
Davao Urban Transportation Development (IN-14) **(Terms of Reference for Master Plan Study)**

1. Background

One of the development strategies in the Davao Integrated Development Program Master Plan is to strengthen the urban function of Davao City as the regional agro-industrial center as well as the southern gateway of the Philippines especially in the content of the BIMP-EAGA cooperation. In particular, development of an efficient urban transportation system for Davao City is naturally an important component of this strategy.

Davao City is located in the southeastern part of the Mindanao Island, the inner part of the Davao Gulf. The City had a total population of 1,006.8 thousand in 1995, the second largest city in the Philippines following Metro Manila. Population growth has been consistently high: 3.37% per annum during 1980-90 and 3.22% per annum over 1990-95. The urbanization ratio was 73.5% in 1990, increased from 45.5% in 1970 and 67.0% in 1980. Population density, averaging 412 per km² for the entire City, varies widely among its 11 districts. It ranged from 15,391 km² in Agudao to 24 per km² in Baguio in 1990.

Recently, the traffic volume in the coastal areas of Davao City has been increasing due to the growth of its population and economic activities. While the City's road network is still inadequate, urbanization has been spreading over suburban areas, while economic activities are still concentrated mainly in the central business district (CBD) of Poblacion. Most people depend on road-based public transport services such as buses, jeepneys, and tricycles. Therefore, traffic congestion is getting worse, especially on road sections connecting the CBD and suburban residential areas.

To strengthen the urban function of Davao City, efficient urban road network and public transport services should be established, including urban arterial roads such as radial, circumferential and coastal roads. Since the demand for public transport services is very large on some major road sections, an urban rail transit system may be more effective.

2. Objectives

The specific objectives of the Study are the following.

- 1) To establish a transportation database system for the urban transportation planning, research and education,
- 2) To formulate a transportation master plan to develop and improve urban road network and public transport system in Davao City and its vicinity with a target year of 2020, and
- 3) To conduct a feasibility study on some selected priority projects to be implemented in a short-term period.

3. Study Area

The Study will cover the entire Davao City and its influence areas if necessary, specifically Panabo, Davao del Norte and Sta. Cruz, Davao del Sur.

4. Scope of Work

In order to achieve the objectives, the Study shall cover the following works.

(1) Survey on existing conditions

- 1) Collection and analysis of existing data and information:
 - Present transportation policies and administrations,
 - Topographic and geological information,
 - Socio-economic indices and existing land use patterns,
 - Laws and regulations, and
 - Basic engineering data and information, including design standards and criteria and construction materials.
- 2) Review of existing relevant plans and programs:
 - On-going/committed/proposed transportation plans and programs, and
 - Land use plan and urban development projects;
- 3) Conduct of traffic surveys:
 - Home interview survey (person-trip survey),
 - Cordonline and screenline survey,
 - Travel speed survey,
 - Intersection traffic count survey, and
 - Public transport utilization survey;
- 4) Conduct of inventory survey on transport facilities such as road, parking and public transport supporting facilities;
- 5) Environmental survey;
- 6) Establishment of transportation database;
- 7) Identification of the problems to be solved; and
- 8) Setting up criteria for planning and designing.

(2) Master plan study

- 1) Establishment of future socio-economic framework;
- 2) Formulation of development strategy including land use pattern to solve the identified problems;
- 3) Formulation of alternative urban development scenarios;
- 4) Forecast of future traffic demand based on transportation models taking into account the demand side management for the urban transportation system;
- 5) Selection of priority urban development scenario;
- 6) Formulation of transportation development master plan related to road, public transport system including rail transit system and other transportation facilities;
- 7) Formulation of traffic management program;
- 8) Formulation of management/operation improvement plan for public transport;
- 9) Formulation of institutional improvement plan for roads and public transport;
- 10) Preliminary engineering design and cost estimation;

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- 11) Initial environmental examination (IEE);
 - 12) Preliminary economic and financial evaluation;
 - 13) Formulation of phased development and investment plans;
 - 14) Overall evaluation and action programs; and
 - 15) Identification of priority projects for the feasibility study;

(3) Feasibility study on priority projects

- 1) Supplemental traffic and engineering surveys;
- 2) Environmental impact assessment (EIA);
- 3) Engineering design and cost estimation;
- 4) Demand analysis;
- 5) Economic and financial estimation;
- 6) Operation, management and maintenance plan;
- 7) Implementation plan; and
- 8) Overall evaluation and recommendation.

5. Implementing Arrangements

The Study shall be carried out by a team of international class experts in close collaboration with relevant government agencies. The following experts will be involved in the Study: (1) team leader/ transport planner, (2) road planner, (3) public transport planner, (4) urban planner, (5) traffic management planner, (6) transport economist, (7) transportation policy specialist, (8) demand forecast specialist, (9) systems engineer, (10) environmental planner and (11) construction engineer/cost estimator.

Relevant government officials will be involved in the entire process of the Study. A steering committee will be set up to discuss and resolve critical issues involved in the Study.

Solar Energy Development Project-SEDP (IN-15a)

1. Background

1.1. Rural Electrification in DIDP Area

Electrification ratio in the DIDP Area averaged at 56.5% in 1996 (connected household base). The ratio varies between the LGUs: 37.6% in Davao Province, 88.5% in Davao City, 43.4% in Davao del Sur, and 71.2% in Davao Oriental. However, these ratios are based on the number of households within the areas covered by the Rural Electric Cooperatives (RECs) and the Davao Light and Power Company (DLPC). Accordingly, actual electrification is likely to be lower than that of the coverage base, e.g., around 40.0% rather than 71.2% in Davao Oriental.

Electrification is a symbol of modern life and nowadays one of the basic human needs. In this context, electrification ratios in the DIDP provinces are very low.

1.2. DIDP Constraints to Rural Electrification

Low electrification ratios in the DIDP provinces are closely connected with the high distribution cost, which accounted for 45-51% of the power prices in the provinces in 1996. The high cost could be attributable to the following.

- Over dependence of power supply of the DIDP Area, i.e., 100 MW installed capacity to 193 MW demand in 1996, resulting in high transmission and distribution cost;
- Lack of critical mass of the electricity user/demand due to less developed economy in most part of the DIDP Area;
- Scattered/sparse distribution of settlements and low household density in rural areas; and
- Low collection efficiency of electricity bills and large system losses in distribution, which combined are both a result of low investment in rehabilitation and maintenance and a hindrance to further investment.

2. Project Concept

2.1. Objectives

The above constraints to rural electrification would not be easily mitigated, particularly because RECs will transform into private stock companies from cooperatives likely to be reluctant to expand the distribution lines to rural/remote areas.

To address such a situation, the Solar Energy Development Project (SEDP) aims to energize rural/remote areas where population density is low and connecting them with grid is costly or not profitable.

2.2. Project Components

Three projects are proposed as follow. These will be applied according to the local conditions and needs.

- 1) Solar Central Battery Charging System
- 2) Separate Solar Household System
- 3) Solar Water Pumping System

3. Project Description

(1) Solar Central Battery Charging System (SCBCS)

Use of solar energy has become active recently in the DIDP Area. In Calinan, a remote barangay in Davao City, around 65 households out of 200 are currently using a solar central recharging station system. The SPV credit package with battery, lamps and wires costs ₱5,500 paid in five-year installment. Another one is undertaken by NPC, which shows even better prospect. This system is so economical that it only costs farmers ₱265 per month, including monthly installment payment.

The central battery system proposed here could support around 20 households each with 3 lights running 3-4 hours a day. Monthly operation cost is ₱40 (₱20 per charge). This system is so economical that it only costs farmers ₱253 per month (including monthly installment payment). The loan term is assumed at the market rate of 12% for ten years. With this low cost, many households in the DIDP Area could access to electricity (Table 1).

Table 1 A Comparative Analysis on Kerosene Lamp-Solar

				Households served: 6,000			
(1) Solar Central Battery System				(2) Kerosene Lamp			(1 - 2)
Year	Capital Cost	Operation Cost	Total Cost	Capital Cost For PL	Kerosene	Total	Net Benefit
1999	\$2,175,000	\$454,559	\$2,629,559	\$300,000	\$756,000	\$1,056,000	-\$1,573,559
2000		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2001		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2002		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2003		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2004		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2005		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2006		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2007		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2008		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2009		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
2010		\$454,559	\$454,559		\$756,000	\$756,000	\$301,441
Total	\$2,175,000	\$5,454,710	\$7,629,710	\$300,000	\$9,072,000	\$9,372,000	\$1,742,290

Note:1/ Exchange Rate \$1= P 40

Note:2/ Unit Cost of Kerosene Lamp

Cost of Pressure Lamp (PL) in \$ (Two per household) 50.00

Consumption of Kerosene per lamp, per Month (Liters) 60

Cost per month, P 7/Liter Kerosene= \$0.175 \$11

Cost per Year per household \$126

Total Monthly Fee in Peso (household) 420

Note:3/ Unit Cost and Monthly Fee of Solar Central Battery System and Components

Cost per Household

Cost of 3 Lights, Wire, Battery (hh/Peso) 7000

4 Panels, 75 Wp, Installations, AH counter, Wires/20 households (hh/Peso) 7500

Total (hh/Peso) 14500

Total in US\$ \$362.50

Spread into 10 years, Monthly Payment with market interest rate of 12% \$5.20

Salary per month \$0.05

Rent for House \$0.06

Monthly battery charge fee in US\$ \$1.00

Total Monthly Fee \$6.31

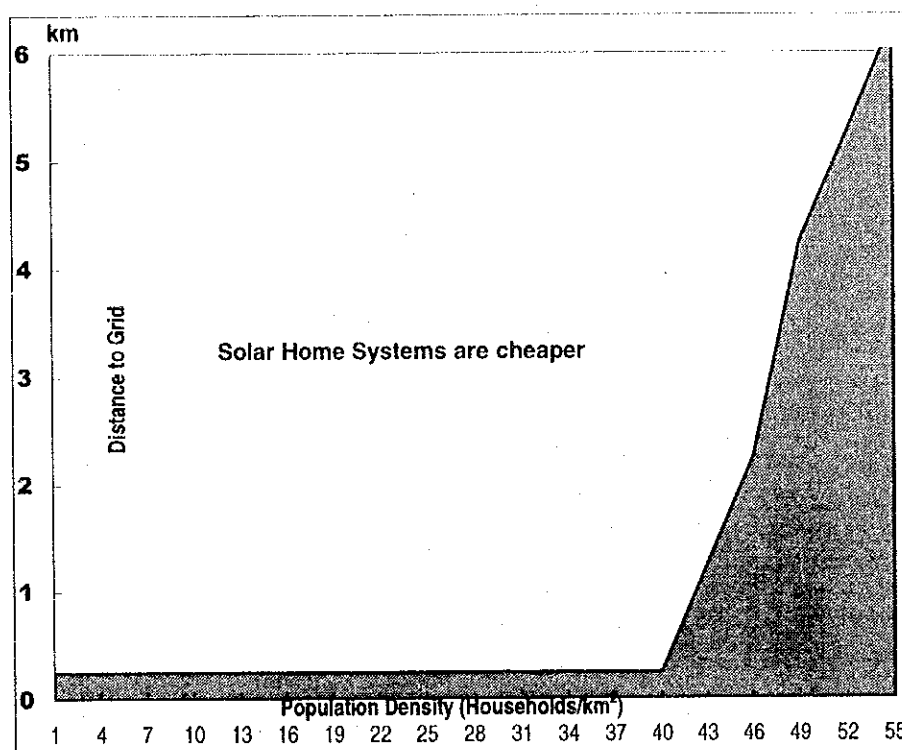
Total Monthly Fee in Peso (household) 253

EIRR 15%

NPV at 10% \$349,379.43

Source: JICA Study Team

Figure 1 Cost Comparison on Grid Extension and Solar Home System (70 W peak) in DIDP Area



Assumptions:

Generation Cost	0.06575 \$/kWh			
Network Costs				
- MV Line Cost	7936 /kmc			Life 25 years
- LV Line Cost	5267 /kmc	Length needed	5 km/km ²	Life 25 years
- Dist.Trans. Cost	41.92 /kVA	Requirement	0.3 kw/hh	Life 15 years
		Min. Size	25 kVa	
Household consumption	6.30 kwh/month, =(70w)X(30 day)X3 hour/day)			
Number of Household to be served (household per village)	300 households			
SHS Amortized Cost	6.31 /month			
Population Density in the Philippines	240 hh/km ²			
Population Density in DIDP	167.19028 hh/km ²			
Population Density in Davao Oriental	80 hh/km ²			
Population Density in Del Monte, New Corella, Davao	14.934498 hh/km²			
Distance to the nearest electricity grid	12 km			
Average Monthly Income	\$125.00 hh/month			

Source: JICA Study Team

To start up 300 systems for 6,000 households, a total cost and loan amount of ₱87 million (US\$2.175 million) will be needed. The monthly payment for each farmer's household will be ₱253 or \$6.31. A comparative study has been conducted between solar lights and kerosene pressure lamps per household—here the Study assumed three (3) solar lights against only two (2) kerosene lights, the most basic lighting needs in rural household. The solar lights are still cheaper than the kerosene light alternative (₱420 per month), without considering the direct and indirect environment and health benefits. The Economic Internal Rate of Return (EIRR) for this component is 15%, showing very promising potential for this solar project (Table 1).

Table 2 Base Data and Inputs on Cost Comparison on Grid Extension VS Solar Home System (70 W peak) in DIDP Area

		Input Values Shown in <input style="width: 50px; height: 15px;" type="text"/>
ASSUMPTIONS		
DISCOUNT RATE		<input style="width: 50px; height: 15px;" type="text" value="10%"/>
MV LINE		
Cost(1)	<input style="width: 50px; height: 15px;" type="text" value="7,936"/>	/kmc
Length Needed	<input style="width: 50px; height: 15px;" type="text" value="3"/>	km
Life	<input style="width: 50px; height: 15px;" type="text" value="25"/>	years
LV LINE		
Cost	<input style="width: 50px; height: 15px;" type="text" value="5,267"/>	/kmc
Life	<input style="width: 50px; height: 15px;" type="text" value="25"/>	years
Length Needed	<input style="width: 50px; height: 15px;" type="text" value="5"/>	km/km ²
Distribution Transformer		
Cost	<input style="width: 50px; height: 15px;" type="text" value="42"/>	/kVA
Life	<input style="width: 50px; height: 15px;" type="text" value="15"/>	years
Need	<input style="width: 50px; height: 15px;" type="text" value="0.3"/>	kw/hh
Power Factor	<input style="width: 50px; height: 15px;" type="text" value="0.8"/>	
Need in kVa	0.375 kVa/hh	
Minimum Size	<input style="width: 50px; height: 15px;" type="text" value="25"/>	kVa
Minimum Cost	1048	
Generation		
Generation Cost	<input style="width: 50px; height: 15px;" type="text" value="0.06575"/>	\$/kWh
Household		
Consumption	<input style="width: 50px; height: 15px;" type="text" value="6.3"/>	kwh/month, =(70w)X(30 day)X3 hour/day)
Annual	75.6 kwh/year	
Annual Generation Cost	4.97 US\$/year	

Solar Costs
 Monthly \$6.74 /month
 Annual Solar Cost \$80.89
 (refer to Table 1 :Central Battery)

Exchange Rate
 1 US\$= Peso 40

Note: 1/ MV line cost uses three phase at P 317,451/km (\$7936/km)
 Note: 2/ The International Experience is \$10,000/km in Indonesia and \$21,687/km in China.
 Note: 3/ Data on line extension and household consumption are provided by DLPC and data on solar unit are from Business Center Davao.

(2) Separate Solar Household System (SHS)

This component is proposed for rural households with relatively higher income. This system consists of: (1) one or more photovoltaic (PV) panels with an output of 75 Wp or more, (2) a battery with a minimum capacity of 70-Ah, (3) a battery charge/discharge controller, (4) at least three fluorescent lights, and (5) related components such as wires, switches, and mounting hardware. The difference between this system and the Central Battery Charging System is that households using SHS could run television or radio.

This components will also be implemented by a rural cooperatives. Basic training may be necessary for the installation and maintenance of the SHS systems. Some 300 units are proposed for the subsidized systems while mobilizing foreign funds. A total US\$ 70,000 is budgeted, among which \$67,000 is for the subsidies to the 300 units and \$3,000 is for the training. A preliminary Solar-Grid Connection Switch Study has been done which shows the economical aspect of SHS in the DIDP Area when the village is 2 km away from the grid and the population density is below 22 households per km² (Figure 1 and Table 2).

(3) Solar Water Pumping System

Two systems are currently under operation in the DIDP Area. One is in Upper Malinao,

Davao del Sur, which is scheduled to serve 500 households. The system consists of 32 panels, costing ₱ 700,000 per system. The system has a capacity of 1.7 kWp, and pumps around 30 m³ of water with three to four hours' sunlight. The second one is under NIA, with 24 panels, costing ₱ 400,000 per system which will serve to irrigation and domestic purpose. New solar pumps (10) should be introduced in island and isolated areas for portable water and irrigation use, at ₱40,000 per system, or \$10,000 in total amount.

4. Project Implementation

4.1. Project Schedule/Cost

Schedule and cost of the project are summarized in Table 3. Targeted number of households will amount to 42,000 during 1999-2016 for the Solar Central Charging System and the Separate Solar Household System, respectively. The total 84,000 households correspond to around 20% of the total households of 440,000, estimated based on 2.2 million rural population in 2016 (refer to Annex, Spatial/Infrastructure Sector Report). One-third of the households, 14,000 households will be energized by the solar system during each phase. As for solar water pumping system, it is assumed that four systems (two system for ₱700,000 per system and two system for ₱400,000 per system) will be installed every year.

Table 3 Project Schedule and Cost of Solar Energy Development Project

	Cost (Pesos)		Purpose of Use		Project Target	
Solar Central Battery System	14,500	Per Household	For lighting		42,000 Household	
Separate Solar Household System	15,450	Per Household	For lighting and TV/radio		42,000 Household	
Solar Water Pumping System A	700,000	Per System	For portable water		36 System	
Solar Water Pumping System B	400,000	Per System	For irrigation etc.		36 System	

	Project Target and Phasing				Cost (P million)			
	Total	Phase 1	Phase 2	Phase 3	Total	Phase 1	Phase 2	Phase 3
Total					1,297.5	432.5	432.5	432.5
Solar Central Battery System	42,000	14,000	14,000	14,000	609.0	203.0	203.0	203.0
Separate Solar Household System	42,000	14,000	14,000	14,000	648.9	216.3	216.3	216.3
Solar Water Pumping System A	36	12	12	12	25.2	8.4	8.4	8.4
Solar Water Pumping System B	36	12	12	12	14.4	4.8	4.8	4.8

Note: Cost is capital cost, not including operation cost.

Source: JICA Study Team

Thus, cost for the rural electrification in the DIDP Area by the solar systems will total ₱1,298 million during 1999-2016.

4.2. Institutional Arrangements

The above three projects will be implemented by respective agencies/organizations: the Department of Energy and USEP Renewable Energy Center will be in charge of technical assistance. The Davao Business Center (BCD) and a Rural Cooperative Bank will provide financing mechanism, and RECs will assist in implementation. In case of the Separate Solar Household System, basic training may be necessary for the installation and maintenance. Some 300 units are proposed for the subsidized systems while mobilizing foreign funds. A total US\$ 70,000 is budgeted, among which \$67,000 is for the subsidies to the 300 units and \$3,000 is for the training.

A creative loan structure is expected to cover the initial cost of the projects. International soft loan could be used to channel the fund to an intermediate agency as

part of a nation-wide project or a separate regional project (i.e., OECF's two step loan to a cooperative bank).

An alternative funding source of the fund is the World Bank IBRD loan subsidized by the Global Environmental Facility Fund (GEFF). The intermediate agency will on-lend the loan to farmers which would form cooperatives to borrow the money and implement the project at a market rate. The loan will be repaid in ten years, and the cooperative bank could use the repaid loan and proceeds to finance new projects. BCD will be an ideal implementation agency.

As a part of a broader effort in rural development, this project will interact with the Eco-Energy Park Project (Project No. IN-17) in providing solar peak power as complement to the whole system, and with the Sarangani Renewable Energy Island Project in providing various solar system to rural hospital/health clinic and solar pumping.

In view of sustainable and environment-friendly energy development, this project will be implemented in line with a DIDP renewable energy development plan as a guideline to be formulated by a renewable energy development council under strengthened DIDP PMO, consisting of concerned agencies, LGUs, RECs, NGOs etc.

SWIM Expansion Project (IN-18)

1. Background

The availability of water in some rural areas and small towns in the DIDP Area is constrained by peninsular, mountainous and rolling topography. These areas are deprived of irrigation water, drinking water, and electrical power, while suffering from periodical flash flood. Upper watershed areas of many small rivers have been degraded by improper land use and management. The Project is intended to expand the application of Small Water Impounding Management (SWIM) with the view to increasing water availability and improving the upper watershed areas.

According to the definition in the Philippines, a SWIM stands for a project accommodating small scale dams with a height of not more than 30 m and a storage water volume not exceeding 50 million m³. The SWIM schemes in the DIDP Area are planned for multiple purposes including flood mitigation, irrigation, domestic water supply, and if applicable, hydropower generation, fish production and recreation. Each SWIM scheme should contain, as a component, the improvement of upper watershed areas.

2. Objectives

The Project is to furnish currently deprived areas with minimum infrastructures in the short-run and the long-run, aiming:

- To improve water availability in rural areas and small towns for multiple purposes (flood control, water supply for living and irrigation, hydropower generation and so on), and
- To preserve and improve small river basins.

3. Project Description

3.1. Project Scope

(1) Project site

A SWIM scheme shall be more extensively applied in the areas located in relatively small watersheds without available groundwater sources and often suffering from flash floods, not only for irrigation water supply, but also for flood control, drinking water supply, etc.

NIA has already launched a series of SWIM projects intended mainly to supply irrigation water. The candidate sites of SWIM project proposed here will be selected, taking into account of the needs for flood prevention, drinking water supply, hydropower generation, etc. The candidate sites for the Project, which are identified through the Study, are shown in Table 1 and Figure 1. Besides these, while the detail data and information thereof have not been available yet, a number of SWIM candidate sites have been recognized.

Actual Project sites should be selected by a set of criteria including geological and geographic characteristics, acuteness of various water-related problems and environmental conditions.

Of those mentioned above, based on the extent of necessity, the economic rate of return of each scheme and, in some cases, the MBN (Minimum Basic Needs), a certain number of the Project will be implemented at an early stage as the priority projects.

Table 1 Salient Features of the Candidate SWIM Project Sites

No.	Project Name	Project Site		Project's purpose				Watershed (ha)	Reservoir Volume (m ³)	Remarks
		Municipality	Barangay	Flood Control	Irrigation	Water Supply	Hydropower			
Davao Oriental										
1	Dapnan SWIM	Baganga	Dapnan San Ishidoro, etc.	√	√			120	100,000	Flood control of 5-return year 200 ha of irrigated area
2	Bitanagan SWIM	Mati	Don Martin Marundan	√	√			200	150,000	Flood control of 5-return year 500 ha of irrigated area
3	Dumago-Oc SWIM	Gov. Generoso	Sergio Osmena Crispin, etc.	√	√			100	250,000	Flood control of 5-return year 400 ha of irrigated area
4	Sumlog SWIM	Lupon	Limbahan	√	√			500	200,000	Flood control of 5-return year 400 ha of irrigated area
5	San Roque SWIM	San Ishidoro	Tagboa, etc	√	√			500	200,000	Flood control of 5-return year 400 ha of irrigated area
Compostela Valley										
6	Linoan SWIM	Montevista		√	√					150 ha of irrigated area
Davao de Norte										
7	Binansian SWIM	Asuncion		√	√					50 ha of irrigated area
8	Sonlon SWIM	Asuncion		√	√					45 ha of irrigated area
Davao del Sur										
9	Blucon-Albatana SWIM	Magsaysay	San Isidro		√	√			28,000	300 ha of irrigated area
10	Bila SWIM	Matanao	San Miguel	√	√				5,200,000	100 ha of irrigated area
11	Matanao-Padada SWIP	Matanao	New Kaputian		√	√			8,133,000	2000 ha of irrigated area
12	Mal SWIM	Matanao	Asbang	√	√				8,340,000	2230 ha of irrigated area

Source : Compiled by JICA Study Team based on the information provided by Provincial Planning and Development Office.

(2) Project components

The SWIM project is comprised broadly of a component combined works by the provision of dam and reservoir, irrigation water supply, flood control, domestic water supply, hydropower generation, inland fishing as well as watershed protection. The project components will be chosen in consideration of necessity and feasibility by project site.

Dam and reservoir construction

Earthen small-scale dams will be constructed. Dam and reservoir construction sites will be selected according to specific criteria conditioned by: i) geological and geographical characteristics of dam and reservoir construction, ii) hydrological dependability for sufficient water yield, and iii) environmental impact around the submerged area.

The reservoir constructed will contribute to the mitigation of flash flood by the cut-off of run-off peak flow, while storing water for irrigation, domestic water supply, etc. It may be used for inland fishery and recreation activities in some cases.

Irrigation facilities

Irrigation water will be supplied from the reservoir. Trunk channels and lateral channels will be constructed to transport and distribute irrigation water into agricultural lands.

Domestic water supply facilities

Water stored in the reservoir will be utilized for domestic water where groundwater is not available. In order to purify, disinfect and distribute water for domestic use, small-scale water treatment facilities, conveyance/distribution pipes and other necessary

appurtenances will be equipped.

Hydropower generation facilities

Water stored in the reservoir will be used for hydropower generation in areas currently deprived of electricity. In such areas, mini-hydropower generator and electrical distribution lines with necessary appurtenances will be equipped.

Watershed management

To reserve the upper watershed of the Project sites, the watershed management will take place in the manner of the community-participatory activities. It will include nursery, plantation, the construction of forest road networks, and forest protection and maintenance, etc. This is the project component for which strong and extensive community-participation is essential.

Other provisions

Inland fishery facilities and recreation facilities will be provided, if they are required and feasible.

3.2. Implementation Schedule

The Project is envisioned to be proceeded according to the following step-wise phasing:

Phase I (1999-2000) : Engineering study and feasibility study and detail plan of selected priority sites,

Phase II (2001-2004) : Implementation of the selected priority project sites, and

Phase III (2005-2016) : Implementation of the remaining sites.

3.3. Institutional Arrangement

In irrigation, NIA (including BSWN functioning as an agency) is working as responsible body. Meanwhile, LGUs (provincial and municipal governments) are responsible for flood control and water supply. Because the SWIM project is of multi-purpose by nature, various units are concerned in the Project. For coordinated and efficient implementation, it is recommended that a sole representative unit for the project execution be organized in the DIDP Area including concerned parties.

In order that the Project is implemented economically and self-consciously, the community participation should play an important role in the Project throughout planning, implementation and operation.

4. Project Assessment

4.1. Project Cost

The project costs required for the implementation in each phase are roughly estimated as follows:

Phase I (1999-2000) : ₱10 million

Phase II (2001-2004) : ₱24 million

Phase III (2005-2016) : ₱80 million

4.2. Expected Benefit

The Project is envisioned to provide wide-range benefits to the project areas, resulting from flood protection, domestic water supply for irrigation and living, hydropower generation etc.

The irrigated agricultural land would contribute directly to the increase in agricultural produce. The cut-off function of runoff peak by the reservoir would prevent or alleviate flash flooding in the downstream area. As a result of the betterment of environment sanitation by safe living water supply, the living standard should be significantly improved.

5. Recommended Action

At the moment, the candidate SWIM sites meeting the multi-purpose nature of the Project have not been examined yet in sufficient detail. It is recommended that the adequate inventory for the candidate SWIM sites is worked out as the first step.

The upstream area of the subject river would be submerged by the completion of the dam and reservoir. The initial evaluation of the impacts in terms of natural and social environment should be initiated in the project area, especially in areas to be submerged.

Because the Project requires huge investment cost over long term, this may cause an excessive financial burden in the Central Government and LGUs. A possible solution to this is to apply proper selection of priority projects and to be technically and financially aided by ODA.

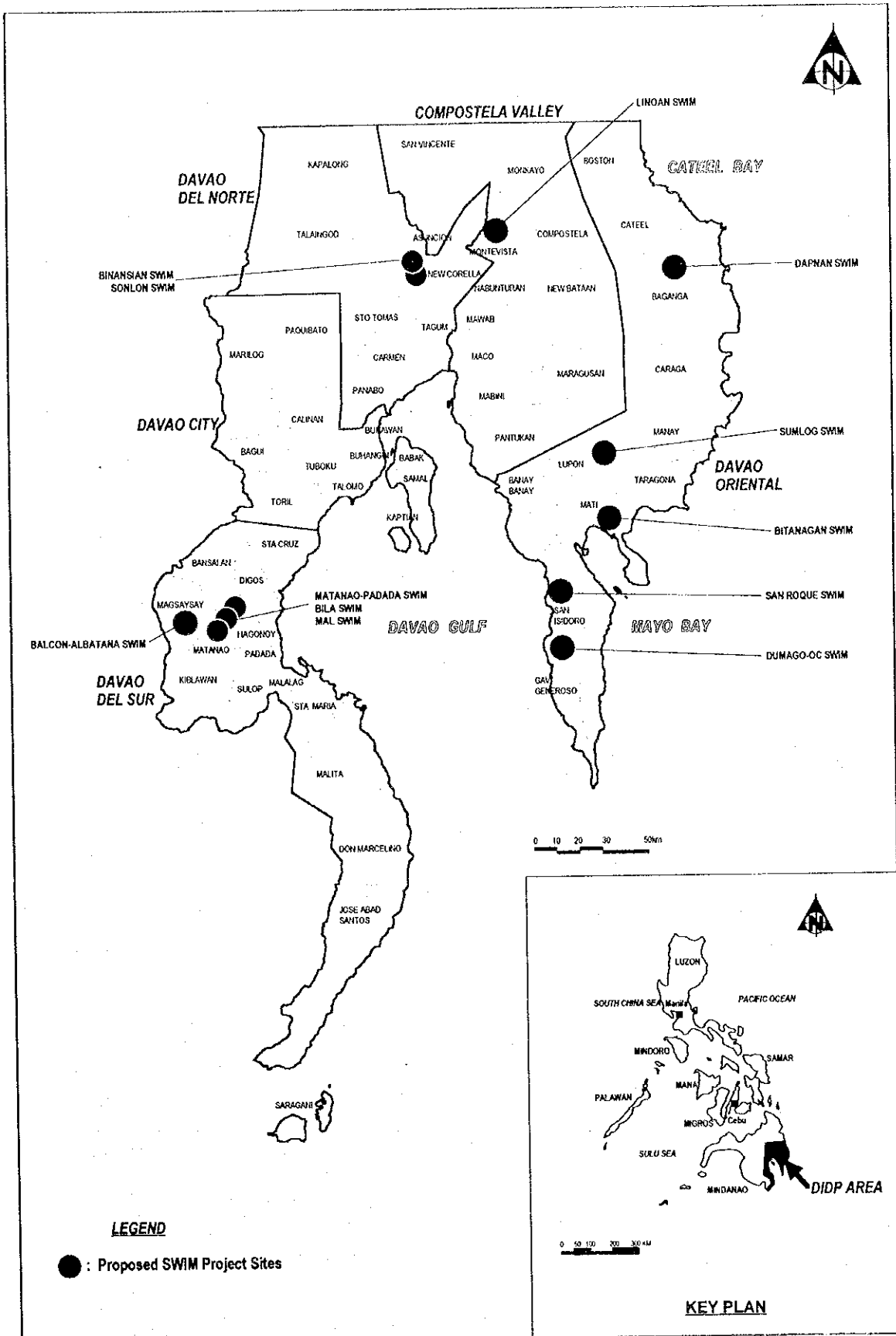


Figure 1 Location of this SWIM Projects

Davao City Comprehensive Flood Control and Drainage Development Program (IN-20)

1. Background

Davao City has experienced unprecedented growth since 1980 due to a favorable business climate with its natural and economic advantages. The growth has brought about the expansion of the central business district and commercial/residential complexes and the uncontrolled sprawl of the urban area. Since then, Davao City has been facing serious incidence and recurrence of land development related flooding which has caused undue inconveniences, health-related problems, and damages to life and properties. Outdated and insufficient urban stormwater drainage and, in some occasions, lowered river flow capacity due to meanderings and heavy silting are main causes for such substandard situation.

Cognizant of flooding problems, Davao City embarked in the early 1980s a rational development plan of its urban drainage system under the Regional Cities Development Project funded by external loans made through the National Government. The main drains and laterals in the Poblacion area were built and other channels improved. Existing natural drainage ways or creeks were also rebuilt into major drainage channels. With rapid urbanization, however, the existing drainage system is far from satisfactory levels.

The City government initiated in 1996 the Master Plan Study of Davao City Urban Drainage and Flood Control focusing on stormwater drainage for internal stormwater discharge in the urban area. The City government earmarked around ₱130 million out of a Land Bank loan as local fund but this is not enough to implement all of even the priority elements for the short term implementation.

The Project, accommodating the Urgent Drainage Rehabilitation Project (IN-20a) which is regarded as the top priority, is intended to address the short-term and long-term measures for the improvement and development of stormwater drainage and flood control.

2. Objectives

The project is to provide such comprehensive measures as ranging from structural to nonstructural categories for the urban area of Davao City, aiming:

- To provide an extensive stormwater drainage system,
- To furnish a river control system to minimize erosion and overbank flow of rivers and waterways, and
- To provide a variety of run-off easements including nonstructural measures, such as plantation, the setup of land use plan and the promotion of rainwater infiltration.

3. Project Description

3.1. Project Scope

(1) Project area

The Project area covers the following three drainage basins in the urban area of Davao City with a total area of 35,200 ha as shown in Figure 1:

Zone I : In the south, the areas covering Toril District along the alignment of

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- Marapangi Creek and portions of Tugbok and Calinan District (12,900 ha),
- Zone II : Along the alignment of Talomo River, covering the area of Matina Pangí, Matina Aplaya, Langub, Maa and Talomo Proper (12,900 ha), and
- Zone III : Along the alignment of Davao River covering the areas of Poblacion, Agdao, Buhangin, Tigatto, Pampangá, Sasa and Panacan up to the alignment of Ilang River in the north (9,400 ha).

In these drainage basins, major causes of inundation and flooding were identified as follows:

- Adverse topography with a large low-lying areas (near or below mean sea level) that are prone to flooding,
- Insufficient flow capacity of rivers flowing in the basins due to heavy meandering and silting'
- Swollen rivers that cause backwater effect on the main drains falling into rivers,
- High tides that reduce the hydraulic gradient of the main drains going out to the Davao Gulf,
- Simultaneous occurrence of high tides and downpour,
- Inadequate or absence of laterals (collection lines) to main drains,
- Clogging or siltation in drainage lines that reduces flowing area and hydraulic capacity,
- Disposal of garbage or domestic refuse into drainage ways and waterways, and
- Encroachment by estate developers on natural waterways or floodways.

(2) Ongoing project

The Davao City Urban Drainage and Flood Control Project is ongoing. It is envisioned to upgrade and rehabilitate the existing structures in the 25 priority sites in low-lying areas where urgent alleviation are needed, as summarized in Table 1 and shown in Figure 1. This ongoing project is also aimed to formulate a master plan which provides the rational basis to address the impact of rapid urbanization and complements the City's Comprehensive Development Plan for the Year 1996 – 2021.

The finance funded locally for the ongoing project is reported to be not enough for the execution of all priority components identified currently.

(3) Project components

Urgent structural measures

The first stage will consist of urgent structural measures to meet needs for immediate alleviation for serious and habitual flooding, such as: i) remaining priority projects out of the ongoing 25 priority drainage projects, and ii) urgent projects identified in the ongoing Davao City Urban Drainage and Flood Control Project.

Stormwater drainage

The rehabilitation of existing drainage and the construction of new stormwater drainage will take place in the whole drainage basins, based on the results of review study on the ongoing Davao City Urban Drainage and Flood Control Project. This will include the following six growth centers in which there are frequent flooding: Lizada, Matina,

Aplaya, Maa, Dumoy, Buhangin Proper, and Panacan, as shown in Figure 1. The salient features of these projects are summarized in Table 2.

River control

Necessary and proper measures for flood control will be undertaken along the rivers, such as Matina, Talomo, Puan, Bago-Oshiro and Davao rivers flowing down in the Project area. Structural measures will include dike constructions, channel improvements, short-cut channel constructions and retention ponds which will be planned in due consideration of the improvement of the urban river environments, if necessary and feasible.

Among river control measures, a short-cut channel construction at the downstream of the Talomo river has been identified as urgent project in a previous study. The physical alignment of the Talomo river as it approaches its mouth in the Davao Gulf shows a meandering course characterized by sharp bends and acute curvatures, rising water elevation and increasing its velocity to unpredictable levels. These factors are mainly responsible for excessive overflowing along both banks of the river causing widespread flooding in the most densely built-up area situated at the river's lower end. The measure by the short-cut channel construction with nearly 300 m in length has been proven to be effective and efficient way in some previous study.

Table 1 Priority Urban Drainage Works in the Ongoing Project

No.	Site	Drainage Line	Drainage Length (m)
1	Bayab's crossing	From Toril, Daliao, Lizada main drainage channel	2,100
2	Puan	From Ulas Talomo main drain	1,500
3	Royal Valley road	From MacArther Highway to Talomo River	700
4	Sto. Nino drainage	From MacArther Highway to Matina Apalaya, to Matina River	1,000
5	Kawayan road	From MacArther Highway to Matina Apalaya, to Matina River	1,500
6	Quimpo blvd	From Davao executive homes to existing cross drain	1,100
7	Quimpo blvd	From PWU road to existing cross drain near Acacia road	600
8	Tulip Drive	From MacArther Highway to Quimpo blvd to Times beach	1,946
9	Bolton	From Magallanes to Davao River	650
10	Rizal extension	From Simeon de Jesus to Davao Gulf	500
11	AMA/Dona Vicenta	From Mabini ext. to Davao River	900
12	Mabini	From F.Torres street to Quirino ave.	500
13	Sta. Ana avenue	From Damazo Suazo to Pier	800
14	Suazo-SIR road Lot Puapi	From Ponce to Davao Gulf	700
15	Roman Magsaysay ave	From L.Guerrero to Magsaysay park to Davao Gulf	1,132
16	Lizada St. /Mini Forest	from Ramon Magsaysay ave. to Davao Gulf	328
17	Mapa / J.P.Laurel	From Jacinto ext. to J.P. Laurel ave.	1,654
18	N. Torres ext.	From J.P. Laurel ave. to Velso street	613
19	Jacinto ext.	From F. Torres to Ponciano st.	563
20	Castillo	From Tancotian to Ducudao ave.	808
21	Tancotian road	From Bolcan st. to R. Castillo, to Davao Gulf	-
22	Park Avenue	From Maya-maya, Holy cross to Davao Gulf	800
23	Belsario Village road	From Belsario - R. Castillo to Davao Gulf	780
24	Lanang executive drainage	From J.P. Laurel ave. to Gerome st.	498
25	Laurel ave.	From Mamay road to Bayside road	3,500

Source : Davao City Urban Drainage and Flood Control Project (August, 1998)

Run-off easement measures

Non-structural measure will be launched by a diverse methods for run-off easement scheme in the long-term. Among them are the forest reservation by plantation in the

upper water basin, the setting of adequate land use planning to keep adequate greenery area in the urban area and the promotion of rainwater infiltration by the introduction of infiltrable pavement, especially in the urban center.

3.2. Implementing Schedule

The project is envisaged to be proceeded according the following step-wise phase:

Phase I (1999-2004) : Construction works of some priority projects and selected urgent projects which will be identified in the review of the on going Davao City Urban Drainage and Flood Control Project, and engineering study of comprehensive master planning including feasibility and analysis, and

Phase II (2005-2010) : Implementation of stormwater drainage facilities, river flood control measures and non-structural measures.

Table 2 Salient Features of Stormwater Drainage Works in Davao City

Drainage System	Line No.	Size of Main drainage	Length of Drainage (m)	Service Area (ha)
Lizada, Toril District	No.1 Line	Canal 1.5 - 4.5 mWidth RC Box 2.6 mWidth	6,300	315
	No.2 Line	Canal 2.5mWidth RC Box 2.9mWidth		
Dumoy, Toril District	No.1 Line	Canal 1.0 - 2.5 mWidth RC Box 2.9 - 3.2 mWidth	12,900	566
	No.2 Line	Canal 2.0 - 3.25 mWidth RC Box 1.95 - 2.45 mWidth		
	No.3 Line	Canal 1.0 - 2.25 mWidth RC Box 2.0 mWidth		
Malina Aplaya, Talomo District	No.1 Line	Canal 3.0 - 3.75 mWidth RC Box 1.9 - 2.6 mWidth	8,200	497
	No.2 Line	Canal 1.0 - 4.0 mWidth RC Box 2.7 mWidth		
	No.3 Line	Canal 2.25 - 2.5 mWidth RC Box 1.65 mWidth		
Maa, Talomo District	No.1 Line	Canal 1.5 - 4.5 mWidth RC Box 2.75 mWidth	7,450	834
	No.2 Line	Canal 2.75 - 7.0 mWidth RC Box 2.5 - 3.1 mWidth		
Buhangin Proper, Buhangin District		Canal 2.5 - 3.5 mWidth	2,010	1,000
Panacan, Bunawan District	No.1 Line	Canal 1.75 mWidth	3,010	95
	No.2 Line	Canal 1.0 - 2.75 mWidth		

Source : Davao City Urban Drainage and Flood Control Project (August, 1998)

3.3. Institutional Arrangement

Davao City will be involved directly in the Project, because the Project area lies down in Davao City. Meanwhile, some portions of the structural measures such as drainage along national highways and anti-flooding measures with major river belong to DPWH. In the light of efficient and smooth implementation, a sole representative unit for project execution should be organized, including Davao City and DPWH. Through the representative unit, well-coordinated cooperation between institutions concerned would be conditioned over the period of planning, construction and maintenance/operation.

4. Project Assessment

4.1. Project Cost

The project costs in each phase required for the implementation of the Project are roughly estimated at:

Phase I : ₱450 million, including some P 15 million of the top priority, projects,
and

Phase II : ₱250 million

4.2. Expected Benefit

A series of measures undertaken under the Project would prevent or alleviate flooding in the Project area. By the adequate provision of stormwater drainage and flood control measures, infrastructure facilities such as road, bridges, electricity cables and transport piping of water supply would be saved from damages. Damages of such properties as houses, furnitures and appliances caused by inundation and submersion also would be saved by the Project.

In addition, as a result of the betterment of environment sanitation, the incidence of water-born diseases would be significantly reduced. The economic benefits of the Project include the man-hours to be saved by employees who have been absent if they got sick due to water-borne diseases brought by floods.

5. Recommended Action

The ongoing Davao City Urban Drainage and Flood Control Project has proposed a series of required countermeasures in terms of stormwater discharge. In the Phase I of the Project, the review and additional study from the viewpoint of the river control and the effect of backwater thereof should be examined to formulate more comprehensively effective and efficient planning for drainage and flood control in the Project area.

Davao City may face excessive financial burden in required huge investment for the Project over the whole phase. A solution to this is to apply the proper selection of priority projects and to be technically and financially aided by adequate ODA.

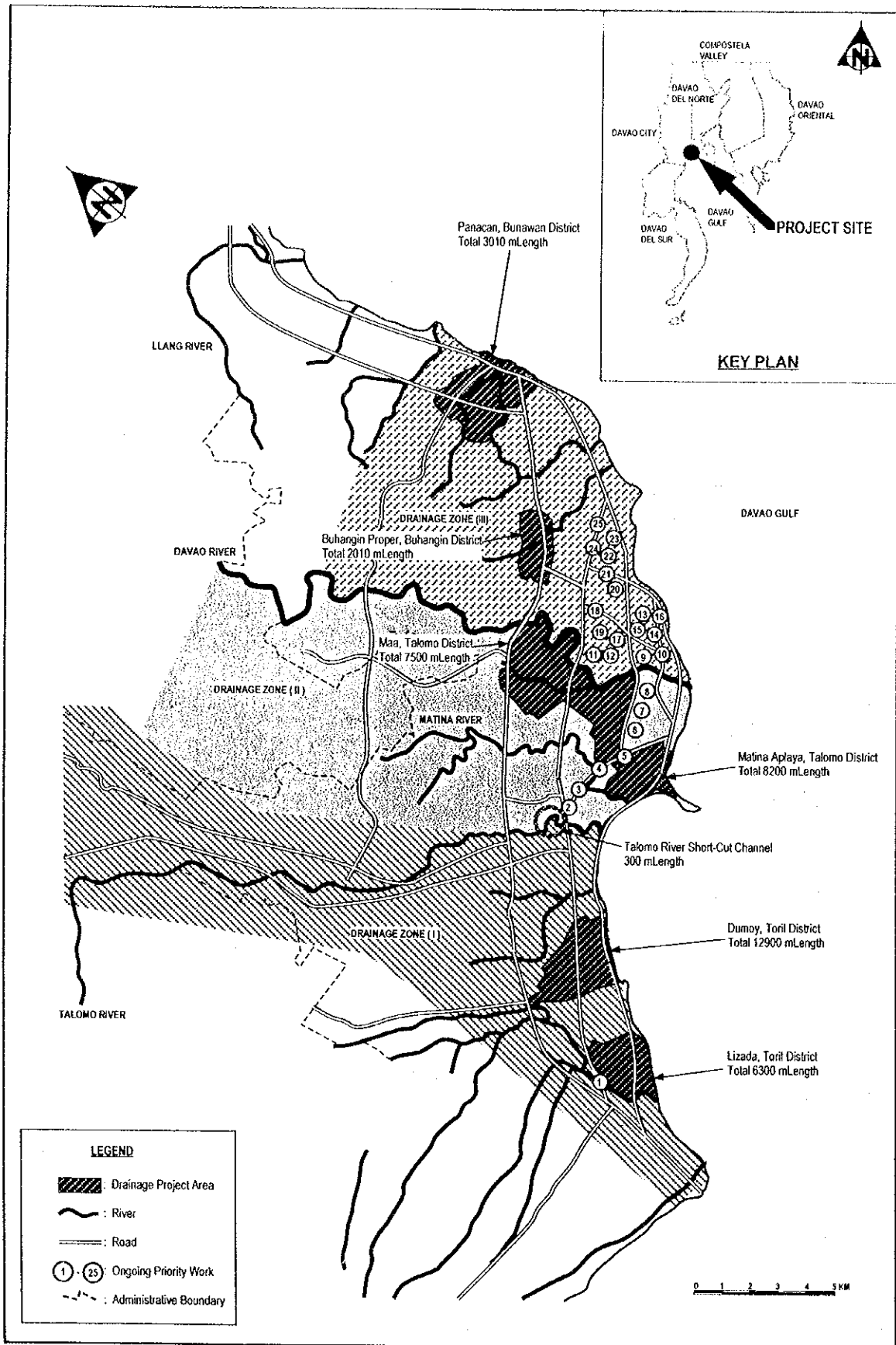


Figure 1 Map of Davao City Comprehensive Flood Control and Drainage Development Program

Flash-Flood Prevention Program (IN-21)

1. Background

The DIDP Area is characterized by a relatively ample water resource endowments on the one hand, and modest provision of facilities for various water uses and water-related disaster prevention, on the other. In terms of flooding, almost all the areas along rivers in the DIDP Area have been affected by habitual flooding.

Rivers which accommodate the relatively smaller catchment basins between 40 km² and 400 km² are classified as the principal rivers in the Philippines. There are 22 principal rivers in total besides four major rivers in the DIDP Area and almost all of them embrace their flood-prone areas with the occurrence of habitual flood-related calamities.

Generally, a sharp land slope and heavy silting of river beds and enlargement of run-offs caused by deforestation contribute to the outbreak of flash floods in case of heavy rains. Although some of principal rivers are equipped with partial measures currently, they cannot serve as a substantial solution to this problem.

These flood-prone areas have to be provided with proper mitigation countermeasures to support the socio-economic development of the DIDP Area.

2. Objectives

Aside from the major rivers to be dealt with under different projects/programs, the Project is envisioned to address the flood protection of principal rivers in the DIDP Area, aiming:

- To formulate comprehensive flood control measures, and
- To implement the specified countermeasures for selected sites

3. Project Description

3.1. Project Scope

(1) Project sites

The flood-prone areas are widely distributed throughout the DIDP Area as shown in Figure &. Of them, a number of the rivers enumerated below have been identified in the Study to be suffering from most serious and frequent damages:

- Davao Oriental: Sumlong, Bagoan, Quiraman, Casuaman, Manay, Caraga, Lanunayao, Baganga, Dapnan, Cateel
- Davao Province: Lasang, Kingking
- Davao City: Lim Dan, Talomo, Tagonol, and
- Davao del Sur: Margus, Tabayon, Marabatuan, Culman, Calian, Siblan

Besides these, while the detailed data and information thereof has not been available yet, a number of the candidate project sites have been recognized. Actual Project sites shall be selected from an inventory worked out by proper criteria at the subsequent stage.

Of those mentioned above, based on the extent of necessity and the economic rate of return, a certain number of Project sites will be chosen for implementation at an early stage as the priority projects.

(2) Project components

The project components consisting of a series of structural and non-structural measures shall be properly selected depending on respective Project sites. In the course of planning and implementing, the Project shall be effectively and efficiently coordinated with the other related on-going projects, if any.

In general, the Project comprises the following components.

Cut-off channel work

A heavily meandering portion of rivers serves as a barrier and affects the upstream area. In such places, a cut-off works shall take place to short-cut this section by a channel and to flush the flood flow quickly.

Dike construction, dredging and channel improvement works

It has been observed that river banks are being eroded in many places without proper protections and accumulated sediments along the river course are obstructing the channel flow. Accordingly, the flood water easily overflows over its river banks, and finds its way to the lower areas at even small downpour. In such rivers and sections, channel improvement works adequately combined with dike construction, dredging and revetment construction shall be taken as the first step.

Sabo dam and small impounding dam construction

In the long run, the Project is envisioned to include sabo dams to prevent an excessive inflow of silts and also small impounding dam to cut the flood peak flow.

Establishment of warning and evacuation system

This shall contain non-structural measures to minimize flood damages in cases like: 1) water stage monitoring system, 2) flood forecasting and warning system, and 3) propagation of flood information and evacuation system.

Watershed management

To reserve the upper watershed of the Project sites and to increase its water retention and flow retarding capacity, watershed management will be undertaken by community – participatory activities. It shall include nursery, plantation, construction of forest road networks, and forest protection and maintenance, etc.

3.2. Implementing Schedule

In the short-term, urgent alleviation using structural measures should be undertaken primarily to protect built-up areas, arterial roads and main bridges. Besides, a long-term plan shall be prepared by means of watershed management and other suitable measures

The Project is envisioned to be proceeded according to the following step-wide phasing:

- | | |
|-------------------------|---|
| Phase I (1999 – 2000) | : Engineering study and feasibility study, and detail plan of selected priority project sites |
| Phase II (2001 – 2004) | : Implementation of the selected priority project sites (about 10 sites), and |
| Phase III (2005 – 2016) | : Implementation of the remaining project sites |

3.3. Institutional Arrangement

In most cases, LGUs administering the Project sites are expected to be mainly responsible for the project. The Project, however, will be of multi-purpose nature due to its diverse components, involving NIA, DPWH, DENR, LGUs as well as NGOs. For coordinated and efficient implementation, it is recommended that a sole representative unit for the project execution be organized in the DIDP Area including concerned parties.

In order that the Project is implemented economically and self-consciously, the community participation is stressed to play an important role in the Project throughout planning, implementation and operation.

4. Project Assessment

4.1. Project Cost

The Project costs required for the implementation at each phase are roughly estimated as follows.

Phase I	: ₱20 million
Phase II	: ₱50 million
Phase III	: ₱100 million

4.2. Expected Benefit

A series of measures undertaken under the project would prevent or alleviate flooding in the Project area. As a result, agricultural land would be prevented from submersion, infrastructure facilities such as roads, bridges, electricity cables and transport piping of water supply would be saved from damages.

Damages of such properties as house, furniture and appliances caused by inundation and submersion would also be saved by the Project. In addition, the incidence of water-borne diseases would be significantly reduced as a result of the betterment of environment sanitation.

5. Recommended Action

At the moment, the candidate sites needing the Project have not yet been examined, perfectly. Thus, it is recommended that the adequate inventory for the candidate Project sites be worked out as the first step.

Because the Project requires huge investment cost over a long period, this may cause an excessive financial burden to the national government and the LGUs. A possible solution to this is to apply proper selection of priority projects and to be technically and financially aided by ODA.

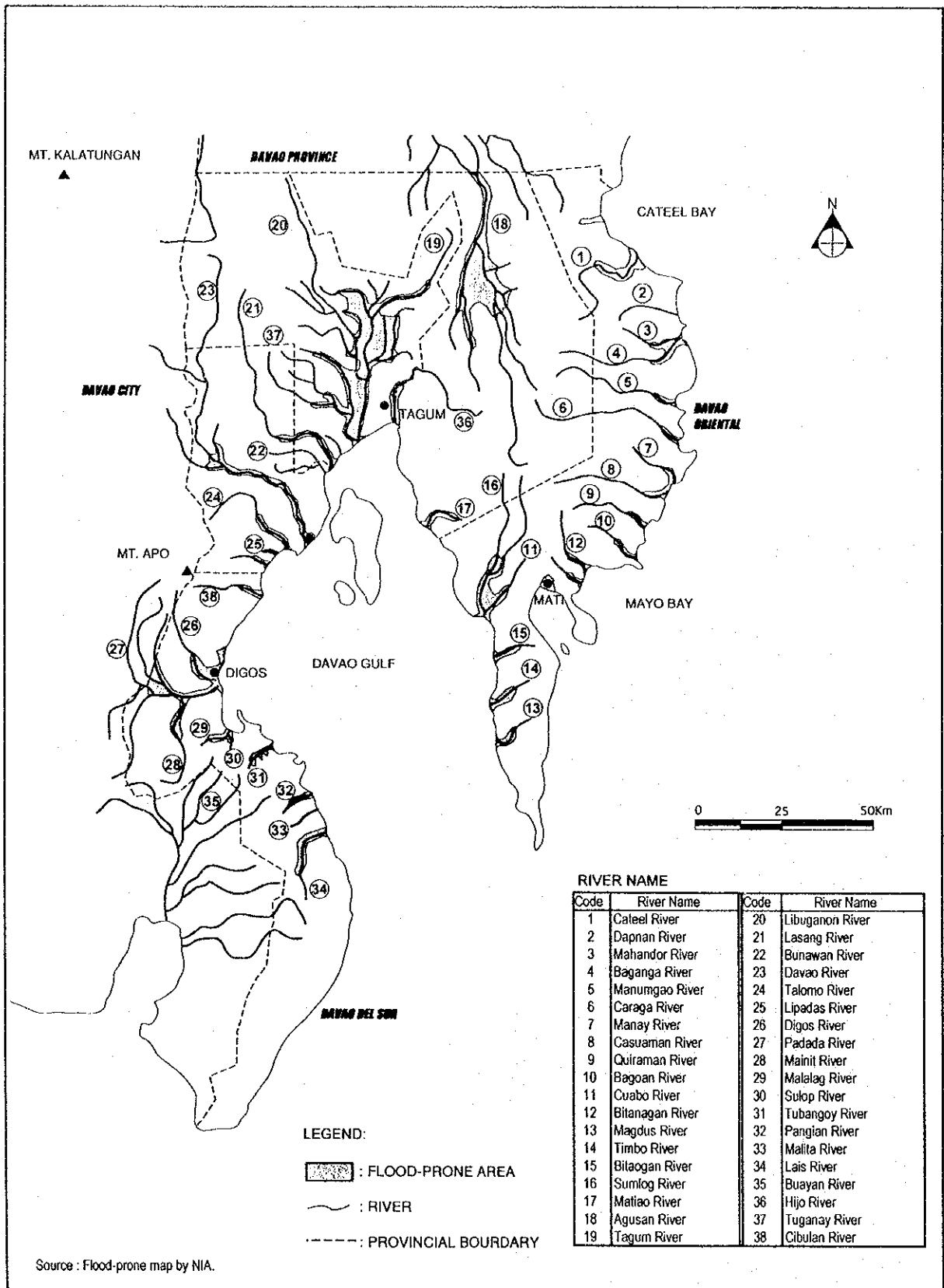


Figure 1 Flood-Prone Areas in the DIDP Area

Rural Water Supply and Sanitation Improvement Program (IN-24)

1. Background

Safe water supply and sanitation constitutes an important part of the Minimum Basic Needs (MBN), which is not adequately satisfied in many rural communities in the DIDP Area deprived of safe drinking water and sanitation facilities. Some 39% of people in the DIDP Area are being forced to unreliable water not protected from contamination. Especially in rural areas, the unreserved ratio by safe water is much higher and prevalence of sanitary toilet is far behind, also.

According to 1997 data, households with sanitary toilet in Davao del Sur and Davao Oriental are still remaining at only 67% and 65%, respectively. Such poor sanitation has resulted in high incidence of water-borne and vector born diseases and becomes one of the undermining causes of high mortalities in rural areas.

From the above, consistent effort to develop and expand in rural water supply and sanitary toilet should be made.

2. Objectives

The Program, as an initiative arrangement for the enhancement of rural sanitation, is aiming:

- To provide the selected rural barangays in the prioritized municipalities with safe water supply and sanitation toilet and,
- To ensure the proper usage and maintenance of sanitation equipment, and disseminate health and sanitation knowledge in rural areas.

3. Project Description

3.1. Project Scope

(1) Project sites

The program is intended to provide a set of Level-I water supply system mainly by using a well (spring in certain areas) and a pour-flash type sanitary toilet for the selected barangays in the prioritized municipalities. Given the limited financial resources, the development of rural water supply and sanitation is destined to be supported fully or partially by proper financial aids. It also should be implemented according to adequate priority order over the long-term.

The prioritization methodology based on "MBN Scheme" has been established using the i) per capita municipal income (PCMI) and the internal revenue allotment (IRA) as a parameter representing financial status, ii) the incidence of diarrhea and the unreserved household ratio as a parameter representing sanitation conditions. Table 1 shows the prioritization results over all the municipalities in the DIDP Area for water supply. Besides these, the Program may be expanded to cover upland communities especially in Davao del Sur, Compostela Valley and Davao Oriental that are reported to be isolated from safe water provision at present.

The selected municipalities based on "MBN Scheme" are shown in Figure 1 and their population to be are summarized as follows:

- Davao Oriental: Caraga, Manay, Cateel, San Isidro, Lupon, Tarragona, Boston, Baganga (total 38,000 capita).
- Compostela Valley: Monkayo, Laak (total 12,000 capita)

- Davao del Norte: Kaputian, Samal, Panabo, Dujali (total 50,000 capita), and
- Davao del Sur: Don Marcelino, Sulop (total 14,000 capita).

Table 1 Priority Order for Rural Water Supply

Priority Order	Province	Municipality	Per Capita Min. Income (Peso/cap)	IRA (1000Peso)	Incidence Diarrhea (cases / 100,000 cap)	Unserviced Ratio (%)	Priority Score				
							Per Capita Income	IRA	Incidence of Diarrhea	Unserviced Ratio	Total
1	Davao Oriental	Caraga	32	23,441	2,010	71	10	0	10	8	7.5
2	Davao Oriental	Manay	42	20,459	785	88	10	0	5	10	7.5
3	Davao Province	Morkayo	594	24,852	1,690	81	5	0	8	10	7.4
4	Davao Oriental	Cateel	46	19,653	893	66	10	5	5	8	7.3
5	Davao Oriental	San Ishidoro	78	16,917	746	67	10	5	5	8	7.3
6	Davao Oriental	Lupon	66	32,571	1,175	73	10	0	8	8	7.1
7	Davao Province	Carmen	397	17,788	641	75	8	5	5	8	7.0
8	Davao Oriental	Tarragona	10	14,755	1,137	52	10	5	8	6	6.9
9	Davao Oriental	Boston	38	11,635	665	60	10	5	5	6	6.3
10	Davao Province	Kaputian	455	10,148	1,555	55	5	5	8	6	6.1
11	Davao Oriental	Baganga	660	32,110	3,732	62	0	0	10	8	6.0
12	Davao Province	Samal	506	8,922	916	46	5	8	5	6	6.0
13	Davao del Sur	Don Marcelino	313	16,671	404	73	8	5	0	8	6.0
14	Davao del Sur	Sulop	272	10,146	229	69	8	5	0	8	6.0
15	Davao Province	Panabo	420	29,276	727	75	5	0	5	8	5.8

Source : DIDP JICA Study Team

(2) Project components

Construction of safe water supply and sanitary toilet facilities

The Program requires wells and sanitary toilets for a total of 114,000 people. Besides miscellaneous materials for construction, the following construction equipment, which call foreign financial aides, is requested based on the implementation period of ten years:

- Rotary/percussion drilling rigs (14 units),
- Service trucks with crane (14 units),
- Well rehabilitation equipment (six units), and
- Support vehicles (six units).

Besides, some equipment and material for the spring tapping may be required, where the development of spring is an important option.

Maintenance and dissemination

A Municipal Water and Sanitation Association or Cooperative will manage and oversee the construction works. Together, it is proposed that a Barangay Sanitary Inspector Association (BSIA) be organized to ensure the proper usage and maintenance of sanitation equipment, and disseminate health and sanitation knowledge.

Broad-based and intensive community participation through every stage of planning, construction and operation/maintenance is an important prerequisite for the Program.

3.2. Implementing Schedule

- Phase I (1990-2001) : Basic planning and designing, and
Phase II (2002-2011) : Implementing.

3.3. Institutional Arrangement

In most cases, LGUs administrating the Program sites are expected to be mainly responsible for the implementation. The Program, however, will be of multi-sector, involving DOH, DPWH, DENR, LGUs as well as NGOs. For well-coordinated and efficient implementation, it is recommended that a sole representative unit for the project execution be organized in the DIDP Area including concerned parties.

In order that the Program is implemented economically and self-consciously, the community participation is stressed to play an important role in the Program throughout planning, implementation and operation.

4. Project Assessment

4.1. Project Cost

The program costs required for the implementation at each phase are roughly estimated as follows.

Phase I: ₱20 million, and

Phase II: ₱540 million,
Including ₱250 million for the construction equipment and
vehicles relying on foreign aids.

4.2. Expected Benefit

As a result of the betterment of environment sanitation, the incidence of water-born diseases would be reduced. In terms of the economic benefits, the man-hours would be saved by people who have been absent if they got sick due to ware-borne diseases.

5. Recommended Action

At the moment, the candidate sites needing the Program have not perfectly examined yet due to the insufficient information on rural environment sanitation. Thus, it is recommended that the adequate inventory for the candidate sites be worked out as the first step.

Because the Program requires huge investment cost over a long period, this may cause an excessive financial burdens in the Central Government and LGUs. A possible solution to this is to be technically and financially aided by ODA.

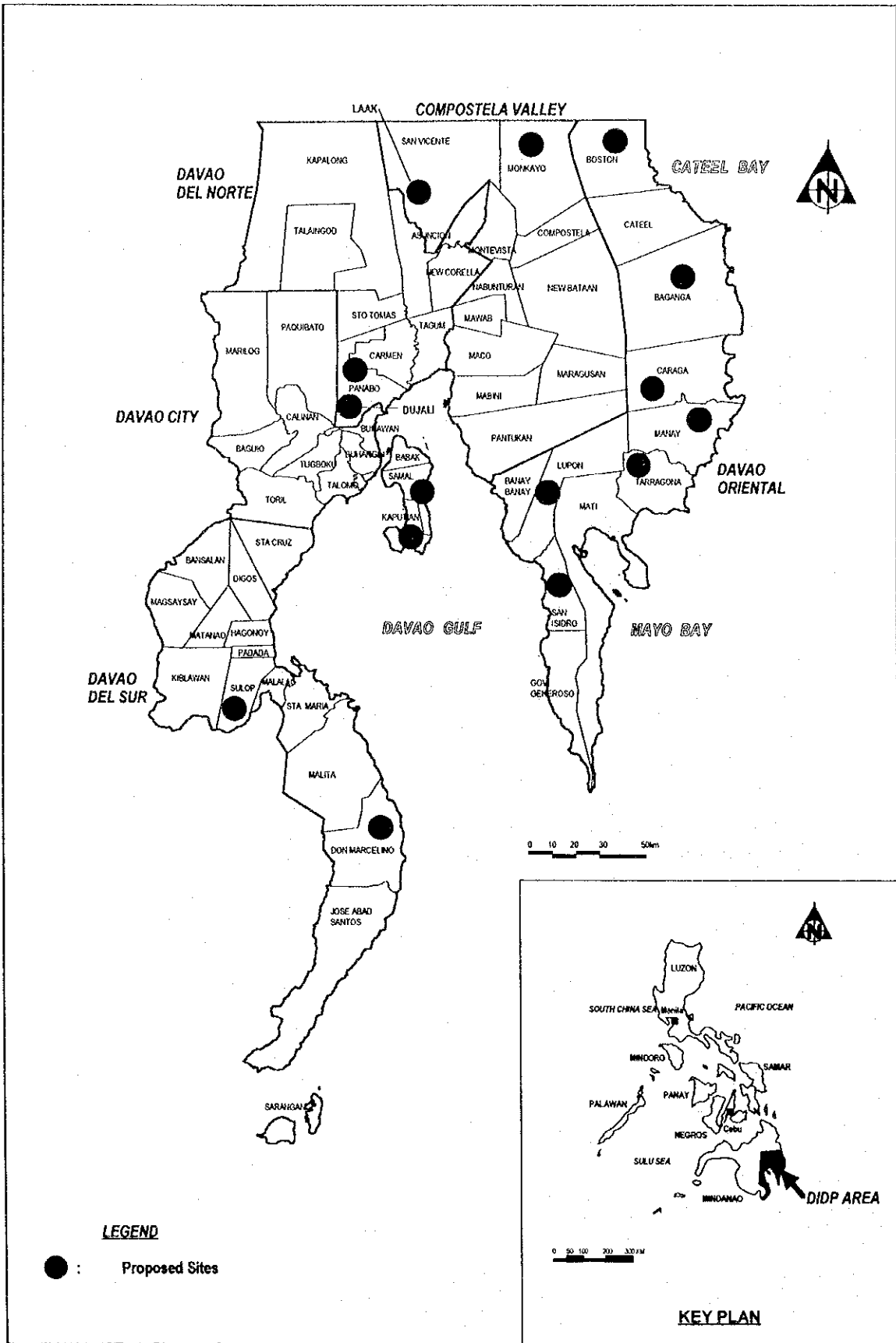


Figure 1 Map of Rural Water Supply and Sanitation Improvement Program

PAIC Support Infrastructure Program (IN-27)

1. Background

The Bipolar Strategy has been adopted linking Davao City and General Santos as spelled out in the 1990 to 2020 Regional Physical Framework Plan (RFPF). It will entail full implementation of the Regional Agri-Industrial Center (RAIC) in Davao City and the industrial estate in General Santos City to serve as growth centers for the neighboring municipalities. Both Cities are selected as the major economic growth centers in the region due to the presence of required infrastructure support facilities, potential for agri-processing and strategic location to establish trade, tourism and other economic linkage with the BIMP-EAGA countries.

The Dispersed Concentric Strategy is undertaken by means of establishing 10 Provincial Agri-Industrial Centers (PAICs) throughout the region inter-linked with the major agri-industrial centers. The Samal Island tourism estate is another core development for the region under this strategy.

Provincial agri-industrial centers (PAICs) represent the local initiative to establish viable economic activities by utilizing indigenous resources. The PAIC initiative is considered instrumental in developing the DIDP Area as a whole under the agri-industrialization strategy. PAICs are expected to develop in a mutually complementary manner, each having characteristic activities based on indigenous resources.

PAICs intend to optimize emerging opportunities brought about by domestic and foreign business initiative through the:

- disperse economic activities from Davao City and General Santos City;
- creation of industrial activities, employment generation and improvement of income;
- optimum and sustainable utilization of the human and natural resources in the areas; and
- improvement of living condition for local populace.

2. Objectives

The program is to improve various infrastructure facilities for seven PAICs to support their developments. Specific support infrastructure for each PAIC or SEZ would be different such as port, farm-to-market roads, water supply, solid waste management and electricity. Some infrastructure may be improved under different programs. In particular, the port development project and farm to market roads project may be implemented:

3. Project Description

3.1. Project Scope

(1) Project sites

Project sites are proposed as all 7 PAICs and Special Economic Zone (SEZ) in the DIDP Area shown as follows:

Davao del Sur: Sta. Cruz and Malalag Bay Alliance PAICs;

Compostela Valley : Nabunturan PAIC;

Davao del Norte : Panabo and Tagum PAICs, and Malata SEZ; and

Davao Oriental : BACABOSCAMAN (Baganga) and MAGBALUSTA (Mati).

(2) Summary of PAIC organization and development

PAIC Boards and offices were organized. The Boards were created through Executive Orders issued by the local chief executives, duly supported by resolutions or ordinances approved by the Sangunians. The Boards consist of offices of municipalities, the provincial governments, line agencies and private sector representative. The PAIC chairpersons elected are mayors of the municipalities. The PAIC Officers also were organized including the staffs. Some PAICs has no office and manager appointed.

The PAIC Office is envisioned to perform four (4) major function, namely, planing, marketing and promotion, networking and resource generation. In addition to the strategic plans and land use plans, each PAIC has to pursue the investment code, activities toward on-site and off-site developments of the PAIC sites.

The Budgets are funded from the municipality budget, provincial funds approved by the local chief executives and their respective Sangunians.

The progress of PAIC development is shown in the following table.

PAIC	Strategic Plan	Approval by PLUC	Land Use Plan for Core Area	PAIC Organization	Industrial Area (ha)	Farm to Market Road	Water Resource	Other Infrastructure required
Panabo	●	●	●	●	570	Pavement Rehabilitation	Spring dev. Distribution	
Tagum	●	●	●	●	675 (I) 300 (T)	Pavement Rehabilitation	Spring dev. Distribution	
Nabunturan	●	●	●	-	165	Pavement Rehabilitation	N.A	
Sta. Cruz	●	●	●	●	746	New const. Rehabilitation	Distribution	Power
Malalag Bay Area	●	●	*	●	1,600	Pavement	Spring dev. Distribution	
MAGBALUSTA (Mati)	●	-	-	●	500	Pavement Rehabilitation	Spring dev. Distribution	
BACABOSCAMAN (Baganga)	●	●	●	●	80	Pavement Rehabilitation	Spring dev. Distribution	Telecommunication Power

Note: ● Approval by Provincial Land Use Committe (PLUC)

* Not approved yet

- All related municpalis in Malalag bay area submitted to PLUC, but not apporved yet.

(3) Project components

The program is to improve various infrastructure facilities for seven PAICs and the Malita SEZ to support their developments. Specific support infrastructure for each PAIC or SEZ would be different such as port, farm-to-market roads, water supply, solid waste management and electricity. Some infrastructure may be improved under different programs. In particular, the following projects may be implemented:

- 1) PAIC – related Port Development Project for Mati, Baganga, Maco, Malalag and Sta. Cruz, and
- 2) PAIC – related Farm-to-Market Roads Project.

PAIC – related Port Development Project

The port development projects consist of new construction, expansion (improvement) and rehabilitation. New port construction and expansion will be implemented according to the demand base for transporting agricultural products, processing goods and general cargo.

Mati port, a public port handled by PPA, will be improved with wharf expansion due to shortage of the handling capacity for MAGABALUSTA PAIC development. Baganga wharf which was used by a logging company, under deteriorated condition, will be replaced with new one.

Proposed Maco port will be provincial port for the Compostela Valley and, a sub-port of the Sasa port, Davao City.

Malalag port, a municipality port, will contribute to transporting agricultural products and good/general cargo as a provincial port. Sta. Cruz municipality has no public and private port. There are two candidate sites of Tagaburi and San Miguel development area as private port.

PAIC – related Farm-to-Market Roads Project

Related agencies of Farm to market road are Department of Agriculture (DA) for the planning and DPWH and LGUs for the implementation. Farm to market roads consist of national, provincial, city, municipality and barangay roads.

DA established requirement criteria for farm to market roads as follows:

- 1) roads classified as barangay roads outside the city and municipal/urban areas not otherwise designated as national, provincial, or municipality roads including bridges that area part of the road section; and
- 2) roads located within the Key Production Areas (KPAs) designated by DA and/or those which link these areas to major markets/trading roads to higher road class systems.

Priority shall be given to the rehabilitation of existing roads (or restoration of existing road section) to their original road class or to a higher class system. On a case to case basis, the construction of new roads shall be considered, depending on the urgency of the need, as may be justified by the Regional Field Unit (RFU) Director; and provided that the right-of-way (ROW) has been adequately secured by the LGUs.

Recently DA issued amendment to the Farm to Market Roads Development Program Guideline to consider two (2) types of pavement under the program as follows:

- 1) gravel road 4 - 6 meters of roadway surface course; and
- 2) concrete pavement 4 - 6 meters of roadway surface course.

The PAIC Support Infrastructure Program covers the major farm to market road of 6 meters roadway with concrete pavement for PAIC areas and its hinterlands.

The total length of primary farm to market roads is assumed to be about 460 km for PAICs in the DIDP Area.

3.2. Implementing Schedule

The implementation schedule shall be considered based on progress of each PAIC development, the development potential and strategical viewpoint.

Priority of the port development is considered as follows:

- Stage 1: PAICs of Panabo, Sta. Cruz, Tagum and MAGBALUSTA (Mati)
Stage 2: PAICs of Malalag Bay Alliance, Nabunturan and BACABOSCAMAN (Baganga)

Priority of farm to market roads is not given and the implementation will be taken continuously during the planning period of Phase 1 to Phase 2.

3.3. Institutional Arrangement

Setting up mechanisms to spearhead and continue the PAIC activities become necessary. A PAIC Management Board/Council (PMB) supported by PAIC project Office shall be strengthen as one mechanism recommended to oversee the process of institutionalizing the PAIC in the LGU for the implementing stage. Consultations with DA and DPWH should be conducted for the arrangement and implementation purpose.

4. Project Assessment

4.1. Project Cost

The project costs are roughly estimated for implementation of port and farm to market roads projects for the implementation as follows:

Phase 1: ₱1,040 million

Phase 2: ₱708 million

4.2. Expected Benefit

The farm to market roads will contribute to not only efficient transportation of agricultural products and cargo, improvement of social service delivery and accelerating other infrastructure development such as power supply, water supply and telecommunication.

The port development could strengthen globalization drive, formulate sea transport network in DIDP Area and reduce sea transport cost due to competition of ports.

4.3. Recommended Action

Farm to market road network shall be formulated for each PAIC area analyzing production volume, distribution of Key Production Areas (KAPs), populated areas, other purpose such as tourism development and environmental management.

Samal Integrated Area Development Project (IN-30)

1. Background

Though poorly recognized at present, the Philippines has comparative advantage as well as potential to develop its tourism sector. The Philippines has tropical climate and is renowned for sandy beaches and coral reefs. Filipinos are well known for their friendliness, hospitality, and communication ability. The Country has proximity to one of the largest and fastest growing areas in the world, namely Japan, Taiwan, Korea and Hongkong (possibly China).

Despite the advantage, the tourism sector in the Philippines lags behind other Asian countries. It is due partly to an unfavorable country image as a consequence from the political instability during the 1980s and the early 1990s, and partly due to its immature tourism sector.

Mindanao island, which is the second largest in the Philippines, is endowed with many tourism resources. The island has coral reefs and beaches which are suitable for beach resort development. Surviving tropical forest and colorful indigenous cultures are untapped tourism resources for eco-tourism and soft adventure. These tourism opportunities, however, have been impeded by conflicts between indigenous Muslim minorities and Christian migrants from the north. The situation has changed drastically since the Philippine Government finally signed a peace treaty with Moro National Liberation Front (MNLF) in 1996.

Brunei, Indonesia, Malaysia and the Philippines have agreed to establish an international cooperation scheme called the BIMP-EAGA or East ASEAN Growth Area. It aims to jointly develop an area covering Brunei, Kalimantan and Sulawesi in Indonesia, Sabah, Labuan and Sarawak in Malaysia, and Mindanao and Palawan in the Philippines by promoting tourism, trade and exchange of people. The promotion of the free trade regime through the BIMP-EAGA is expected to enhance the comparative position of the DIDP Area as its center, which in turn would contribute to the enhancement of the Philippine position in the international society. To ensure peace and stable economic growth in Mindanao, substantial supports by the Government and the international society are expected to be continued and expanded. Davao City located in the south-eastern part of Mindanao is expected to play a leading role for the BIMP-EAGA cooperation.

Samal Island, located one kilometer southward of Davao City, is evaluated to have potential for tourism development. It has excellent beaches and off-shore coral reefs. The island has an advantage as it is located in the calm Davao Gulf embraced by peninsulas, and the area has no dry season nor typhoon. Besides It has the Davao international airport. Recognizing these strengths, the National Tourism Master Plan prepared in 1991 by Department of Tourism (DOT) designated the island as one of the five priority development areas in the Philippines. The island is also specified by the JICA Davao Integrated Development Program (DIDP) Master Plan to be the anchor resort tourism center for Mindanao island and the BIMP-EAGA.

The Island's economy has been depended on small-scale agriculture and fishery. The traditional economic system, however, seems to have reached a turning point. Due to the population increase in the island and Davao Gulf area, the ecology, the principal tourism appeal, is threatened by deforestation, over-fishing and deterioration of coral reefs by dynamite and cyanide fishing, and possibly urban sprawl from Davao City.

DOT started the Samal Island Tourism Estate (SITE) Project in response to the national tourism master plan; it needs further elaboration to realize its vision to make the island an anchor international tourism destination. The southern part of the island have being developed by a Malaysian investor for multiple beach resort area. Recently DOT declared an expansion of the eco-tourism zone, not only in the southern part of the island but also the whole island.

Samal Island may be connected to Davao City by a bridge and, due to proximity to Davao City and well preserved environment, has high potentials for high-grade residential development, environmental friendly industrial estate, and cultural and financial centers under the BIMP-EAGA scheme as well as resort development. The bridge connection would open opportunities for the residents on the island to receive better social and other services. Such development, however, should be subject to strict enforcement of the new zoning ordinances for conservation of environment, a vital condition for the developments. Therefore a feasibility study for the bridge project shall be conducted clarifying the development potential of the island.

In the above context, a comprehensive area development plan should be immediately prepared to guide the economic development. The tourism sector is expected to play a vital role to conserve the environment through utilizing the profit generated by the tourism development, and to promote sustainable development for the island.

2. Objectives

The objective of the project is to prepare an integrated area development plan for the Island Garden City of Samal with focus on the tourism sector. The project will pursue a comprehensive development scheme which assures sustainable development of Samal Island. The following points should be stressed to prepare the development plan:

- to strengthen the linkages between the tourism sector and other economic sectors including agriculture, fishery and manufacture to generate as synergy effects;
- to promote local participation in tourism so that the tourism development would contribute to the social development, and enable local people to take the initiative in development;
- to establish a system in which tourism would provide an economic incentive to local people to conserve the environment, and stimulate cultural awareness which motivates them to revitalize their cultural traditions;
- to analyze potential of development for "Free Trade Zone" which has tax free incentive and BIMP-EAGA related facilities;
- to formulate land use zoning with the ordinances to prevent unordered development and to conserve the environment; and
- to recommend institutional measures to strengthen development administration and to promote private investments.

3. Project Description

3.1. Project Scope

(1) Project sites

The study area should cover the whole area of Island Garden City of Samal including the Talikud island. The study, however, should include a proposal to establish overland and flying tourism circuit in Mindanao with Samal Island as a base of the touring.

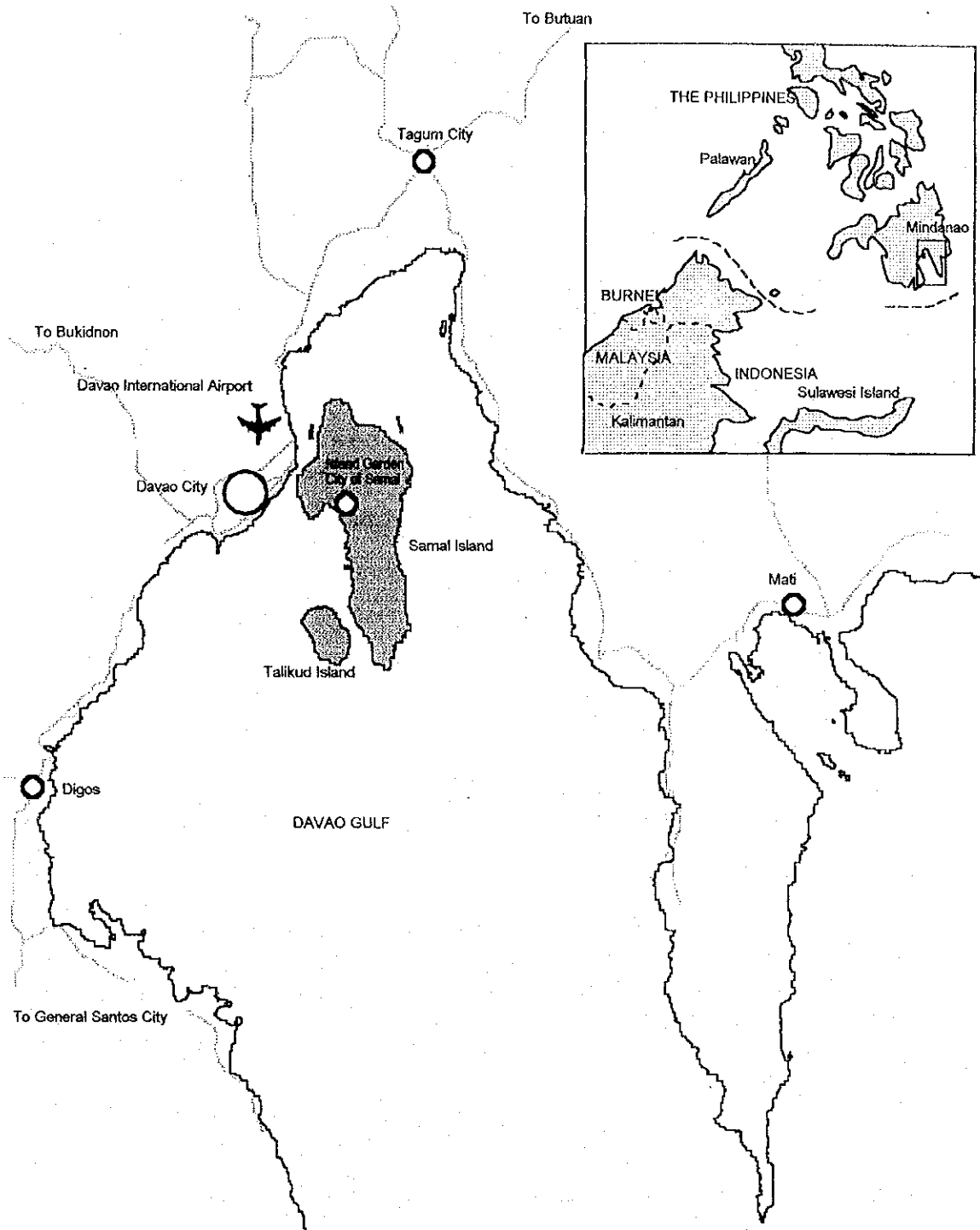


Figure 1 The Study Area

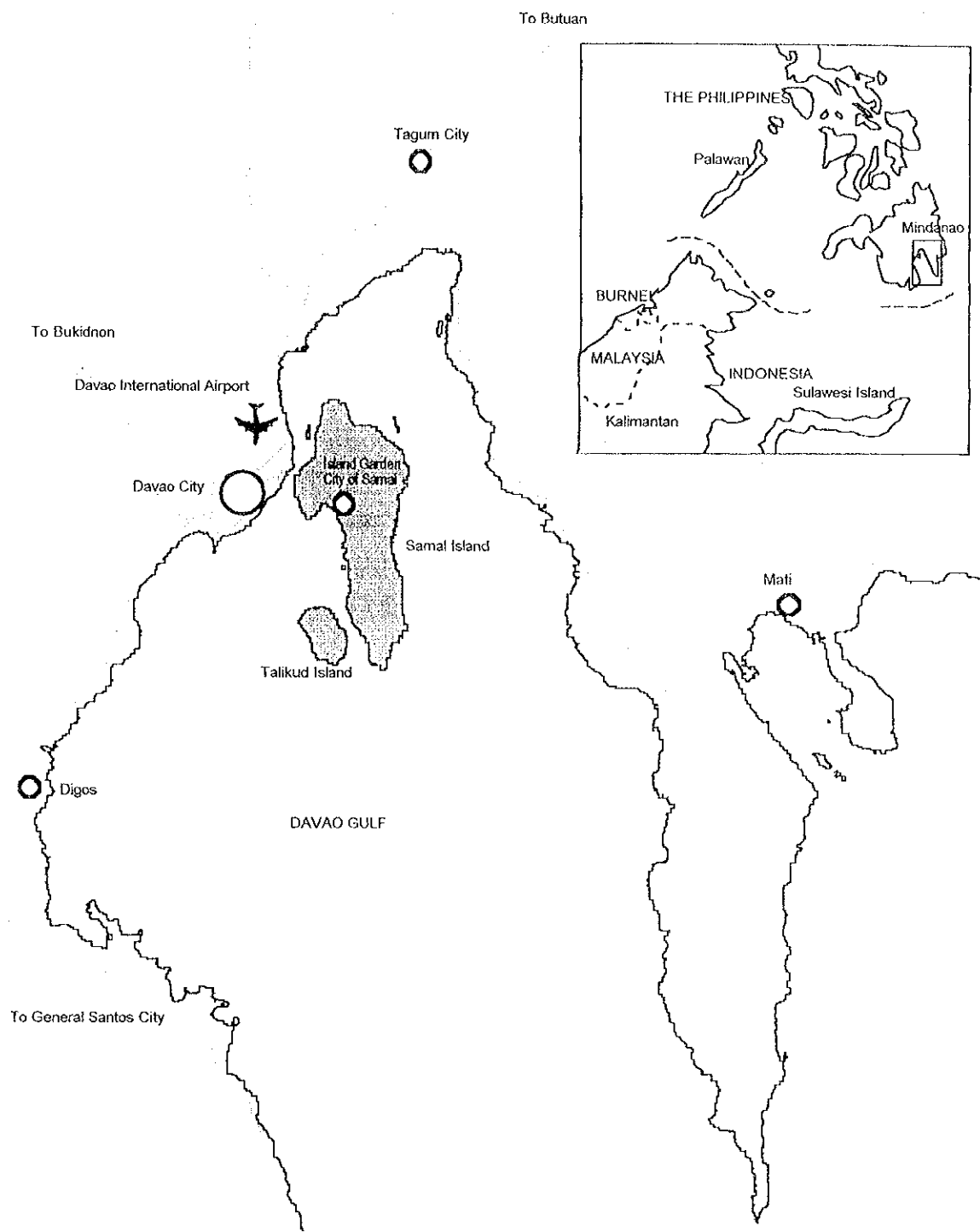


Figure 1 The Study Area

Outline of Samal Island Integrated Area Development by area is considered as follows.

As an alternative development direction, in conjunction with a bridge connection between the Davao City and Samal Island, the island could have more aggressive developments under new zoning ordinances and environmental management. Outline of Samal Island Integrated Area Development by area is considered as follows.

1) Northern part (previous Babak municipality)

The following component development is considered:

- BIMP-EAGA Free Trade Zone (FTZ):
- duty-free trade shops of all goods and shopping arcade,
- merchandising center to wholesale the BIMP-EAGA local made goods,
- world-class hotel,
- entertainment center, and
- unpolluted light industrial estate.

High-grade residential development zone:

- condominium, and
- second house; and

Daily type mass-tourism development zone:

- beach resort, and
- amenity facilities.

2) Central part (previous Samal municipality, presently the City capital)

The following component development is considered:

- BIMP-EAGA conventional center zone;
- BIMP-EAGA R &D Center zone; and
- Business hotel zone.

3) Southern part (previous Kaputinan municipality)

- Kaputinan eco-tourism zone (high class marine resort area, long staying type), and
- Talikud Island eco-tourism zone.

The bridge could contribute to reduction in travel time from Davao City to Davao Oriental through operating super ferry service from the southern part of island and Lupon, Davao Oriental. Therefore alternative development shall be considered with/without the bridge (Samal Rainbow bridge).

(2) Scope of works

The study will be conducted in a phased manner with three phases shown as follows:

- 1) Phase 1: analysis of existing condition;
- 2) Phase 2: formulation of integrated area development plan; and
- 3) Phase 3: formulation of implementation plan and conducting feasibility study for the priority projects/programs.

Phase 1: Analysis of Existing Condition

a. Collection and analysis of existing data and information

Present conditions in Samal Island and the related areas are analyzed covering the following:

- Macro socio-economy such as population, employment, income and economy,
- Land use,
- Social services,
- Environmental condition,
- Physical infrastructure, and
- Development administration.

b. Market survey

A market survey will be conducted to supplement existing tourism statistics. More specifically, 1) interviews with the travel and trade both in the Philippines and major tourism markets such as East Asia, BIMP-EAGA, North America and Europe, and 2) a visitor survey at the Davao International Airport, will be necessary to obtain more qualitative aspects of existing and potential tourism demand to Samal Island.

c. Review of existing relevant plans and programs

The existing development plans and framework will be reviewed in the light of recent changes and revised for both socio-economic and spatial frameworks. Especially Samal special economic zone (eco-tourism zone) shall be reviewed including expansion of the scheme.

d. Analysis of viability for Samal bridge construction

The development direction in the island would have different features with/without a bridge. The feasibility analysis shall be carried out with careful consideration of the environment management.

e. Identification of development issues

Development issues for the study area will be identified based on the analysis of existing conditions. Identified issues will provide basis to prepare an integrated area development plan in the next stage.

Phase 2: Formulation of Integrated Area development plan

The plan should envisage to establish a system, in which the tourism sector would provide an incentive to the conservation of the nature, and work as a catalyst for economic development.

a. Formulation of development strategies

A development scenario will be chosen after examining in the scenarios from economic, social and environmental aspects, as well as from the view point of consistency with national and regional development plans.

b. Integrated area development plan

An integrated area development plan will be prepared based on the strategies. The plan should include aspects of economic and social developments, environmental management, land use, infrastructure development, and institutional arrangement to realize the plan.

c. Detailed land use planning for strategic zone

A detailed land use plan will be prepared for each strategic zone based on the selected development strategies. Area to be protected from urbanization will be delineated, and detailed land use in urbanized and urbanization areas specified.

d. Preparation of preliminary project and program ideas

Preliminary project and program ideas will be proposed for discussion among the relevant personnel and organizations. The ideas will be elaborated in the next stage.

Phase 3: Formulation of Implementation Plans and Guidelines

The phase 3 study will establish projects and programs after elaborating the idea proposed in the previous phase. It also examine their implementation priority, set up a short-term action plan, and specify necessary arrangements which would actualize the integrated development plan. Social/environmental and economic/financial evaluation will examine the viability of projects and programs.

3.2. Implementing Schedule

(1) Implementing arrangements

The study shall be carried out by a team of international class experts in close collaboration with relevant governmental agencies, The following experts will be involved to the study:

- 1) Regional and urban planner,
- 2) Tourism research and tourism product development specialist,
- 3) Tourism facility planner,
- 4) Institutional arrangement specialist
- 5) Civil engineer,
- 6) Social development specialists,
- 7) Environmental specialist, and
- 8) Economist.

(2) Implementing schedule

The study required 18 months for the implementation during 1999 to 2000.

4. Project Assessment

4.1. Project Cost

The project cost for the study is estimated to be US\$2,800,000.

4.2. Expected Benefit

The study is envision to provide wide-range benefits to the project area, resulting from integrated area development master plan including specific area development plan, new zoning ordinances and environmental management plan, and proposed high priority projects and programs for immediate implementation, the action plan and the institutional arrangement.

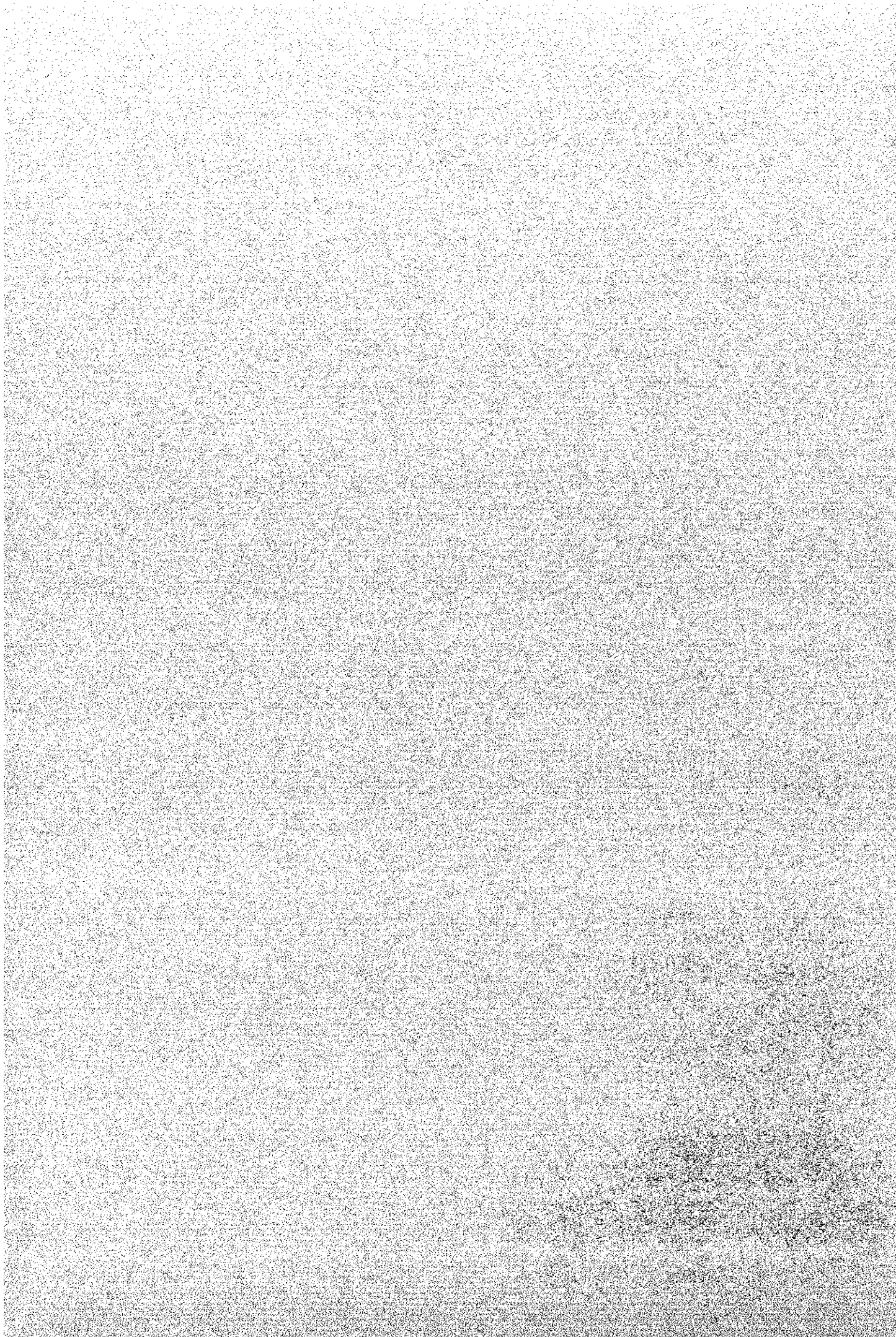
The environmental management plan and the zoning ordinances would contribute to enforcing conservation of the natural resource. The specific area development plan could promote to attract the investors to develop in the island.

4.3. Recommended Action

The Davao Gulf is surrounded by DIDP's cities and provinces. The seawater in the gulf is polluted directly and through rivers by sedimentation, discharge of domestic waste water, solid wastes dumping and leaks of oil by accident and others. Causes of degradation of coastal ecosystem are illegal activities such as illegal fishing, inappropriate coastal land use and land-base human activities. Therefore coastal ecosystem in the gulf faces various problems on pollution.

In order to avoid degradation for the land and marine resources in the island and to conserve valuable tourism resource, land and marine resource data base in Samal Island shall be prepared to clarify valuable resources to be conserved, and Davao Gulf management programs should be implemented immediately.

Part 2
Initial Environmental Examination



PROJECT REPORT

Part 2: Initial Environmental Examination

1. Objectives of IEE

(1) Objectives

Initial Environmental Examination (IEE) is a very important and useful planning tools for development projects and programs at early stage. Original formulation of any projects and programs may be modified, if significant negative impact is predicted by the IEE.

This Philippine Government established "Philippines EIA System" as Presidential Decree No. 1586 of 1978. According to EIA guidelines, Revising DENR Administrative Order No. 21 of 1992, it called "To Further Strengthen the Implementation of the Environmental Impact Statement (EIS) System", the IEE is defined as the follows:

"the document required of proponents describing the environmental impact of, and mitigation and enhancement measures for, projects or undertaking located in an Environmentally Critical Area. The IEE shall replace the Project Description required under DAO 21, series of 1992."

The IEE is one of Philippine EIA System components. However, the IEE for the DIDP Master Plan is not a legal process. Objectives of the IEE for the DIDP Master Plan are as follows:

- to identify possible environmental impact of implementing the proposed projects and programs based on available data and information, and limited field reconnaissance,
- to recommend necessary environmental measurement, if necessary, and
- to make judgement as to needs for legal EIA.

(2) Use of IEE result

After the IEE, results of the IEE should be used for the following:

- to provide necessary recommendation for modification of projects and programs;
- to make judgement as to need legal EIA for further study; and
- to suggest necessary survey for legal EIA , if legal EIA necessary.

2. Methodology

(1) Procedure

There are three steps for the IEE as follows:

Selection of projects and programs

Projects and programs are selected for the IEE from anchor projects and programs. Criteria of selection are:

- negative impact will be expected; and
- projects will include construction of structure.

Conduct of evaluation

Projects and programs are evaluated from environmental viewpoint based on available data and information. Evaluation is carried out by using an environmental impact matrix.

Output of evaluation

After environmental evaluation, environmental considerations will be recommended, if necessary.

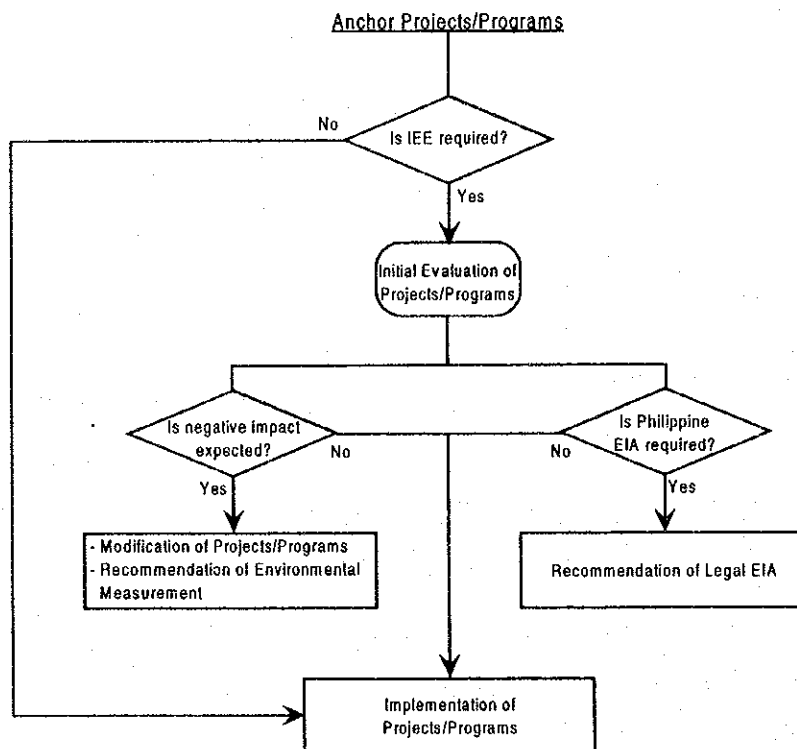


Figure 1 Process of IEE

(2) Evaluation of environmental elements

An environmental impact matrix is used as a checklist of environmental effects. Environmental elements of impact matrix are based on DENR Administration Order No. 21 of 1992. Environmental impact is evaluated including not only negative impact but also positive one. Environmental evaluation elements are as shown in Table 1.

Table 1 Environmental Evaluation Elements

Classes	Environmental Elements
I. Natural & Biological Environment	Surface water, Groundwater, Soil, Geology, Climate, Wildlife habitat, Ecology of fisheries, Natural vegetation
II. Environmental Hazards	Hazards substances, Solid waste
III. Resources Conservation & Use	Water resources, Agriculture production, Timber production, Mining and energy resources
IV. Air Quality & Noise Environment	Air quality, Noise
V. Community Facilities/ Services & Structure	Community facilities and services, Infrastructure, Transportation, Community population, Resettlement, Income, Racial, ethnic distribution, Lifestyle
VI. Open Space and Recreation	Accessibility, Activities
VII. Historic Resources	Historical sites and structure, Archaeological or paleontological sites
VIII. Visual Resources	Natural landscape, Cultural landscape
IX. Economic Environment	Elimination or relocation of commercial & industrial enterprises, Employment, Local economy

(3) Targets of projects and programs

A total of 27 projects and programs are called anchor projects in the DIDP Master Plan. Of these, 17 projects and programs are selected for IEE based on the selection criteria. The selected projects and programs for IEE are shown in Table 2.

Activities of projects and programs are divided into three phases: Pre-construction phase, Construction phase and Operation and Maintenance phase. These activities are included for evaluation as follows:

Pre-construction phase

- land acquisition,
- resettlement,
- employment of workers, and
- establishment of site office.

Construction phase

- traveling of construction vehicles,
- operation of heavy equipment, and
- other construction activities.

Operation and Maintenance phase

- existence of structure, and
- operation and maintenance activities.

3. Results of IEE

Results of IEE are shown in Tables 3 and 4.

Table 2 List of Projects and Programs

No.	Title	IEE is required
Economic Development		
EC-1	Small Irrigation Development Project	Yes
EC-2	Commercial Farms Convert ARB's Support Program	not yet completed
EC-3	Abaca Industry Revitalization Project	No
EC-14	Fisherfolks Livelihood Enhancement Program	Yes
EC-24	Integrated SMEs IE Development Program	Yes
Social Development		
SO-1	Poverty Alleviation and Community Transformation Project	No
SO-6	Special Indigenous Peoples Education Program	No
SO-10	Common Service Laboratory Facilities Dev't. Project	Yes
SO-19	Regional Skills Training Center Project	No
SO-21	Health Care Delivery System Improvement Project	Yes
SO-22	Health Financing Program	No
Environmental Development		
EN-1	LGU Environmental Management Capability Bldg. Program	No
EN-8	Comprehensive CADC-Forest Management Project	not yet completed
EN-10	Integrated Watershed Management Program	-
EN-10a	Tagum-Libuganon Multi-Purpose Water Resources Development Project	Yes
EN-10b	Upper Agusan Flood Control and Drainage Improvement Project	Yes
EN-11	Upland Farming Model Villages Establishment	not yet completed
EN-12	Comprehensive Davao Gulf Management Program	not yet completed
EN-15	Davao City Integrated Waste Management System Development	Yes
Infrastructure Development		
IN-1	Inter-Regional Upgrading Project	Yes
IN-5	Special Purpose Roads Improvement Project	-
IN-5a	Nabunturan - Mainit Park Road Widening	Yes
IN-5b	Toril - Bayabas - Eden Road Pavement	Yes
IN-5c	Mt. Apo National Park Road Pavement	Yes
IN-5d	Babak - Penaplata - Kaputirian Road Improvement	Yes
IN-6	Davao Port Development Project	not yet completed
IN-8	Davao International Airport Development Project (DIADP)	not yet completed
IN-15	Rural Electrification and Renewal Energy Development	Yes
IN-18	SWIM Expansion Project	Yes
IN-27	PAIC Support Infrastructure Program	-
IN-27a	Special Purpose Roads Improvement Project	Yes
IN-27b	Farm to Market Road Pavement Project	not yet completed
Governance		
GO-1	MBN-based Bottom-up Planning System Establishment Project	No
BIMP-EAGA Cooperation		
EC-21	BIMP-EAGA Construction Materials Merchandising Center Project	Yes
EC-29	BIMP-EAGA R & D Triad Linkage Program	No
27 projects and Programs (with 8 sub-projects)		17 projects & programs

Table 3 Possible Environmental Impact Matrix for IEE (1/2)

Proposed Projects and Programs			Environmental Elements																																			
			Class I	Class II	Class III	Class IV	Class V	Class VI	Class VII	Class VIII	Class IX																											
			Surface water	Groundwater	Soil	Geology	Climate	Wildlife habitat	Ecology of fisheries	Natural vegetation	Hazards substances	Solid wastes	Water resources	Agriculture production	Timber production	Mining and energy resources	Air quality	Noise	Community facilities and services	Infrastructure	Transportation	Community population	Resettlement	Income	Racial, ethnic distribution	Lifestyle	Accessibility	Activities	Historical sites and structure	Archaeological or paleontological sites	Natural landscape	Cultural landscape	Elimination or relocation of commercial & industrial	Employment	Local economy			
Economic Development																																					C-	
EC-1	Small Irrigation Development Project	Pre-construction																	B-																			
		Construction											B-	B-					C-	C-	B-					B-										B-		
		O & M	? B-																																			
EC-14	Fisherfolks Livelihood Enhancement Program	Pre-construction																	C-	C-																		
		Construction											B-							B-						B-											B+	
		O & M	B-																																		C-	
EC-24	Integrated SMEs IE Development Program	Pre-construction																	B-	B-																		
		Construction																	B-	B-																	B-	
		O & M	B-																																			B+
Social Development																																					C-	
SO-10	Common Service Laboratory Facilities Dev't. Project	Pre-construction																																				
		Construction												C-																								
		O & M																																				
SO-21	Health Care Delivery System Improvement Project	Pre-construction																																				
		Construction																	B-	B-																		
		O & M																			A+																	
Environmental Development																																						
EN-10	Integrated Watershed Management Program	Pre-construction																																			A+	
EN-10a	Tagum-Libuganon Multi-Purpose Water Resources Development Project	Pre-construction																																			B+	
		Construction	? C-																																		A+	
		O & M	? ?																																		A+	
EN-10b	Upper Agusan Flood Control and Drainage Improvement Project	Pre-construction																																			B+	
		Construction	B-																																		A+	
		O & M	? ?																																		A+	
EN-15	Davao City Integrated Waste Management System Development	Pre-construction																																			B-	
		Construction																																			B-	
		O & M	B- B-																																		B-	

Environmental Elements

- I. Natural & Biological Environment
- II. Environmental Hazards
- III. Resources Conservation & Use
- IV. Air Quality & Noise Environment
- V. Community Facilities/Services and Structure

- VI. Open Space and Recreation
- VII. Historic Resources
- VIII. Visual Resources
- IX. Economic Environment

Environmental Impact Score

- A+: Significant positive impact
- B+: Moderately positive impact
- C+: Negligible positive impact
- ? : Unclear

- A-: Significant negative impact
- B-: Moderately negative impact
- C-: Negligible negative impact

Table 3 Possible Environmental Impact Matrix for IEE (2/2)

Proposed Projects and Programs		Environmental Elements																																			
		Class I			Class II			Class III			Class IV			Class V			Class VI	Class VII	Class VIII	Class IX																	
		Surface water	Groundwater	Soil	Geology	Climate	Wildlife habitat	Ecology of fisheries	Natural vegetation	Hazards substances	Solid wastes	Water resources	Agriculture production	Timber production	Mining and energy resources	Air quality	Noise	Community facilities and services	Infrastructure	Transportation	Community population	Resettlement	Income	Racial, ethnic distribution	Lifestyle	Accessibility	Activities	Historical sites and structure	Archaeological or paleontological sites	Natural landscape	Cultural landscape	Elimination or relocation of commercial & industrial	Employment	Local economy			
Infrastructure Development																																					
IN-1	Inter-Regional Roads Upgrading Project	Pre-construction																																	B+		
		Construction									B-						B-	B-			B-															B+	
		O & M															B+	B+			A+															B+	
IN-5a	Nabunturan - Main Park Road Widening	Pre-construction											C-								C-	?													B+		
		Construction			C-						B-						B-	B-			B-							B-								C+	
		O & M															C+	C+			A+							B+								C+	
IN-5b	Tori - Bayabas - Eden Road Pavement	Pre-construction																			C-														B+		
		Construction	C-	C-			C-									C-	C-										C-					B-				C+	
		O & M					?										C+	C+			B+						B+									C+	
IN-5c	Mt. Apo National Park Road Pavement	Pre-construction																			C-														B+		
		Construction	C-	C-			C-									C-	C-										C-					B-				C+	
		O & M					?										C+	C+			B+						B+									C+	
IN-5d	Babak - Penapata - Kaputinan Road Improvement	Pre-construction																			C-															B-	
		Construction	C-	C-			C-									C-	C-										C-					B-				C+	
		O & M					?										C+	C+			B+						B+									C+	
IN-15	Rural Electrification and Renewal Energy Development	Pre-construction					?	?				?																								C-	
		Construction																																			C-
		O & M																																			C-
IN-18	SWIM Expansion Project	Pre-construction					?	?						?																							C-
		Construction	B-	B-			C-	C-	?			B+	B+				C-	C-								B+			B+							B+	
		O & M	?					?																													B+
IN-27a	PAIC Related Port Development	Pre-construction					?																													B-	
		Construction	B-				B-										C-	C-																		B+	
		O & M	B-				C-				C-											B+														B+	
BIMP-EAGA Cooperation																																					
EC-21	BIMP-EAGA Construction Materials Mechandising Center Project	Pre-construction						?																												C+	
		Construction															C-	C-																		C+	
		O & M		B-	B-		B-	B-		B-		B+	B+				B-	B-			B-															B+	A+

Environmental Elements

- I. Natural & Biological Environment
- II. Environmental Hazards
- III. Resources Conservation & Use
- IV. Air Quality & Noise Environment
- V. Community Facilities/Services and Structure
- VI. Open Space and Recreation
- VII. Historic Resources
- VIII. Visual Resources
- IX. Economic Environment

Environmental Impact Score

- A+: Significant positive impact
- B+: Moderately positive impact
- C+: Negligible positive impact
- ?: Unclear
- A-: Significant negative impact
- B-: Moderately negative impact
- C-: Negligible negative impact