,012	0.75	2.80	304
16. Dapco	3,971	2.96	9.34	304
17. Datu Abdul Dadia	3,592	2.68	8.75	261
18. Kasilak	2,004	1.53	8.21	214
19. Katipunan	1,176	0.89	8.29	156
20. Katualan	439	0.32	6.58	61
21. Kauswagan	1,112	0.83	9.21	111
22. Kiotoy	965	0.72	6.96	143
23. Little Panay	1,562	1.16	7.32	221
24. Lower Panaga	1,171	0.87	12.49	73
25. Mabunao	1,837	1.37	1.00	1,944
26. Maduao	1,922	1.43	5.28	316
27. Malativas	2,207	1.64	9.11	232
28. Manay	4,135	3.08	7.70	473
29. Nanyo	2,903	2.16	5.82	522
30. Dalisay Village	1,319	0.98	3.76	317
31. New Malitbog	2,173	1.62	8.21	216
32. San Nicolas	1,558	1.16	6.25	262
33. San Roque	511	0.38	5.43	81
34. Sta. Cruz	928	0.69	7.60	103

Barangay	Population	% to Total	Area (sq.km.)	Persons per sq.km.
35. Sindaton	2,358	1.76	3.83	639
36. So. Davao	3,628	2.70	6.90	333
37. Tagpore	1,017	0.75	6.16	145
38. Tibungol	1,562	1.16	5.48	416
39. Upper Licanan	1,131	0.84	3.97	286
40. Waterfall	683	0.50	3.94	166
TOTAL	***133,950***	***100.00***	***25.123***	***533***

NOTE: 100 hectares = 1 square kilometers Land area used for 2000 = 25,123 has. or 251.23 sq.km.

SOURCE: National Statistics Office, Region XI, Davao City and Land Management Bureau, Davao City

Congestion is expected to happen in the urban area considering that household population prefers to settle in this area due to economic opportunities.

-

Barangay Gredu is the most densely populated among the urban barangays with a population density of 8,200 persons per square kilometer while the least densely populated is barangay J.P.Laurel with a population density of 449 persons per square kilometer. The former has only a small area of 109 hectares but people tend to reside in this barangay due to its accessibility to road transport.

Age Distribution

Children with ages 10 to 14 years old dominated in the city in year 2000 with a total share of thirty seven percent (37%) to the total population. This is followed by those within the age group of 5 to 9 years old comprising twelve percent (12%). Age below one year old is considered as the base line of population pyramid. This consists only two percent (2%) of the total population (**Figure. 3.2**).

Sex Distribution

Males dominated the age group sixty four (64) and below while females in age sixty five (65) and over. Males are more exposed to risks during the age working years, therefore, their number declined when they reach the age group sixty five (65) and above (**Table 3.14**)

Male population consists of fifty one percent (51%) of the total population while female is only forty nine percent (49%). Sex ratio is 100:96 which means that there are 100 males for every 96 females.

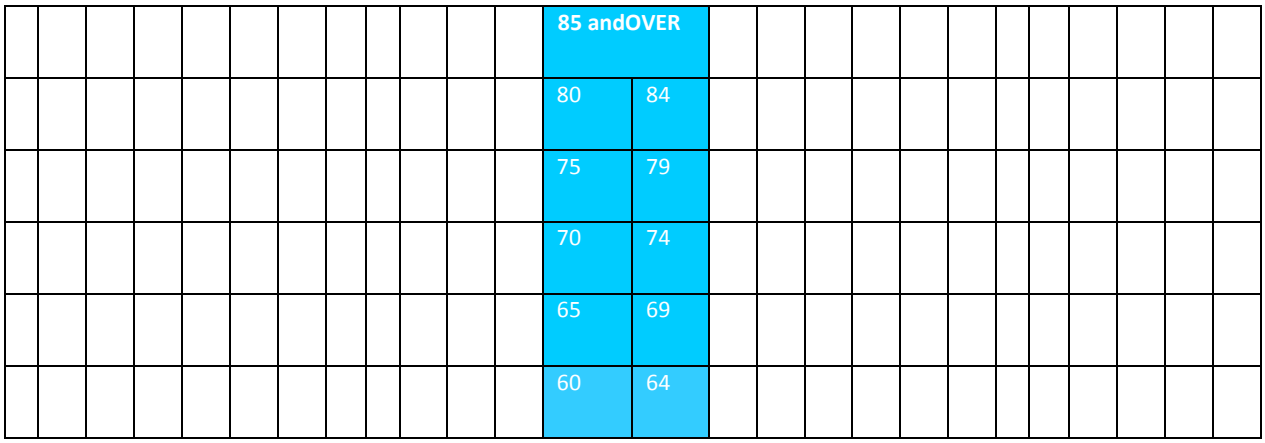
Table 3.14

Household Population by Age Group, Sex

Panabo City, Davao del Norte CY 2000

Age Group	Both Sexes	Male	Female
All Ages	133,950	68,265	65,685
Under 1	3,175	1,623	1,552
1-4	12,682	6,502	6,180
5-9	16,347	8,454	7,893
10-14	16,977	8,495	8,482
15-19	15,042	7,494	7,548
20-24	12,686	6,486	6,200
25-29	10,288	5,203	5,085
30-34	9,447	4,858	4,589
35-39	8,790	4,391	4,399
40-44	8,368	4,343	4,025
45-49	6,720	3,485	3,235
50-54	4,472	2,425	2,047
55-59	2,779	1,465	1,314
60-64	2,266	1,174	1,092
65-69	1,487	719	768
70-74	1,080	541	539
75-79	689	298	391
80 and over	655	309	346

Source: National Statistics Office, Region XI, Davao City



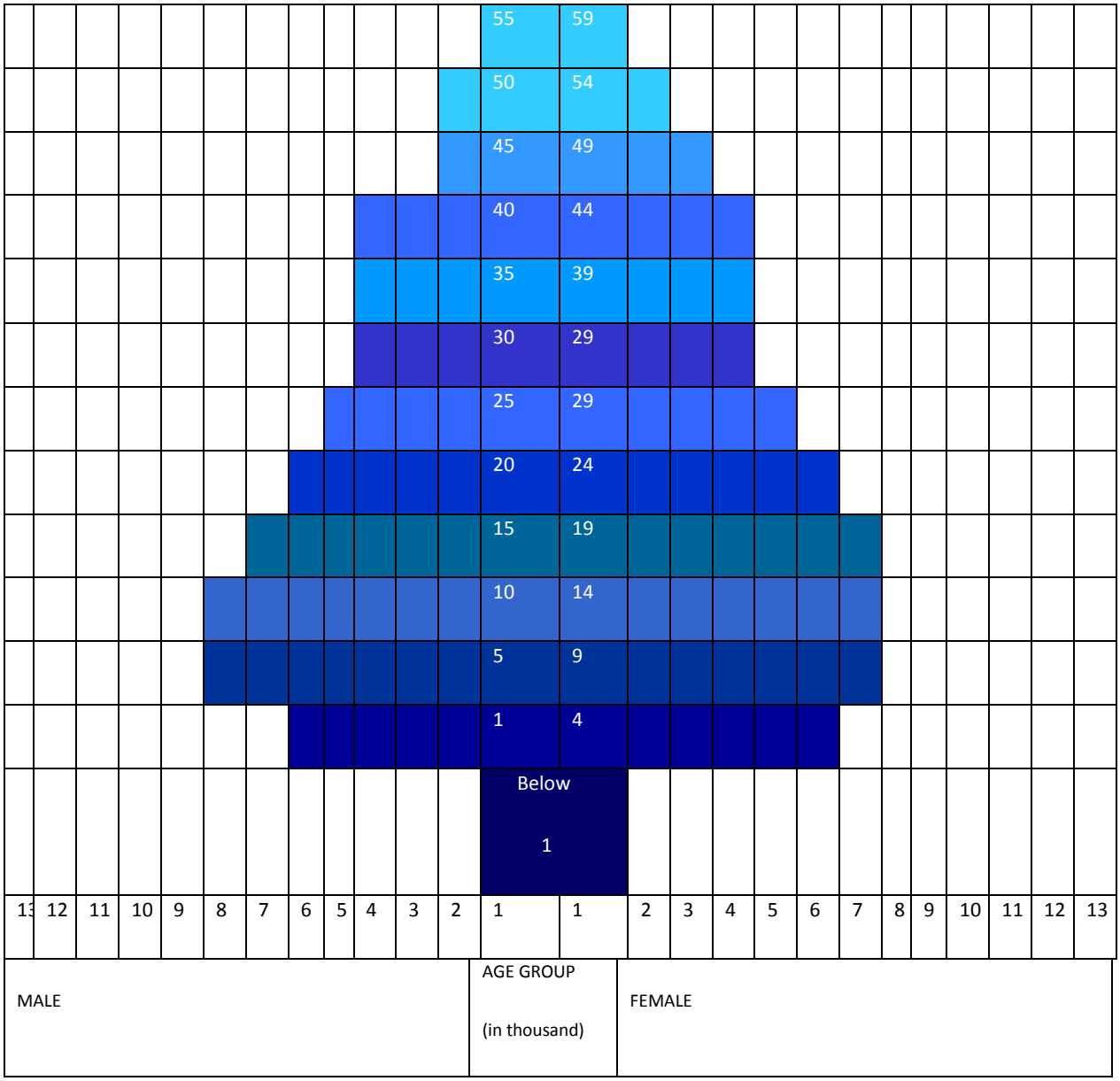


Figure 3.8

Population Structure, CY 2000

City of Panabo, Davao del Norte

Marital Status

a. Total Population 10 Years Old and Over by Age Group, Sex and Marital Status

The total population ten years (10) old and over is 101,746 or seventy six percent (76%) of the city's total population. This shows that twenty four percent (4) is below the age range of 0-19. Out of the 101,746 population, forty five percent (45%) are single, forty six percent (46%) are married, four percent (4%) are widowed, one percent (1%) divorced/separated, four percent (4%) are live-in and one percent (1%) for those with other marital arrangements. In this manner, married persons outnumbered single persons by one (1%) percent. Majority of the population of both sexes married when they reached the age range of 35-39; male tends to show greater interest to marry at ages 40-44 while women at ages 35-39.

For both sexes, separation is significant at age range 40-44. Male separation is great at ages 40-44 while women at ages 35-39.

Table 3.15

Total Population 10 Years and Over by Age Group, Sex, and Marital Status

Panabo City, Davao del Norte CY 2000

Age Group Sex	**Total Population 10 Years Old and Over**	**MARITAL STATUS**					
		Single	**Married**	**Widowed**	**Divorced/ Separated**	**Common Law / Live-in**	**Un-known**
Both Sexes	***101,746***	***45,645***	***46,628***	***3,431***	***919***	***4,050***	***1,073***
Below 20	32,019	30,333	625	34	20	416	591
20-24	12,666	8,554	2,962	17	37	931	185
25-29	10,288	3,472	5,838	40	83	784	71
30-34	9,447	1,456	7,217	73	102	548	51
35-39	8,790	671	7,390	124	145	428	32
40-44	8,368	448	7,144	242	155	326	53
45-49	6,720	272	5,730	301	118	281	18
50-54	4,472	165	3,667	369	92	160	19
55-59	2,779	96	2,180	350	62	84	7
60-64	2,266	63	1,669	436	50	36	12
65-69	1,487	46	969	416	29	18	9

Age Group Sex	Total Population 10 Years Old and Over	MARITAL STATUS					
		Single	Married	Widowed	Divorced/ Separated	Common Law / Live-in	Un-known
70-74	1,080	27	660	355	11	18	9
75-79	689	14	348	297	10	12	8
80 and over	655	28	229	377	5	8	8
MALE	***51,686***	***24,565***	***23,252***	***879***	***412***	***2,044***	***535***
Below 20	15,989	15,394	163	12	7	126	287
20-24	6,486	4,982	973	7	3	433	88
25-29	5,203	2,173	2,536	6	23	420	45
30-34	4,858	957	3,493	23	53	299	33
35-39	4,391	401	3,655	35	58	229	13
40-44	4,343	266	3,735	62	82	172	26
45-49	3,485	151	3,045	80	45	153	11
50-54	2,425	100	2,082	92	49	94	8
55-59	1,465	50	1,230	86	35	59	5
60-64	1,174	31	980	109	24	25	5
65-69	719	25	563	102	15	9	5
70-74	541	17	414	86	8	11	5
75-79	298	4	216	60	7	10	1
80 and over	309	13	167	119	3	4	3
FEMALE	***50,060***	***21,081***	***23,376***	***2,552***	***507***	***2,006***	***538***
Below 20	16,030	14,939	462	22	13	290	304
20-24	6,200	3,572	1,989	10	34	498	97
25-29	5,085	1,299	3,302	34	60	364	26
30-34	4,589	499	3,724	50	49	249	18

Age Group Sex	Total Population 10 Years Old and Over	MARITAL STATUS					
		Single	Married	Widowed	Divorced/ Separated	Common Law / Live-in	Un-known
35-39	4,399	270	3,735	89	87	199	19
40-44	4,025	182	3,409	180	73	154	27
45-49	3,235	121	2,685	221	73	128	7
50-54	2,047	65	1,585	277	43	66	11
55-59	1,314	46	950	264	27	25	2
60-64	1,092	32	689	327	26	11	7
65-69	768	21	406	314	14	9	4
70-74	539	10	246	269	3	7	4
75-79	391	10	132	237	3	2	7
80 and over	346	15	62	258	2	4	5

Religious Affiliation

a. Household Population by Religious Affiliations, Sex

Roman Catholic is the dominant religious group in Panabo City comprising eighty-two percent of the total household population. Other religions are the following: Evangelical, 4%, Islam, 3@,Iglesiya ni Kristo, 2%, Seventh Day Adventist, 2% and Jehovah's Witness, 1% while other groups comprising the remaining sixpercent (6%).

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Table 3.16

Household Population by Religious Affiliations, Sex

Panabo City, Davao del Norte, CY 2000

Religious Affiliation	Both Sexes	Male	Female
TOTAL	**133,856**	**68,210**	**65,646**

Religious Affiliation	**Both Sexes**	**Male**	**Female**
Roman Catholic	109,566	56,160	53,406
Aglipayon	1,059	539	520
Islam	32,03	1,575	1,628
Iglesia ni Cristo	2,677	1,338	1,339
United Church of Christ in the Philippines	860	427	433
Lutheran Church in the Philippines	8	4	4
Philippines Episcopal Church	56	29	27
Iglesia Evangelista Methodista en Las Pilipinas	111	58	53
United Methodist Church	106	48	58
Other Methodist	20	8	12
Salvacion Army, Philippines	7	3	4
Convention of the Philippines Baptist Church	484	244	240
Other Protestant	956	477	479
Buddhist	56	33	23
Church of Jesus Christ of the Latter Day Saints	594	295	299
Jehovah's Witness	1,447	695	752
Philippines Benevolent Missionaries Association	84	41	43
Seventh Day Adventist	2,229	1,075	1,154
Evangelicals	5,377	2,682	2,695
Bible Baptist	285	132	153
Southern Baptist	302	146	12
Association of Baptist Churches in Luzon, Visayas and Mindanao	20	7	115
Association of Fundamental Baptist Church in the Philippines	226	111	2
International Baptist Missionary Fellowship	7	5	45
Missionary Baptist Churches of the Philippines	90	45	62
Other Baptist	114	52	5
Tribal Religious	12	7	1,595

Religious Affiliation	Both Sexes	Male	Female
Others	3,228	1,633	9
None	27	18	323
Unknown	645	322	

SOURCE: National Statistics Office, Region XI, Davao City

Literacy

Based on the 2000 census, more males had gone to school but only few survived and acquired a degree in college. There were 24,749 males who enrolled in the elementary level and 21,647 females. At the tertiary level, only 1,734 males graduated in college while female reached a total of 2,376.

Literacy rate in Panabo is high given the presence of educational institutions in both urban and rural barangays. About ninety-six percent (96%) ar e literate and only four (4%) illiterates. Among the literates, only, three percent (3%) became academic degree holder where one (1%)percent are males and two percent (2%) are females.

Table 3.17

Literacy of Household Population 10 years Old

and Over by Age Group, Sex

Panabo City, Davao del Norte CY 2000

Age Group, Sex and City/Municipality	Household Population 10 years Old and Over	Literate	Illiterate
Both Sexes	***101,658***	***95,515***	***6,143***
10-14	16,973	15,741	1,232
15-19	15,031	14,221	8,10
20-24	12,659	12,184	475
25-29	10,278	10,012	266

Age Group, Sex and City/Municipality	**Household Population 10 years Old and Over**	**Literate**	**Illiterate**
30-34	9,439	8,880	559
35-39	8,783	8,419	364
40-44	8,362	8,026	336
45-49	6,715	6,474	241
50-54	4,464	4,182	282
55-59	2,779	2,462	317
60-64	2,266	1,985	281
65-69	1,487	1,234	253
70 and over	2,422	1,695	727
Male	***51,634***	***48,343***	***3,291***
10-14	8,493	7,716	777
15-19	7,487	7,103	384
20-24	6,471	6,235	236
25-29	5,198	5,032	166
30-34	4,851	4,520	331
35-39	4,386	4,226	160
40-44	4,340	4,121	219
45-49	3,484	3,307	177
50-54	2,419	2,243	176
55-59	1,465	1,322	143
60-64	1,174	1,030	144
65-69	719	599	120
70 and over	1,147	889	258
Female	***50,024***	***47,172***	***2,852***
10-14	8,480	8,025	455

Age Group, Sex and City/Municipality	Household Population 10 years Old and Over	Literate	Illiterate
15-19	7,544	7,118	426
20-24	6,188	5,949	239
25-29	5,080	4,980	100
30-34	4,588	4,360	228
35-39	4,397	4,193	204
40-44	4,022	3,905	117
45-49	3,231	3,167	64
50-54	2,045	1,939	106
55-59	1,314	1,140	174
60-64	1,092	955	137
65-69	768	635	133
70 and over	1,275	806	469

SOURCE: National Statistics Office, Davao City, 2000

Labor Force

a. Employment

As of 2000, there were 78,592 persons in the labor force, 55,358 of which were within the age bracket under 1 to 14 years old and 60- 80 and over who were considered as unproductive population. The record from the Public Employment Service Office, specifically for the months of January, February, July, September, November and December shows that there were 113 job applicants for foreign works but only 73 were able to get a job.

Table 3.18

Overseas Worker
Panabo City, Davao del Norte CY 2003

JOBS APPLIED	NO. OF JOB APPLICANTS	NO. OF APPLICANTS REFERRED	NO. OF APPLICANTS PLACED
1. Domestic Helper	72	72	47

JOBS APPLIED	NO. OF JOB APPLICANTS	NO. OF APPLICANTS REFERRED	NO. OF APPLICANTS PLACED
2. Packer	1	1	0
3. Waiter	1	1	0
4. Singer	2	2	1
5. Entertainer	6	6	5
6. Hotel Receptionist	1	1	0
7. Waitress	1	1	0
8. Cut & Sew	1	1	0
9. Officer Worker	2	2	1
10. Laborer	1	1	0
11. Finishing Carpenter	1	1	0
12. Electrician	3	3	1
13. Cashier	1	1	1
14. Driver	2	2	0
15. Supervisor	1	1	0
16. Saleslady	1	1	1
17. Seaman	7	7	7
18. Factory Worker	1	1	1
19. Electronic (cellphone repair)	3	3	3
20. Nurse	2	2	2
21. Part time worker	1	1	1
22. Gardener	1	1	1
23. Social Worker	1	1	1
TOTAL	***113***	***113***	***73***

SOURCE: Public Employment Office, Panabo city, 2003

Other Related Demographic Data

Current and Projected City Population

The 2000 census revealed a total population of 133,950 and a total household of 127,774. The increase in population is attributed to in-migration due to increased employment opportunity.

3.2.2 Economic Sector

Agriculture

Existing Situation

Of the total land area devoted for agriculture there were 9,573.5700 hectares or 45% are planted with exportable banana (Cavendish) and 1,500 hectares for local bananas; 3,987 hectares or 19% are planted with coconut; rice lands, both irrigated and non-irrigated, accounted for 860.3966 hectares or 4.06%. Other cash crops like mango, citrus and vegetables abound in other parts of the City. Areas planted to corn contributed 20 hectares or 0.94% of the total agricultural land.

Table 3.19

Area Devoted to Agricultural Crop Production

Panabo City, Davao del Norte CY 2004

Crops	**Area (has.)**	**% to Total Agricultural Land Devoted to Crop Production**	**% to Total Of City's Total Land Area**
1. Rice			
- Irrigated	818.3966	3.861	3.260
- Rainfed	42.0000	1.198	0.167
2. Corn	20.0000	0.094	0.070
3. Coconut	3,987.0000	18.810	15.870
4. Banana			
- Exportable (Cavendish)	9,573.5700	45.166	38.110
- Local (Cardava)	1,500.0000	7.077	5.970

Crops	**Area (has.)**	**% to Total Agricultural Land Devoted to Crop Production**	**% to Total Of City's Total Land Area**
5. Citrus	380.0040	1.728	1.513
6. Fruits	3,051.2400	14.630	12.150
7. Rootcrops	526.4340	2.484	2.095
8. Vegetables	259.7000	1.123	1.033
9. Other Crops	334.9584	1.590	1.333
Sub-Total	***20,493.3030***	***96.683***	***81.080***
Mangroves/Marsh	120.0000	0.566	0.4886
Pasture/Brush/Grassland	358.0000	1.688	1.4250
Forest	225.0000	1.061	0.8956
Grand Total	***21,196.3030***	***100.000***	***83.000***

SOURCE: Office of the City Agriculturist, Panabo City, CY 2004

City Assessor's Office, Panabo City, CY 2004

The average production per hectare for irrigated agricultural crop like rice is about 10,306,105 kilograms while irrigated banana shoots to 395,411,520 kilograms (Evergreen Farms Inc., Datu Abdul Dadia). The total production and the value of production by crop as tabulated show that banana major source of income in the City. However, rice and coconut remain to be the major contributors of agricultural income in Panabo. Other crops like mango, citrus and some pomologic crops have a combined land percentage at 27%.

Table 3.20

Area, Production and Value of Production By Major Crops

Panabo City, Davao del Norte CY 2004

Major Crops	Area (has.)	% to Total of Agricultural Land Devoted To Crop Production	ANNUAL PRODUCTION		
			Total (kg.)	Value of Production (P)	Milling Recovery (kgs.)
1. Rice					
- Irrigated	818.3966	3.861	10,306,105		
- Rainfed	42.0000	0.198	504,000		
2. Corn	20.0000	0. 940	180,000		
3. Coconut	3,987.0000	18.810	2,935,602	115,819,282.50	5,871,203.91
4. Banana					
- Exportable	9,573.5700	45.166	395,411,520		
- Local	1,500.000	7.0767	57,375,000		
5. Other Crops	5,255.3364	24.780			
Total	21,196.3030	100.00			

SOURCE: Office of the City Agriculturist, Panabo City, CY 2004

City Assessor's Office, Panabo City, CY 2004

Existing Agricultural Support Facilities

The City is adequately provided by the Local Government in coordination with other line agencies like RFU, PAGRO and NIA, with pre and post harvest facilities crucial in producing good quality agricultural product. Seven powertillers with threshers were given to rice producing barangays. Multi-purpose drying pavements for 2004 alone (as of June) totaled to nine units at P63,000 each for materials and barangay equity of P10,000.00 for labor where beneficiaries do a balikatan. A power spray with pressure hose was granted to mango producing cooperatives to help our local mango producers and PNPL (Plant Now Pay Later) recipients to produce better mango fruits (**Table 3.21**).

On post harvest operation, rice threshers were given to barangays New Malitbog and So. Davao. Corn sheller was provided to marginal corn producers in barangay Mabunao. Grain moisture meters which are essential tool in post harvest were also provided to four barangays. One hundred fifty thousand Pesos (P150,000.00) worth of micromills were also helpful in the grain production for the four selected barangays. Twenty seven multi-purpose cooperatives of Panabo also benefited from DA-RFU grant a total of 27 tarpauline canvass for those cooperatives that were not able to avail of MPDP projects.

Table 3.21

Agricultural Facilities and Other Related Services

Panabo City, Davao del Norte CY 2003

Agricultural Facilities and Other Related Services	**Location**	**Agency**	**Total Funding Cost (P)**
1. Irrigation Facilities	San Nicolas	National Irrigation	300,000.00
	So. Davao	Administration	
	Datu Abdul		183,920.00
	Manay		
	Nanyo		17,600.00
	New Malitbog		68,242.00
	Quezon		
2. Breeding Station/Services	Salvacion	Office of the City Agriculturist Panabo	100,000.00
3. Drilling Machine	Salvacion	DA-Nat'l/Prov-LGU	
4. Nursery	Salvacion	DA-Nat'l/Prov-LGU	
Post Harvest Facilities			
Acquired since 1998			
1. Power Tiller with Thresher	7 different barangays	DA-Nat'l/Prov-LGU	7,000,000.00
2. Solar Dryer	23 diff. barangays	-do-	
3. Small Farm Reservoir	Katipunan	-do-	
4. Mechanical Drier	7 diff. brgys.	-do-	
5. Multi-Purpose Pavement	Various Brgys.	-do-	
As of CY 2004			
Solar Dryers	New Visayas	-do-	63,436.00

Agricultural Facilities and Other Related Services	**Location**	**Agency**	**Total Funding Cost (P)**
	Prk. 3 Manay	-do-	63,436.00
	Lower Panaga	-do-	63,436.00
	Malativas	-do-	63,436.00
	New Malitbog	-do-	63,436.00
	Little Panay	-do-	63,436.00
	Consolacion	-do-	63,436.00
	Cacao	-do-	63,436.00
	Kauswagan	-do-	63,436.00
	Prk. 2 Manay	-do-	63,436.00
	Prk. 5 Manay	-do-	63,436.00
	Sharon Faith, New Visayas	-do-	63,436.00
	Prk. 9, New Visayas	-do-	63,436.00
	Prk. 6 Little Panay	-do-	63,436.00
	Brgy. Hall, Little Panay	-do-	63,436.00
	Behind the Clouds, New	-do-	63,436.00
	New Malitbog	-do-	
Shallow Tube Well	So. Davao (3 units)	-do-	168,0000.00
	Kasilak (4 units)	-do-	224,000.00
	New Malitbog (2 units	-do-	112,000.00
	Quezon (3 units)	-do-	168,0000.00
	Little Panay (2 units)	-do-	112,000.00
	Nanyo	-do-	56,000.00
	Niagara, Datu Abdul	-do-	56,0000.00
Micro Mill	Kasilak, So. Davao, Quezon		
	& Nanyo		
Turtle Tiller with Engine	So. Davao, Nanyo		
Power Tiller with Trailer & Engine	So. Davao, Nanyo		
Thresher with Engine	Nanyo		
Power Spray with Pressure Hose		PAMAGROCO-DA-RFU	
Micromill			

The proponent is still preparing with the checklist before the implementation of the project.

CHAPTER 4.0 IMPACT PREDICTION AND ASSESSMENT AND MITIGATION

This Section shall discuss the identified impacts in relation to the project activities and the existing environmental quality and assess the significance of the identified impacts of the proposed project. The impacts identified that would require mitigation or enhancement measures would be further discussed in the succeeding Chapter (Environmental Management Plan/Program).

4.1 SUMMARY MATRIX OF PREDICTED ENVIRONMENTAL ISSUES/IMPACTS THEIR MITIGATING MEASURES AND LEVEL OF SIGNIFICANCE AT VARIOUS STAGES OF DEVELOPMENT

Table 4.1, shows the summary of the major impacts of different Project Activities and the *enhancement mitigating measures* for the construction phase activities of the Project. The matrix is divided into five major columns depicting the environmental attributes, phase of project implementation/activities, impacts generated, type and degree, and mitigating measures.

Impacts were also classified into three (3) major categories corresponding to the physical, biological and socio-economic environments. The major categories were further divided into sub-categories like water, air, noise etc for the physical environment; terrestrial flora for biological environment; and influx of workers, employment and livelihood, etc. for the socio-economic environment.

After prediction of the impacts, mitigating measures were drawn up, which was a consensus between the environmental consultants and the proponent. The mitigating measures identified, depending on the severity of the impacts, will be included in the Environmental Management Plan (EMP) in the succeeding chapter to incorporate it with the corresponding parties who will be responsible for its implementation.

The summary matrix is similar to the Leopold Matrix (Canter, 1994), with some modifications, usually being used in impact assessment of Projects. Prediction of the impacts on each environmental attribute by activities undertaken for the project was carried out using the impact registers obtained in the literature and coupled with the experience in similar projects and activities. The extent (type and degree) of the impacts was decided though discussions with the team to assess the level of significance of the impacts of the activities to be undertaken for the project.

Several desk studies of existing secondary data (monitoring report) were complemented with actual site visits. Matching the proposed activities and the baseline environmental conditions of the site, environmental impacts as well as its degree were predicted. Impacts were evaluated in terms of their nature, spatial extent, and cumulative effects. The combination of these factors was used to measure the magnitude of the impacts. Their ranking is expressed as follows:

- Significant (S)
- Moderate Significant (MS)
- Non-Significant (NS)
- Negative (N)
- Positive (P)

Table 4.1 Summary of Construction Phase Impacts

Environmental Factor	Relevant Project Activities	Potential Impacts	Type/Degree of Impact	Mitigation or Enhancement Measures
PHYSICAL ENVIRONMENT				
Air Quality	Vegetation clearing, site preparation, excavation, land clearing, movement of vehicles on site, transport of construction materials	Contribution to the incremental increase of ambient air temperature. Potential increase in total suspended particulate (TSP) within and around the project site from fugitive emissions Potential increase in NO_2 and S O_2 from vehicle emissions (i.e. from additional traffic generated)	MS, N	Minimize clearing of vegetation and cutting of trees. Access roads going to site should be sprinkled with water regularly especially in dry season; speed limits should be implemented. Use of good quality fuel for the heavy equipment to reduce NO_2 and SO_2 emissions.
Noise	Ground clearing, use of heavy equipment during excavation, piling and driving for foundations, erection of facilities, finishing.	Potential increase in ambient noise from the various activities.	MS,N	Maintain vehicle and heavy equipment mufflers and engines in good conditions.

Environmental Factor	**Relevant Project Activities**	**Potential Impacts**	**Type/Degree of Impact**	**Mitigation or Enhancement Measures**
BIOLOGICAL ENVIRONMENT				
Terrestrial Flora	No vegetation inside the project site as it is used as the city's controlled dumpsite. Only grasses and shrubs grow.	NONE	NS	NONE
SOCIO-ECONOMIC ENVIRONMENT				
Labor Demand Influx of Migrant Workers and Increase in Population	All construction activities	Temporary In-migration of workers from outside Barangays (expected to be heavy)	MS,N	Priority hiring of labor force be given to residents in the area.

Environmental Factor	**Relevant Project Activities**	**Potential Impacts**	**Type/Degree of Impact**	**Mitigation or Enhancement Measures**
Health, Sanitation and Safety	Earthmoving, excavation, piling/storage of construction spoils	May cause temporary increase in upper respiratory illnesses due to increased TSP. Recovery is expected after construction activities is completed Exposure of workers to increased TSP, noise and other nuisance Potential impacts due to unsanitary conditions and improper disposal of solid wastes	S, N	Provisions of temporary housing and sanitary facilities. Proper orientation of workers on waste disposal. Provisions of health services to workers. Implementation of Ecological Solid Waste Management Plan as per RA 9003

Environmental Factor	**Relevant Project Activities**	**Potential Impacts**	**Type/Degree of Impact**	**Mitigation or Enhancement Measures**
Occupational Risks	All construction activities	Undesirable accidents to workers and exposure to occupational hazards	MS, N	Hiring of physically fit workers. Provisions of protective and safety gear to workers. Provisions of emergency medical facilities.
Employment Livelihood and Tax Revenues	Construction activities requiring skilled and non-skilled labor	Employment generation and increased income and business opportunities Improvement of workers standard of living	S, P	Priority in hiring qualified local residents. Providing training for local labor

4.2 BRIEF DISCUSSION OF IMPACTS AND MITIGATING MEASURES (CONSTRUCTION PHASE)

4.2.1 Air Quality Impacts

The expected air quality impacts during construction phase would be from three sources; namely, a) clearing of vegetation increase of ambient air temperatures by 1-2 degrees centigrade (Cotton and Pielke, 1995), (b) fugitive emissions in the active construction site, and (c) vehicular emissions from construction equipment and other vehicles.

The expected impacts of the project on the local climate during the construction stage is the incremental increase of ambient air temperature within the site by 1-2 degrees centigrade, however this impact will be temporary in nature and will be felt only during the development phase of the project.

During vegetation clearing, ground preparation, excavation and concentration of Total Suspended Particulates (TSP) from fugitive emissions in the vicinity of the site may temporarily increase due to the exposure of the soil material and eventual resuspension due to wind action. This may affect the barangay and other adjoining residential areas depending on the meteorological conditions (wind direction, precipitation). It is expected that TSP resuspension may be significant during the dry season.

The third source of air quality impacts would be from vehicular emissions (i.e. construction equipment, delivery trucks, and private vehicles). Its contribution would be minimal. The typical pollutants of concern from vehicular emissions include sulfur oxides (SO_2) and Nitrogen Oxides (NO_2) and particulate matter.

Mitigating Measures

Although groundwork activities within the project area are not expected to exceed the DENR Standards for ambient TSP concentrations in adjacent barangays, traffic-generated dust emissions will likely cause high TSP, SO_2 and NO_2 concentration along access roads. These roads should be sprinkled with water regularly to maintain the concentrations in residential areas within DENR Standards. Vehicles should also maintain speed limits (10-20 km/hr) in dusty roads near population centers to minimize dust resuspension.

4.2.2 Noise Impacts

Noise levels in the area are also expected to increase from the use of heavy equipment for the various construction activities such as jackhammers, bulldozers, graders, payloaders, heavy trucks, generators and compressors.

"Noise" can be defined as unwanted sound or sound in the wrong place at the wrong time. It can also be defined as any sound that is undesirable because it interferes with speech and hearing, and is intense enough to damage hearing, or is otherwise annoying (U.S. EPA, 1972).

Table below shows the typical noise levels from construction equipment that could be used in the construction stage of the project.

Table 4.2 Typical Noise Levels from Construction Equipment

Equipment	Typical sound pressure levels, dB(A)	Predicted noise levels at various distances, dB(A)			
		30-m	60-m	120-m	240-m
Compressor	75-86	69-80	63-74	57-68	51-62
Backhoe	71-92	65-86	59-80	53-74	47-68
Compactor	72-74	66-68	60-62	54-56	48-50
Concrete mixer	75-85	69-79	63-73	57-67	51-61
Concrete pump	80-82	74-76	68-70	62-64	56-58
Crane	76-85	70-79	64-73	58-67	52-61
Front loader	72-81	66-75	60-69	54-63	48-57
Grader	80-92	74-86	68-80	62-74	56-68
Pump	69-71	63-65	57-59	51-53	45-47
Truck	83-93	77-87	71-81	65-75	59-69
Vibrator	68-81	62-75	56-69	50-63	45-57

Source : Canter, 1996

Noise emissions from construction equipment will significantly increase and may reach up to 78 dB(A) 240 meters from the source. This could impact residents near the

construction site. Further, background noise in some of the stations (baseline study) have marginally exceeded the standards for residential areas, hence any incremental noise from the construction activities may cause annoyance to the adjacent residential areas and exceed to ambient noise level standards. Similarly, workers in the active construction site will also be affected by the elevated noise levels.

However, the data provided in **Table 4.2** assumes that there are no sound attenuation from the source of noise propagation to the sensitive receptor (i.e. sound waves are traveling in free air without physical obstruction). In the case of the project area which is forested and the presence other structures will potentially attenuate the noise coming from the heavy equipment to be used.

Further, noise from construction operations is relatively different from noise impacts during the operation stages and from other sources of noise for two reasons. First is that noise are emitted by many types of equipment present in the construction site and is dependent on the substages of the construction activities (ground clearing, excavation, foundations, erection, finishing) noise being more intense during some stages (e.g. pile driving) than in others (e.g. ground clearing). Second, the resulting adverse impacts will be temporary since the activities are relatively short-term and noisy activities are intermittent. Moreover, since construction activities are usually done during daytime, there will be a minimum of sleep interference.

Mitigating Measures

Noise levels from construction and heavy equipments operating in the construction sites are not expected to cause noise levels above DENR Standards in barangays outside the project boundaries. If sound levels are found to exceed noise standards in area adjacent to the project site, sources of this noise should be controlled by enclosures and silencers.

Noise emanating from vehicles travelling access roads should be controlled by maintaining vehicle mullers and engines in good conditions.

4.2.3 Water Quality Impacts

Water quality impacts during the construction stage would include a) increased sediment load to the nearby creek, b) Oil and grease contamination from small fuel spills, and c) domestic wastewater discharge

- Temporary increase in Total Suspended Solids

Various construction activities will result in the exposure of the soil surface. The exposed soil surface during precipitation will result in loose soil particles being transported with surface run-off to the nearby creek. This will result in temporary increase of sediment load which may also result to unwanted turbidity as well as depositing sediments at the bottom of the creek that will reduce the river's holding capacity. Such condition may result in decreased light penetration thereby leading to decreased photosynthetic activity of autotrophic phytoplankton. This impact is envisaged to be temporary and necessary mitigating measures can be implemented to reduce the silt content of surface run-off emanating from the active construction site.

- Oil and Grease from small fuel spills

Fuel spills in the construction site may result to a slight increase in oil and grease concentrations in the creek. However, this impact is relatively small and temporary in nature.

- Domestic wastewater discharge

The construction activities will require the deployment of personnel in the project site.

These workers, especially the migrant workers, will generate additional source of domestic wastes, which if not properly disposed maybe the source of potential pollutants to the creek.

Mitigating Measures

These impacts can be mitigated by formulation and implementation of soil erosion control measures. Also contractors shall be advice to be cautious in handing and disposal of spoils. A designated temporary and final disposal area should be sited and structurally supported to prevent spoils from being washed down in the river during rainy season.

The contractor must also provide appropriate sanitation facilities for its workers.

4.2.4 Impacts on Terrestrial Flora

The degree of impact on the terrestrial environment, given the area and ecological significance of the vegetation affected is not significant since only grasses and some shrubs grow in the site. However, the vegetations near the site will be affected but very minimal.

Mitigating Measures

The loss of vegetation near the site should be properly compensated by developing new areas where more usable vegetation can be re-established for purposes of catchment rehabilitation, protection and livelihood.

Table 4.3 Summary of Operations and Maintenance Phase Impacts

Environmental Factor	Relevant Project Activities	Potential Impacts	Type/Degree of Impact	Mitigation or Enhancement Measures
PHYSICAL ENVIRONMENT				
Land Use	Operational Activities, Maintenance	Change in land use form. From open dump to a sanitary landfill. No adverse impact is foreseen.	S, P	Proper Maintenance
Air Quality and Noise	Operational and Maintenance	Increase in air pollutants and noise levels.	MS, N	Proper Maintenance
Surface Water Quality	Operational	Storm Water Contamination	MS, N	Management of leachate
Groundwater Quality	Operational Phase	Direct infiltration of leachate to the groundwater aquifer	S, N	Leachate collection and treatment system. Provision of HDPE liner
Aesthetics and Odor	Operational and Maintenance	Wind-blown litters	S, N	Provisions of fence. Daily Soil Cover
Gas and Fires	Operation and Maintenance	Landfill gas emissions that will cause fires.	S, N	Gas Vents and Management
BIOLOGICAL ENVIRONMENT				
Terrestrial Flora	Operational and Maintenance	No impact foreseen	NS, P	Vegetations will be added and tree planting of open space

Environmental Factor	**Relevant Project Activities**	**Potential Impacts**	**Type/Degree of Impact**	**Mitigation or Enhancement Measures**
SOCIO-ECONOMIC ENVIRONMENT				
Labor Demand Influx of Migrant Workers and Increase in Population. Employment	Operational and maintenance activities	Permanent migration of workers from outside Barangays Additional Economic activities for host barangay.	S,P	Priority hiring of labor force be given to residents in the area.

Environmental Factor	**Relevant Project Activities**	**Potential Impacts**	**Type/Degree of Impact**	**Mitigation or Enhancement Measures**
Health, Sanitation and Safety	Operational and maintenance	May cause temporary increase in upper respiratory illnesses due to increased TSP. Exposure of workers to increased TSP, noise, odor and other nuisance Potential impacts due to unsanitary conditions and improper disposal of solid wastes	S, P	Provisions of permanent housing and sanitary facilities. Proper orientation of workers on waste disposal. Provisions of health services to workers. Implementation of Ecological Solid Waste Management Plan as per RA 9003

Environmental Factor	**Relevant Project Activities**	**Potential Impacts**	**Type/Degree of Impact**	**Mitigation or Enhancement Measures**
Occupational Risks	Operational activities	Undesirable accidents to workers and exposure to occupational hazards	MS, N	Hiring of physically fit workers. Provisions of protective and safety gear to workers. Provisions of emergency medical facilities.
Livelihood and Tax Revenues	Operational activities requiring skilled and non-skilled labor	Employment generation and increased income and business opportunities Improvement of workers standard of living	S, P	Priority in hiring qualified local residents. Providing training for local labor

4.3 BRIEF DESCRIPTION OF THE SIGNIFICANT SOCIOECONOMIC EFFECTS/IMPACTS OF THE PROJECT

Operation of the proposed project is expected to influence the socio-economic environment of the impact area.

4.4.1 Labor Demand, Influx of Migrants and Population Increase

Employment and business opportunities will definitely attract workers and entrepreneurs from adjacent areas and municipalities. The population is expected to increase during the operation stages of the project. The increase in population will result to tune need of living quarters. This impact is short-term but considered as moderately significant.

Like that of the construction phase the increase in population would be measured by the level of migrants that would establish residence for a longer period, and the numbers of families and members. The impact would be more on shifts in the employment structure with increases in the labor force and the labor force participation rate.

However, if local residents will be prioritized to meet the required manpower, impact will definitely lessen pressure on local infrastructures and services. If employing migrant workers is unavoidable, contractors must orient migrant workers in the cultural practices of the people in the community.

4.4.2 Health, Sanitation and Safety

The project will have a positive impact on the economy of the area and indirectly lead to improve public health. Additional sources of livelihood may be opened and there may occur an improvement in the standard of living. An improved water supply system and increased number of sanitary toilets and better health education may follow. Disease related to poor economic conditions like diarrhea and respiratory illnesses might decrease. A better road and transportation network would certainly result in better access to and improved delivery of health services.

4.4.3 Occupational Risks

The risk of accidents is something faced by all projects throughout their lifecycle. These are normal occupational risks common to infrastructure projects but proper safety instructions and management together with the training of workers will mitigate these risks.

4.4.4 Livelihood, Employment and Additional Tax Revenues

Like that of the construction phase, most identifiable and significant contribution of the project operation is the tax revenues that can be generated by the government in the form of corporate income taxes and personal income taxes from employees, community taxes and taxes on equipment/machines. With the increased income for the local government, such situation is expected to spur development in the Municipality and improve delivery of basic social services in the impact barangays.

CHAPTER 5 ENVIRONMENTAL MANAGEMENT PLAN

Based on the impacts identified in Chapter 4, the following mitigating measures are proposed for various environmental factors/resources. The responsible parties are also identified. A summary matrix of the proposed mitigation and enhancement measures for the construction and operation stages of the project are shown in Tables 5.1 and 5.2. Brief descriptions of the mitigating and enhancement measures are presented in the succeeding part of this section.

Table 5.1
Summary Matrix of Environmental Management Plan during Construction Stage

Environmental Attributes	Impacts	Mitigation/enhancement Measures	Responsible Parties
Air Quality	Increase in dust generation due to clearing and grubbing, civil works and earthmoving activities.	Regular watering of unpaved roads or exposed soils/ground. Require construction suppliers hauling dusty materials to cover delivery vehicles with tarpaulin to avoid fugitive dust	LGU, EPC contractor

Environmental Attributes	Impacts	Mitigation/enhancement Measures	Responsible Parties
Soil Quality	Top soil removal and loss due to earthmoving activities, transport, and access road construction. Erosion from exposed cuts and landslide due to earthmoving and excavation activities. Sedimentation / siltation of drainage or water ways from unconfined stock-piles of soil and other materials. Loss of vegetation due to land clearing. Presence of pot holes due to tear and weather. l) Growth of grasses along shoulders and drainage	Hauling trucks should be covered with canvass or any equivalent materials. Stockpile the top soil in a safe place and use as final grading material or final layer. As soon as possible/riprap or re-vegetate the area. As soon as possible/riprap or re-vegetate the area.	LGU, EPC contractor

Environmental Attributes	Impacts	Mitigation/enhancement Measures	Responsible Parties
Vegetation Loss	Loss of vegetation due to land clearing.	Re-plant/plant indigenous tree species and ornamental plants. Re-establish or simulate the habit of affected wildlife in another suitable area.	LGU
Noise Quality	Noise generation that can affect the nearby resident and loss of wildlife within the influence area Increased traffic and possible congestion.	Schedule noisy construction activities during day time. Undertake proper maintenance of equipment and use mufflers.	LGU, EPC contractor
Water Quality	Pollution on nearby water body due to improper	Strictly require the contractor and its workers to observe	LGU, EPC contractor

Environmental Attributes	Impacts	Mitigation/enhancement Measures	Responsible Parties
	disposal of construction waste.	proper waste disposal and proper sanitation Set up temporary disposal mechanism within the construction area and properly dispose the generated solid waste.	
Socio-economic Public/Occupational Health	Increase in the incidence of crime and accidents. Increased traffic and possible congestion as well as increase risk of vehicular related accidents. Placement of signage and warnings in appropriate places. Periodic maintenance and spot gravelling.	Strictly require the contractor and its workers to follow safety rules and regulations in the construction and in the locality (in coordination with local authorities.	LGU, EPC contractor LGU, EPC to liaise with LGU

5.1 BRIEF DISCUSSIONS ON THE ENVIRONMENTAL MANAGEMENT PLAN (EMP), CONSTRUCTION PHASE

5.1.1 Air Quality Management,

Air quality management measures to be adopted for the project are the following:

Frequent water sprinkling of exposed areas, especially during hot and windy days, will be undertaken to minimize re-suspension of dust. Controlled wetting of the exposed cleared site can reduce the amount of dust generated during project construction. Spraying causes the dusts to be waterlogged so it will be done at periodic intervals. Also, regular disposal of spoils will be conducted while the indisposed spoils will be covered with canvass or placed in sacks to prevent or minimize dust particle dispersion.

Whenever practicable, vegetation clearing will be avoided to limit exposed areas. Areas where activities have been completed will be re-vegetated.

5.1.2 Noise Management

Noise level is expected to slightly increase during the construction phase of the project. To mitigate this, it is recommended that sources of noise be provided with mufflers or noise suppressors.

Limit the operation activities during the daytime period (7 A.M.-6 P.M) where fewer people will be disturbed.

5.1.3 Water Quality Management

Expeditious storage and disposal of used oil and lubricants used in servicing heavy equipment and other equipment during the construction of the facilities will minimize, if not eliminate, oil and grease contamination of the receiving bodies of water.

5.1.4 Socio-Economic, Public/Occupational Health

Contractors will be encouraged to give priority to qualified residents of area when hiring workers and employees. Next priority will be residents of surrounding barangays, then of the adjacent municipalities.

The Environmental Protection Contractor (EPC), in coordination with LGU, will be expected to formulate its hiring policy with regards to local residents. It will be encouraged to put into writing specific policies to indicate priority given to local residents at the same time that it maintains its standards by requiring certain qualifications to fill up specific positions.

The EPC contractor will also be encouraged to source construction material, equipment and services locally.

Implementation of Project Related Activities

The community relations' office will liaise with the recognized leaders of the community and develop its own community program. Said office will liaise with the leaders of the community and address community concerns by assuming the following functions:

Organizational support and assistance to the barangay activities.

Information, education and communication (IEC) campaign of issues related to construction activities and environment related matters

Adequate supply of potable water will be supplied in all workplaces. This is to mitigate public health impacts during construction and solid wastes generated will be properly managed

Comprehensive guidelines will be developed and a program of action for safety during the construction stage of the project will be drafted and implemented by a safety engineer. Standard operating procedures from civil works will be strictly followed. Company policy will be written down and strictly implemented with provision for a schedule of sanctions in case of violations.

Use of personnel protective equipment (PPE) during the construction period shall comply with the regulations of the Department of Labor and Employment (DOLE). The PPE shall include safety boots, safety hats/helmets, and ear muffs (during pile driving or other potentially noisy operations. DOLE Rule 1080 (Occupational Safety and Health Standards) will be strictly enforced.

Workers' discipline and adherence to occupational safety standards will be emphasized.

Table 5.2 Summary Matrix of Environmental Management

Plan during Operation

– ENVIRONMENTAL ATTRIBUTES	– IMPACTS	– MITIGATION/ ENHANCEMENT MEASURES	– RESPONSIBLE PARTIES
Air Quality	Pollution from vehicle emissions; increased TSP; gas emission;	Compliance with clean air act; landfill gas management	LGU, O & M Contractor
Noise	Noise pollution	Installation of noise barriers; provisions of buffer zone.	O & M Contractor
Water Quality	Potential Groundwater and surface water contamination	Provisions of drainage canal and water treatment plant	LGU, O &M Contractor
Public Health and Safety	Potential health risks to public and workers	Compliance with regulations on health and safety	LGU, O & M Contractor
Socio-Economic, Labor and Employment	Increase employment; increase local income;	Proper management; adherence to development plans	LGU, O & M Contractor

5.2 BRIEF DISCUSSION OF THE ENVIRONMENTAL MANAGEMENT PLAN, OPERATION AND MAINTENANCE PHASE

5.2.1 Air Quality Management

Dust is also a primary problem in landfill operations. This is generated by collection vehicles as well as heavy equipments in the site. To reduce the amount of dust generation, roads must be paved and frequent water sprinkling of the roads must be implemented.

5.2.3 Noise Management

Collection vehicles and operating equipments are the primary sources of noise generation in landfill operations. The site should be surrounded by a buffer zone so that the noise will not disturb the surrounding neighborhood. Also trees can be effective control measures.

5.2.4 Water Quality

The primary contaminant of water quality are the expeditious storage and disposal of used oil and lubricants used in servicing heavy equipment and other equipment during the construction of the facilities will minimize, if not eliminate, oil and grease contamination of the receiving bodies of water.

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5.2.5 Public Health and Safety

During operation, mandatory use of personnel protective equipment (PPE) will be strictly enforced (Rule 1080, Occupational Safety and Health Standards – DOLE) to reduce occupational health hazards. Further, Rules 1090 and 1070 will also be strictly enforced. The former requires employers to undertake specific precautions in handling hazardous materials, provision of material safety information (through MSDSs or materials safety data sheets), including emergency instructions in case of exposure or poisoning. The latter pertains to standards in the physical work environment (noise levels, indoor airborne contaminants, illumination levels, temperature and humidity).

5.2.6 Labor and Employment

During operation as in the construction stage, the O&M contractor will be encouraged to give priority of employment to qualified local residents. At the same time, it will maintain its standards by requiring certain qualifications to fill specific positions.

5.3 ENVIRONMENTAL MONITORING PLAN (EMOP)

This Environmental Monitoring Plan (EMoP) has been formulated to:

Ensure that all emissions and effluents as a result of the project are all in accordance with DENR Rules and Regulations which include but not limited to RA 8749 (Clean Air Act) and PD 984 (Pollution Control Law);

Validate the changes in the various environmental media (principally air, water and socio-economic) as predicted in the impact assessment;

Provide early warning information of unacceptable environmental conditions.

The EMoP will also be the basis of the Multi-Partite Monitoring Team that will eventually be formed once the ECC for this project is issued.

5.3.1 Air Quality and Noise Monitoring

During construction, air quality monitoring will be undertaken at the periphery of the site and at sensitive receptors (e.g. schools and residential areas). The primary aim of the noise monitoring during the construction period is to respect sleeping and resting periods of residents near the construction site

During operation, air quality monitoring will be monitored during dry months only.

Table 5.3 shows the summary of the environmental monitoring plan during construction and operation stages of the project.

5.3.2 Water Quality Monitoring (Surface water and Groundwater)

Water quality monitoring will consist of surface water and groundwater quality monitoring. During construction, surface water quality monitoring will be undertaken at the baseline sampling stations on a monthly basis. Groundwater monitoring will also be conducted on a quarterly basis.

During operation, surface water quality monitoring will be conducted upstream and downstream of the original baseline stations. Monitoring of the ground water will also be monitored.

Table 5.3 shows the summary of the environmental monitoring plan during the construction and operation stages of the project.

5.3.3 Public Health Impact Monitoring

Public health monitoring for the project during construction and operation stage will include but not be limited to the following:

- Annual monitoring of public health indicators (e.g. incidence of acute respiratory illnesses) during project construction

CHAPTER 6 INSTITUTIONAL DEVELOPMENT PLAN

The Institutional Development Plan's main thrust is the establishment of essential structures that will effectively monitor the implementation of the Project's proposed Environmental Management Plan as well as provide the necessary mechanism that will strengthen organizational relationship of the proponent with stakeholders and government agencies.

6.1 ESTABLISHMENT OF A COMMUNITY RELATIONS OFFICE (COMREL)

Pursuant to basic thrusts of DAO 96-37, Chapter 8, a Community Relations Office (CRO) shall be established, staffed and operational.

The Community Relations Office (CRO) is tasked to serve as linkage between proponent and stakeholders. It is also expected to be the venue for all negotiations, complaints and the formulation of systems and policies in the implementation of programs, under the Social Development, to be undertaken in the impact areas. The Office shall be composed of staff skilled in the following areas: public relations, community development and sustainable livelihood development. Part of the role of the Office includes ensuring the effective conduct of IEC Program.

6.2 ESTABLISHMENT OF AN ENVIRONMENTAL UNIT (EU)

The environmental unit shall be headed by an Environmental Officer/Pollution Officer (PO). He/she will be responsible in the implementation of the EMP and EMoP and shall regularly coordinate with DENR and other agencies. The PO will also be responsible for ensuring compliance with other environmental rules and regulations that the DENR may impose on the project. He/she will also assist the head of the CRO in coordinating the activities of the Multi-partite Monitoring Team (MMT).

6.3 ECC COMPLIANCE REPORTING

After the issuance of the ECC, the City of Panabo must ensure that the contractors during the construction and operation stages will comply with the ECC conditions and the approved EMP.

6.4 HEALTH AND SAFETY

The designated Environmental Officer/PCO may concurrently act as the Health and Safety Officer and will undergo necessary training on health and safety. Comprehensive health and safety programs and guidelines will be formulated by the EO/PCO in coordination with other key personnel of the project (e.g. engineering personnel). These guidelines will be made clear to contractors during the construction and operation phases of the project.

Regular health and safety audits shall be conducted in parallel with environmental audits with the aim of continuously improving health and safety practices in the Plant. Likewise, an annual health examination for employees shall also be conducted.

6.5 FORMATION OF MULTIPARTITE MONITORING TEAM

After the issuance of the ECC, a multipartite monitoring team (MMT) will be created to oversee the implementation of the EMP and other activities. The potential members of the MMT are as follows:

- PENRO
- LGU Representative
- Barangay Representative
- TBI Representative
- NGO/PO Representative

The membership in the MMT is indicative and other members can be identified and included once the project is issued an ECC.