
ECONOMIC SECTOR REPORT

Part 3: Fishery

Chapter 1 Fisheries Policies and Institutions

1.1. Fishery Sector Overview

In 1996, the fishery industry shared 3.5% of the Philippine GDP. The industry provided employment to about one million or 5% of the Country's labor force. The average annual growth rate (AAGR) achieved by the Philippine fisheries from 1987 to 1996 was 2.5%. Fishery products account for 70% of the total animal protein intake and 30% of total protein intake of Filipinos.

Philippine fisheries are classified into municipal fisheries (with fishing boats of less than 3 tons gross weight), commercial fisheries and aquaculture sub-sectors. From 1987 to 1996, aquaculture and commercial fisheries experienced annual average growth rates (AAGR) of 6.4% and 4.5%, respectively. On the other hand, municipal fisheries declined at 1.7% per annum.

According to preliminary data of the Bureau of Agriculture Statistics (BAS), Region XI contributed 127,369 tons or only 4.6% to the Philippine fish production in 1996. Fish production in Region XI contributed, however, approximately 20% to the regional economy.

Mindanao is envisaged as the center of marine fishing activity in the East ASEAN Growth Area (EAGA), particularly for tuna. The fishing industry of General Santos City and South Cotabato Province has grown dramatically in recent years. Davao City has a recently opened Fish Port Complex, which is expected to become a major transshipment point and center of trade within the EAGA.

1.2. Fisheries Policies and Institutions

1.2.1. Fishery policies

It is reported that Philippine municipal fishing has reached or exceeded sustainable levels in recent years, particularly in bay areas. Future growth can only come from exploitation of offshore large pelagic fish such as tuna. Along this trend, one of the national fisheries strategies is to establish a new regime of Coastal Resource Management (CRM) which includes community-based rehabilitation and management of coastal resources in heavily exploited areas. The strategy also promotes offshore fishing by modernizing fleets. This main policy is expressed in the Medium Term Fisheries Development and Management Plan (MTFDMP).

In the Philippines, the Presidential Decree No. 704 revised and consolidated all laws and decrees affecting all kinds of fisheries and marine resources. Under the Decree, as amended, the Secretary of Agriculture is empowered to issue Fisheries Administrative Orders (FAOs) as implementation guidelines for fisheries. Main FAOs are:

- FAO NO. 147: prescribing the rules and regulations governing the issuance of permits for the exploitation fishery and other aquatic products.
- FAO NO. 155: regulating the size of fine mesh net of fishing gears.
- FAO NO. 162: regulates the issuance of permit for the exportation of live mud crabs

The Decree also provided for the establishment of fish refuges, sanctuaries and fishery reservations, declaration of closed season by specific areas, gears or species and prohibition of all forms of illegal fishing such as use of explosives or poisonous substances. Moreover, the decree has imposed strict fines and penalties for illegal fishing activities and determined the limit of municipal waters to 7 km for the shoreline.

The Philippine Fisheries Code of 1998 was enacted as Republic Act 8550 by the Philippine Congress. The code stipulates fisheries management regulations in the Philippines as a whole.

The Local Government Code (LGC) of 1991, empowered the Local Government Units (LGUs) to grant fishing privileges within municipal waters, issue licenses for municipal fishing boats (less than 3 gross tons) and prescribe penalties on illegal fishing. The Bureau of Fisheries and Aquatic Resources (BFAR) retained the authority on issuing licenses for commercial fishing vessels (above 100 gross tons), and licenses for fishpond.

In terms of municipal fisheries, Executive Order No. 240, 1995 creating the Fisheries Aquatic Resources Management Council (FARMCs) has institutionalized the role of municipal fishermen and other resource-users in community-based planning and implementation of policies and programs for fisheries and aquatic resource management. FARMCs are to be established in all barangay, municipalities, and cities.

1.2.2. Fisheries related institutions

Under the Department of Agriculture, is a staff bureau and a government corporation for fisheries. These are:

(1) Bureau of Fisheries and Aquatic Resource (BFAR)

BFAR has the responsibility for fisheries management and development of all fisheries and aquatic resources of the Country except those of municipal waters which are under the municipal or city government concerned. However, BFAR is not a line-agency but a staff bureau. The mandate of the Department of Agriculture over fisheries as a natural resource was turned over to the Department of Environment and Natural Resources (DENR).

(2) Philippine Fisheries Development Authority (PFDA)

PFDA is the government agency mandated to strengthen the Government's development thrusts in fisheries through a program that would balance production ventures with adequate post-harvest support facilities. The main objective of PFDA is to establish fish ports, markets, ice plants and cold storage, and other supportive facilities necessary for the efficient handling and distribution of fish and fishery products.

Other related agencies are:

(1) Department of Environmental and Natural Resources (DENR)

In coastal management aspect, DENR is given the authority to promulgate rules, regulations and guidelines on issuance of fishing licenses, permits, concessions, lease agreements and other privileges on the fisheries development, exploitation and utilization of the country's overall aquatic resources.

(2) **Philippine Council for Aquatic and Marine Research and Development (PCAMRD)**

PCAMRD is one of the sectoral planning councils under the Department of Science and Technology (DOST). PCAMRD is responsible for fisheries and aquaculture research and development. The main functions are: i) monitoring, assessment, management, and conservation of marine and inland fisheries resources, and ii) expansion, diversification and intensification of aquaculture technologies.

(3) **Davao Gulf Management Board (DGMB)**

DGMB was organized in 1995 as a coordinating body to provide general direction in planning and implementation of the Davao Gulf Management Program, of which the primary objective is to ensure food security and improve the economic and living conditions of coastal communities. The Board is composed of eleven members elected from among the mayors or deputy mayors of the Gulf municipalities.

(4) **Davao Gulf Research and Development Consortium (DGRDC)**

DGRDC is one of the lead marine and fishery management institutes in the Philippines. As main education and research organizations for marine and fishery industry in the DIDP Area, there are five member of DGRDC in the DIDP Area as follows:

- University of Southern Mindanao [Davao City];
- University of the Philippines in Mindanao [Davao City];
- Southern Philippines Agri-Business and Marine and Aquatic School of Technology (SPAMAST) [Davao del Sur];
- Davao del Norte State College [Davao del Norte]; and
- Davao Oriental State College of Science and Technology [Davao Oriental].

(5) **Regional Fishermen's Training Center (RFTC)**

RFTC was established in 1979 under the Sixth World Bank Fisheries Education Project Loan. The Center aims to enhance the present capabilities of poor fishing families through relevant training activities and transfer of technology. It is located adjacent to the Davao del Norte State College in Panabo.

The Center provides the following main training programs:

- Fishing technology such as multi gear fishing operation;
- Aquaculture technology;
- Fish processing technology;
- Fisheries conservation program;
- Entrepreneurial Development; and
- Farming system technology.

The facility of Center is one of a kind in Region XI with six trainers belonging to the Center who conduct and manage the programs for the entire Region XI.

(6) **NGO**

"Save Davao Gulf Foundation, Inc.", an NGO established in 1996 is undertaking several programs to rehabilitate marine resources as well as fisheries resources in

Davao Gulf. Activities of the organization have already been implemented with the involvement of LGUs, private sectors, and mass media.

Chapter 2 Existing Conditions and Plans/Programs

2.1. Fisheries Conditions in BIMP-EAGA and Mindanao

(1) Marine capture fisheries

The EAGA countries are aware of the value and vulnerability of their fish stocks and have strong legal safeguards (e.g., the United Nations Convention on the Law of the Sea - UNCLOS). Individual countries in the BIMP-EAGA determine their own marine fisheries situations in their own coastal zones and exclusive economic zones (EEZs), but the overall framework for marine fishery, as it affects all EAGA countries' cooperation on shared resources, is set by the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks (SFSHMFS).

This mechanism provides measures to ensure sustainability of straddling and migratory fish stocks and provides for a range of conservation and management measures to be implemented by coastal states and those fishing on the high seas. These measures cover the following matters:

- establishment of Total Allowable Catch (TAC) and quotas;
- limits the scale of fishing effort (numbers and sizes of vessels);
- limits the sizes of fish to be taken;
- gear and operational restrictions;
- definition of areas and their seasonal/periodic closures;
- promotion of environmentally sound technologies;
- mechanisms on imposing sanctions to deal with over-harvesting; and
- assistance in promoting regional and sub-regional cooperation.

The SFSHMS provides scope for developing vulnerable states to implement measures, and identifies support which other countries can provide.

(2) Aquaculture and mariculture

Major aquaculture and mariculture products from the EAGA sub-regions include prawns, groupers, sea bass, milk fish, catfish, lapu-lapu, eels, oysters, clams, mussels and seaweed. Processing of these raw materials is diverse, and value is added by methods such as drying, refining, freezing packaging into ready meals, and processing into sauces.

The greatest potential lies in the ability to farm selected commercial seaweed species to take advantage of increasing world demand. The Philippines spent twenty years developing, firstly, a seaweed production system which is based on a large number of family farms in southern Philippines, and secondly, a semi-refined and alternatively refined processing industry on the back of raw material supply. In Mindanao, it is Region IX which offers the greatest scope for increased aquaculture around Basilan, Zamboanga, Zamboanga del Norte, and Zamboanga del Sur.

2.2. Fisheries Situations in the DIDP Area

(1) Natural conditions for fisheries

In the DIDP Area, water visibility of the coastal area is relatively clear and free from pollution due to continuous currents that vary from time to time as caused by tidal movements. The Davao Gulf and other coastal areas are endowed with aquatic habitats such as mangroves, seagrasses and coral reefs which support directly or

indirectly the fisheries of the coastal waters. Extensive coral reefs are still found in the coastal areas of Davao Province, Davao Oriental, and Davao City, especially in shoals and islands of Davao Province. There is a widespread distribution of seaweed and seagrasses in the area. Mangroves are also major natural resources in the DIDP Area. The mangrove forest area, however, has been drastically decreased due mainly to conversion into fishponds and human settlements, and partly because of coastal erosion.

It is reported that continuous denudation of watersheds of the DIDP Area may lead to increase in erosion-prone areas causing eventually siltation and sedimentation in the aquatic environment.

Aquaculture, of both freshwater and brackish water is widely practiced especially in Davao del Sur and Davao Oriental. Several tributaries around the Davao Gulf and the east coast of Davao Oriental create ideal sites for brackish water fishculture.

(2) Characteristics of current fisheries in the DIDP Area

Fish production

At present, the Davao Gulf ranks among the top 15 major municipal fishing grounds in the whole Country, and is in the top 18 for commercial fisheries production. According to data from the Bureau of Agricultural Statistics (BAS), total fish production in the DIDP Area recorded at 30,621 metric tons in 1996. Of the total production, 38% is from Davao del Sur and 33% from Davao Oriental. These top two production provinces depend mainly on municipal fisheries, while Davao Province depends mainly on aquaculture. The total fish production in the DIDP Area has been stagnant for the recent five years, while the total fish production in Mindanao has increased during the same period (Table 1).

There are very small commercial fishermen in Davao del Sur compared with the other three areas. In Davao Province and Davao Oriental, the number of municipal fishermen has increased continuously since 1991, while the number of the municipal fishermen in Davao del Sur has not changed over the recent six years.

The Catch Per Unit Effort (CPUE) values were very low in many fish landing places in the DIDP Area according to a rapid resource appraisal of the Davao Gulf. Thus, municipal fisheries are unprofitable in many areas due to overexploitation of fish resources. Intensive or illegal fishing activities, water pollution, sedimentation, and other negative impacts created by human pressures have resulted to this condition.

Fish distribution and marketing system

In the Philippines, the sale and distribution of fish are generally dominated by middlemen, wholesalers and retailers. At the auction hall, fishes are received by the middlemen or wholesalers who in turn, sell them to the fish processors, retailers and consumers (Figure 1).

In terms of fish distribution in the DIDP Area, fish catch is sold mainly in provincial capitals, municipal poblacions in the three Provinces and main public markets such as Bankerohan in Davao City except for the small-scale production by subsistence fishermen. Fish catch is handled usually by middlemen ("comprador") who distribute to retailers in the public markets.

Table 1 Fisheries Production during 1992 – 1996

Aquaculture Production by Province during 1992 - 1996

Region/Province	1992		1993		1994		1995		1996	
	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)
Davao City	n.a.	n.a.	685	67,101	1,921	165,747	925	117,573	1,254	201,350
Davao	n.a.	n.a.	2,261	90,956	3,569	164,815	2,566	118,496	2,631	132,843
Davao del Sur	n.a.	n.a.	2,296	98,303	1,968	10,040	1,897	85,386	2,020	93,854
Davao Oriental	n.a.	n.a.	1,584	63,960	1,202	59,286	510	28,959	552	35,332
DIDP	n.a.	n.a.	6,826	320,320	8,660	399,888	5,898	350,414	6,457	463,379
Southern Mindanao	n.a.	n.a.	23,439	1,334,751	18,106	1,643,558	17,491	1,713,600	19,243	2,262,881
Mindanao	n.a.	n.a.	340,955	4,500,153	390,597	5,765,483	474,187	6,509,035	475,034	7,571,938
Philippines	n.a.	n.a.	793,620	30,163,191	869,083	35,002,719	919,039	33,527,341	980,857	33,210,625

Commercial Fish Production by Province during 1992 - 1996

Region/Province	1992		1993		1994		1995		1996	
	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)
Davao City					2,098	54,128	2,064	58,269	1,688	61,901
Davao										
Davao del Sur	7,635	184,641	3,043	45,809	1,040	26,361	997	29,668	1,341	32,170
Davao Oriental	2,308	53,450	2,080	49,156	1,820	56,795	2,829	75,881	2,934	81,153
DIDP	9,943	238,091	5,123	94,965	4,958	137,284	5,890	163,818	5,963	175,224
Southern Mindanao	51,446	1,223,020	44,503	845,157	37,604	1,276,447	47,343	1,252,753	68,589	1,347,318
Mindanao	218,543	4,176,890	227,174	2,939,020	230,876	3,777,307	279,947	5,001,630	292,528	5,374,651
Philippines	804,866	16,800,653	829,668	18,021,205	859,328	20,714,470	893,232	23,065,358	879,073	24,555,340

* Production included in Davao del Sur

Marine Municipal Fish Production by Province during 1992 - 1996

Region/Province	1992		1993		1994		1995		1996	
	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)
Davao City					967	50,431	1,395	83,439	2,145	125,821
Davao	1,356	39,617	1,301	31,158	1,250	40,429	1,377	40,929	1,535	44,744
Davao del Sur	9,708	400,389	8,220	235,005	4,988	197,563	6,929	385,470	7,811	426,145
Davao Oriental	8,285	77,429	10,628	280,872	8,188	137,093	7,947	121,940	6,710	100,945
DIDP	19,349	517,435	20,149	547,035	15,393	425,516	17,648	631,778	18,201	697,655
Southern Mindanao	28,782	717,214	30,846	787,569	25,879	723,129	35,258	1,172,966	38,589	1,318,682
Mindanao	377,092	8,104,929	335,614	7,549,577	320,770	8,149,505	314,999	8,540,480	281,412	7,858,956
Philippines	854,687	1,944,008	803,194	20,118,443	786,847	22,327,442	785,369	24,335,973	731,308	23,333,331

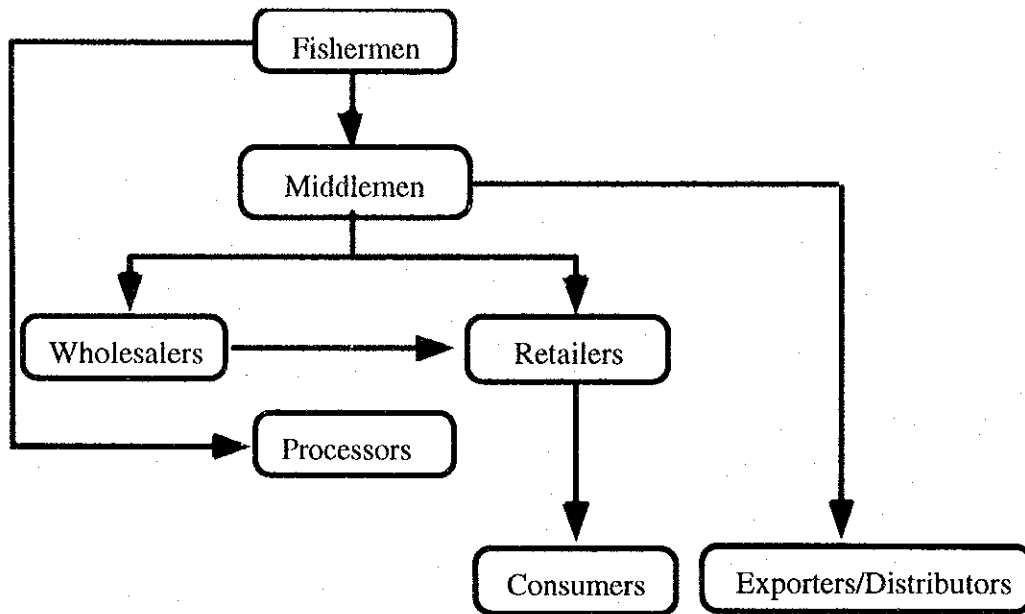
* Production included in Davao del Sur

Total Fish Production by Province during 1990 - 1996

Region/Province	1992		1993		1994		1995		1996	
	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)	Quantity (m.t.)	Value (1,000P)
Davao City	0	0	685	67,101	4,986	270,306	4,384	259,281	5,087	389,072
Davao	1,356	39,617	3,562	122,114	4,819	205,244	3,943	159,425	4,166	177,587
Davao del Sur	17,343	585,030	13,559	379,117	7,996	233,964	9,823	500,524	11,172	552,169
Davao Oriental	10,593	130,879	14,292	393,988	11,210	253,174	11,286	226,780	10,196	217,430
DIDP	29,292	755,526	32,098	962,320	29,011	962,688	29,436	1,146,010	30,621	1,336,258
Southern Mindanao	80,228	1,940,234	98,788	2,967,477	81,589	3,643,134	100,092	4,139,309	126,421	4,928,881
Mindanao	595,635	12,281,819	903,743	14,988,750	942,243	17,692,295	1,069,133	20,051,145	1,048,974	20,805,545
Philippines	1,659,553	18,744,661	2,426,482	68,302,839	2,515,258	78,044,631	2,597,640	80,928,672	2,591,238	81,099,296

Source: JICA Study Team based on the Data from Bureau of Agricultural Statistics, Department of Agriculture

Figure 1 Distribution Channel for Raw Fish



In rural areas as well as in Davao City, middlemen exist for people who do not have good access to marketing system. In the course of business transactions with small scale fishermen, middlemen divest most of fishermen's profits through this fish distribution system. For example, the middlemen provide gasoline for fishing boats and other fishing inputs in exchange for exclusive buying of the catch and privilege to identify fish prices after the fish catch has been sold to a third party.

Fisheries education and research

There are 74 schools of fisheries in the Philippines. In the DIDP Area, there are five higher education institutes (HEIs) which are the members of the Davao Gulf Research and Development Consortium (DGRDC) in relating to fisheries and marine sciences at higher level education. Although these HEIs differ in their capability to offer courses, most of them have insufficient physical facilities, financial resources, and faculties in terms of quantity and quality (Table 2).

Fisheries education and research activities are much influenced by the development of the fisheries industry. As a career, however, fisheries remains unattractive compared with other professions as law, medical and commerce. Opportunities for employment related to fisheries are not well known and very few. Actually, most of the graduates from the fisheries HEIs in the DIDP Area remain unemployed and tend to go back to their home villages.

2.3. Existing Conditions by City/Province

(1) Davao City

The Davao Fish Port Complex (DFPC) has been operated for more than two years, giving a big boost to the City's as well as the region's fishing industry. Earnings from its operations exceeded P 24 million in the first five months. However, most of

the pelagic fish in the offshore of western part of the DIDP Area is now landing at the General Santos Fishing Port Complex in General Santos City after its completion.

Table 2 Existing Fisheries-Related HEIs in DIDP Area

Province or City	Name of School	Location	Main Research/Education Fields
Davao City	Agro-Industrial School and Technology	Matina, Davao City	Bachelor of Science in Fisheries - Inland Fisheries
	*University of Southeastern Philippines (USP)		Information Technology, Biotechnology, Engineering, Marine Sciences, Material Sciences
	*University of the Philippines - Mindanao (UP-Mindanao)	Calinan, Davao City	No marine related education
Davao del Sur	*Southern Philippines Agri-Business and Marine and Aquatic School of Technology (SPAMAST)	Malita, Davao del Sur	Bachelor of Science in Fisheries - Fish Processing - Inland Fisheries Diploma in Fisheries Technology - Fish Processing - Inland Fisheries BSAT MAT
	Davao del Sur School of Fisheries	Malalag, Davao del Sur	Secondary Education - Fish Capture - Fish Preservation - Fish Culture
Davao Province Area	*Davao del Norte State College	Panabo, Davao del Norte	Diploma in Fisheries Technology - Fish Capture - Fish Processing - Fish Culture BSE Major in Fisheries Education BS Marine Biology
Davao Oriental	*Davao Oriental State College of Science and Technology (DOSCST)	Mati, Davao Oriental	BS Marine Sciences BS Geo-Sciences
	Luzon National High School	Luzon, Gov. Generoso, Davao Oriental	Agri-Fishery subjects
	Lupon School of Fisheries (Post-Secondary)	Lupon, Davao Oriental	Diploma in Fisheries Technology - Fish Processing - Inland Fisheries

Notte: * means the members of the Davao Gulf Research and Development Consortium (DGRDC)

Source: JICA Study Team

The coastline of Davao City stretching 60 km accounts only for 4% of the regional total coastline of 1,520 km. Of all the coastal barangays in the DIDP Area, 24 or 13% of the total locate in the coastal area of Davao City. However, more than 80% of the City's population live in the coastal areas, including dominant marginal fisherfolks.

In the City's major fishing ground, commercial species of skip-jack, yellow-fin tuna, big-eyed scad, herring, anchovy and other marine products like sea cucumbers, seaweeds, and ornamental shells could be found. However, coastal resources such

as seagrass bed are heavily damaged due mainly to discharge of wastewater and overfishing activities. The marginal fishers include many illegal dwellers of the City.

Municipal fish production in Davao City increased rapidly in recent years to reach 2,145 tons in 1996, accounting for 42% of the total fish production in the City. Commercial fish production has not increased as much, reducing its contribution from 50% level in early 1990s to 33% in 1996. The total fishpond operation area in the City was almost 200 ha in 1996, of which 100 ha are found in Bunawan district. They are managed by more than 30 fishpond operators.

(2) Davao Province

The Davao Province areas including the provinces of Davao del Norte and Compostela Valley, Davao Gulf and the waters of the Samal island are the major fishing grounds. However, coastal waters there do not have much fishing potentials as Sarangani in Davao del Sur assures larger scale fishing industry.

Major marine capture species are tuna, sardine, herrings, anchovies, big-eyed scad, round scad, and squids. Other sea products are shells, shrimps, crabs, and seaweeds. The prevalent fishing methods and gears used are bagnet, ring net, gill net, hook and line, and fish trap. The areas obtain additional supply of fish from General Santos City, Davao del Sur and Agusan del Sur.

Table 3 shows fisheries situation in Davao Province. As shown, municipal fish production has not increased much, while in recent years the number of municipal fishermen has increased. This means the productivity per fisher basis of municipal fishery has been decreasing for the past six years.

Davao Province has the largest aquaculture production in the DIDP Area, contributing over 40% of the total aquaculture production in 1996. This is supported by 1,600 ha fishponds by over 240 operators. Dominant fish is tilapia.

Table 3 Fisheries Situation in Davao Province

	Year	1986	1991	1992	1993	1994	1995	1996
Annual Production								
Aquaculture [ton]		1,968	2,431	-	2,261	3,569	2,566	2,631
Commercial Fish [ton]		-	3,240	3,485	4,515	4,902	4,863	5,567
Municipal Fish (ton)		-	-	1,356	1,301	1,250	1,377	1,535
Fishermen								
Commercial Fishermen [person]		2,016	3,240	3,485	4,515	4,902	4,863	5,567
Municipal Fishermen [person]		3,208	4,515	4,750	5,501	5,593	6,461	6,562
Main Aquaculture Products & Productions								
1) Milk fish [M.T.]		1,398	2,503	2,632	2,753	2,127	2,304	2,482
2) Squid [M.T.]		-	-	-	-	-	-	-
3) Tilapia [M.T.]		22	31	39	45	67	94	149
Fishing Vessels								
Non powered boat [#]		3,101	3,530	3,580	6,312	6,379	6,201	5,512
Powered boat [#]		1,905	2,180	2,517	1,905	2,035	2,130	2,248
Aquaculture Area								
Brackish water pond [ha]		1,532	1,532	1,705	1,992	1,773	1,773	1,664
Fresh water pond [ha]		31	70	87	91	133	157	155

Source: JICA Study Team based on the data from Davao Provincial Agriculturist Office

(3) Davao del Sur

Davao del Sur was blessed with abundant coastal natural resources such as seagrass, corals, and mangrove. Of the 15 municipalities, 11 are coastal. However, most of the coastal resources within municipal waters were depleted in recent years due mainly to intensive fishing pressures and siltation caused by deforestation which affected the breeding and nursery ground of fish. Illegal fishing activities like trawl fishing occasionally intruded into the coastal waters. Nevertheless, coastal waters of the province still have much pelagic fish potential especially in the offshore of Sarangani Island.

Table 4 shows fishery situation in Davao del Sur. Commercial fish production in the province decreased drastically since the early 1990s. Municipal fish production has been comparatively more stable, accounting for 70% of the total fish production in the province. Unlike in Davao City or Davao Province, however, the number of fishermen has not increased, implying a stagnant fishery activity. The common catch fish species are yellow fin tuna, skip-jack, anchovy, sardines, round scad, squid, and mullet.

In terms of inland culture, brackish water fishponds in 1996 occupied 2,141 ha. Of this total, milk fish occupied about 2,000 ha harvesting more than 2,000 tons.

Table 4 Fisheries Situation in Davao del Sur

	Year	1991	1992	1993	1994	1995	1996
Annual Production							
Aquaculture [ton]		2,416	1,963	2,296	1,968	1,897	2,020
Commercial Fish [ton]		-	7,635	3,043	1,040	997	1,341
Municipal Fish (ton)		-	9,708	8,220	4,988	6,929	7,811
Fishermen							
Commercial fishermen [person]		124	151	194	187	187	89
Municipal fishermen [person]		18,405	17,630	17,967	18,001	17,876	18,801
Total		18,529	17,781	18,161	18,188	18,063	18,890
Main Aquaculture Products & Productions							
1) Milkfish		1,989	1,446	1,499	1,499	1,550	2,089
2) Shrimp		377	410	452	452	409	-
3) Seaweed		32	48	90	71	2,150	287
Fishing Vessels							
Non powered boat [#]		5,092	5,803	5,894	5,972	6,159	6,794
Powered boat [#]		2,428	2,712	2,479	2,615	2,635	2,952
Aquaculture Area							
Brackish water pond (ha)		1,775	1,835	1,937	1,937	1,937	2,141
Fresh water pond (ha)		12	11	25	25	25	26
Others [ha.] (sea farming)		24	26	38	34	33	26

Source: JICA Study Team based on the Data from Davao Del Sur Provincial Agriculture Office

(4) Davao Oriental

Davao Oriental has several main fishing grounds such as Pujada Bay, Mayo Bay, Baculin Bay, and Cateel Bay. Fish and marine resources found in these major fishing grounds are tuna, scad, grouper, blue marine, and mackerel.

Table 5 shows fishery situation in Davao Oriental. Municipal fishery production shows a sign of decline in recent years while the number of municipal fishermen has increased. This means that the productivity of municipal fishery has been decreasing in the past six years. The number of commercial fishermen has also increased in recent years, although its production has not increased as much. Banaybanay and Lupon are two fish pond municipalities in Davao Oriental.

At the eastcoast of the province, fishers are not only supplying fish for the local residents but also consumers in other towns like Cateel and Caraga. They are also engaged in seaweed growing as other sources of income especially in Baganga. Most of the coastal areas are free from siltation.

Table 5 Fisheries Situation in Davao Oriental

	Year	1990	1991	1992	1993	1994	1995	1996
Annual Production								
Aquaculture (ton)		681	521	-	1,584	1,202	510	552
Commercial Fish (ton)		-	-	2,308	2,080	1,820	2,829	2,934
Municipal Fish (ton)		-	-	8,285	10,628	8,188	7,947	6,710
Fishermen								
Commercial Fishermen (person)		8,414	8,857	9,324	9,815	10,324	10,868	11,411
Municipal Fishermen (person)		2,904	3,353	3,508	3,672	3,842	4,023	4,204
Main Aquaculture Products & Productions								
1) Milk Fish (MT)		505	505	505	505	707	707	1,011
Main Commercial Products & Productions								
1) Yellow Fin Tuna/Blue		2,024	1,985	1,947	1,909	1,872	1,836	1,800
Main Municipal Products & Productions								
1) Scad		3,552	3,777	3,703	3,631	4	3,491	3,804
Main Fishing Methods & Productions								
1) Purse Seine (MT)		2,024	1,995	1,947	1,909	1,872	1,836	1,800
2) Gill nets (MT)		-	3,777	3,703	3,631	3,560	3,491	3,804
3) Hook & Line / Spear Fishing (MT)		3,852	-	-	-	-	-	-
Fishing Vessels								
Non powered boat (#)		3,217	3,387	3,566	3,754	3,952	4,160	4,368
Powered boat (#)		1,055	1,111	1,170	1,232	1,237	1,366	1,432
Aquaculture Area								
Brackish water pond (ha)		1,011	1,011	1,011	1,011	1,011	1,011	1,011
Fresh water pond (ha)		23	23	25	27	28	30	30
Others (ha)		-	-	-	-	5	3	20
Fishery Resources								
Demersal Fish (ton/year)		3,852	3,777	3,703	3,631	3,560	3,491	3,804
Pelagic Fish (ton/year)		2,024	1,945	1,947	1,900	1,872	1,836	1,800
Fishing Port (#)		4	4	4	4	4	4	5
Main Seafood Export Value (US\$)								
1) Tuna (MT)		1,012	993	974	955	936	918	-

Source: JICA Study Team based on the data from Davao Oriental Provincial Agriculturist Office

2.4. Existing Plans and Projects

2.4.1. General programs and projects

(1) National level program

Medium-Term Fisheries Management and Development Program (MTFMDP)

The MTFMDP intends to enhance the productivity of the country's fisheries resources with the planning period from 1993 to 1998. The scope of development efforts will be directed to management of specific coastal resource, aquaculture, and lake areas. It has two main targets: i) to double aquaculture productivity from 1.2 metric tons per hectare to 2.4 metric tons per hectare, and ii) to double the number of Coastal Resource Management (CRM) priority bays and gulfs from 12 to 24. In the DIDP Area, the CRM area includes Davao Gulf. However, the aquaculture management areas do not cover the DIDP Area.

(2) Regional level program

There are several fisheries programs and projects going on in Region XI as of 1997. The main regular programs and projects in the DIDP Area are as follows.

Fisheries management and development program management

- Monitoring services

To establish and institutionalize an effective feedback mechanism in determining the status of programs/projects implemented.

Technical assistance services

- Aquaculture services

To intensify aquaculture production of the region using ecologically and environmentally attuned technology to environment.

- Marine services

To disseminate the important aspects of marine fishery resources and management strategies.

- Post-harvest services

To provide technical assistance and advisory services to LGUs, NGOs, fishermen, and prospective post-harvest investors.

Regulatory services

- Law enforcement services

To involve sea borne patrols and market inspections, jointly or in coordination with LGUs and appropriate law enforcement agencies of the Government

- Post-harvest services

To provide technical assistance and advisory services to LGUs, NGOs, fishermen, and prospective post-harvest investors.

Other regional level projects include GATT Funded Projects, Other Support Components, and a Special Project. The contents of the GATT Funded Projects are

almost the same as those of the regular project. Other Support Components include BIMP-EAGA project which aims to promote technology and business exchange among member countries. The Special Project (Establishment of Fish Sanctuary in Barangay Baybay and Bulacan in Malalag, Davao del Sur) aims to maintain the population of fish and aquatic resources of the area at sustainable level.

Another main special program is an ADB funded program which will be implemented in 1998. The program is "Fisheries Resource Management Project" which includes CRM plans in accordance with MTFMDP, Resource and Social Assessments (RSA), and Information and Education Campaign (IEC). CIDA has also contributed to fishery through its coast of management program.

2.4.2. Specific programs and projects in Southern Mindanao

(1) Fisheries intervention programs by the Government

1) Rehabilitation and Enhancement Programs

Artificial Reef Projects in Davao Gulf were introduced in order to rehabilitate fishery resources and to increase fish catch of municipal fishermen. It is reported that more than 600 artificial reef units were installed in selected coastal areas by DA, other government agencies, and NGOs since 1987. However, installation of artificial reef units was done apparently without proper consideration of criteria in the selection of sites. Some artificial reefs are still installed in areas near river mouths where heavy siltation was observed. Also the effect of the installation of artificial reefs is controversial.

Mangrove Reforestation Projects were initiated by DENR, funded by DA through LGUs in order to rehabilitate fishery resources as well as to prevent future resource degradation by natural hazards. Like other programs, the projects were conducted with fishermen associations or cooperatives in various sites. The total project area will be more than 100 ha in Davao Gulf. It is reported, however, that most fishermen cannot recognize the importance of mangrove reforestation due to lack of project dissemination.

Alternative Livelihood Projects were provided to some subsistence fishers in order to improve living conditions and augment income during fishing off seasons. The projects which include fish capture, seaweed culture, and establishment of cooperative stores were funded mainly by DA or DSWD through various LGUs which could use their community development fund. It is reported that the projects had generally been successful in many coastal communities in the Davao Gulf area. However, fish capture components tended to be unsuccessful mainly due to lack of basic fishery equipment. For the seaweed culture component, 10 major seaweed farms were established. However, half of the farms were unsuccessful due to poor administrative control leading to occurrence of seaweed diseases.

2) Fisheries Assistance

Extension Services are important components of any development activities. In the DIDP Area, the extension activities are performed by devolved local officers of DA. The Regional Agricultural Fishery Council (RAFC) is mandated to monitor and manage the financial assistance projects, designated field coordinators, and beneficiaries.

Credit Support Facilities Projects granted loans to finance several development components for fishers in the DIDP Area as follows:

- Development Assistance Program for Cooperatives and People's Organization (DAPCPO);
- The Livelihood Enhancement for Agricultural Development (LEAD);
- Fisheries Sector Programs (FSP); and
- Davao Gulf Management Board (DGMB) Funds.

(2) ADB funded project

The Fisheries Resource Management Project (FRMP) was proposed in 1997 and funded by Asian Development Bank (ADB). The long-term goals of the project are to achieve sustainable development of fisheries sector, and reduce poverty among municipal fishers. The primary objective is to reverse the trend of fisheries resource depletion in municipal waters. The project covers 18 priority bays, comprising 11 Fishery Sector Program (FSP) bays and seven new bays including Davao Gulf.

The project comprises the following three components.

1) Fisheries Resource Management

This component aims to strengthen fisheries regulations, rationalize the utilization of fisheries resources, and rehabilitate the damaged fish habitats. This component consists of the following interrelated elements:

- Philippine Fisheries Information System (PHILFIS);
- Coastal resource management planning and implementation;
- Fisheries legislation and regulations;
- Community-based law enforcement; and
- Monitoring control and surveillance (MCS).

1) Income Diversification

The short-term objective of this component is to provide municipal fishes with supplementary income and reduce their reliance on fishing. Its long-term objective is to facilitate the gradual exit of subsistence fishers from fishing. This component will involve the following three interrelated activities:

- Community organizing;
- Promotion of micro-enterprises; and
- Support for mariculture development.

1) Capacity Building

The objective of this component is to build up the capabilities of government agencies at the national, regional, and local levels for fishery resource management in the long term.

The above-mentioned management objectives and directions for fisheries by the FRMP translate on-going regional fisheries management policy and programs in Region XI.

(3) USAID funded program

The Growth with Equity in Mindanao (GEM) project, funded by USAID, has been involved in promoting the development of the fisheries and aquaculture sectors in Southern Mindanao. There is the Strategic Plan for GEM Participation in Fisheries and Aquaculture Development during 1997-1999 as an on-going fisheries project in Southern Mindanao. The plan does not focus on the DIDP Area and is more commercial development-oriented but some of the strategies are similar to the specific strategies applicable to the DIDP Area.

The plan comprises the following three sector strategies:

1) Fisheries Sector Strategies

- Proper management of tuna and other resources within the Philippine EEZ;
- Extension of fishery into international and host-country waters;
- Development of diversified value-added processing;
- Improvement of fish quality for a higher base price;
- Improvement of market linkages and international product promotion;
- Development of alternative fishing methods; and
- Modernization of fishing fleet and equipment.

2) Fish Culture Strategies

- Determine international market demand for various species and product types;
- Use the "Geographical cluster" approach in determining areas most favorable for particular species, and location of processing facilities;
- Introduce the latest and most appropriate technology for culture systems and processing;
- Promote and package projects that are practical, profitable, environmentally sound, and replicable; and
- Closely coordinate with BFAR and other government agencies involved with fish culture.

3) Seaweed Culture Strategies

- Determine international market demand before advocating increases in production of number of processing plants;
- Before expanding hectareage, concentrate on improving yields and increasing farmgate prices through technology transfer;
- Further analyze the political, infrastructure, and environmental constraints;
- Plan expansion of the industry on the basis of "geographic clusters";
- Take into consideration the social and political impact when allocating GEM assistance; and
- Liaise with appropriate government offices to ensure policy and infrastructure coordination.

Chapter 3 Constraints and Prospects

3.1. Constraints

(1) Intensive fishing pressure in municipal water

The "open access" nature of marine fisheries resources in the DIDP Area has caused multiple resource use conflicts especially between commercial fisheries and municipal fisheries within municipal waters. Better-equipped fishing rigs using powerful lights to enter municipal waters were observed in some fishing grounds in Davao Province, Davao Oriental and Davao del Sur. In recent years, these intensive fishing activities by commercial operators tend to lead to decrease in the municipal fish production which is carried out by non-motored bancas.

Another fish resource use issue within municipal waters is conflict between fish pen owners and municipal fishermen at the fishing grounds in front of the fisherfolks villages. Fish sanctuaries which were identified by some private fisheries businessmen are also subject to similar conflicts.

(2) Water pollution

According to water sampling data from the rapid resource appraisal of the Davao Gulf, most of the river sampling sites in the Davao Gulf appeared to have some environmental problems as indicated by heavy silt flow and the accumulation of sediments at the mouths of rivers. Also, pesticide-contaminated runoffs from agricultural farms such as banana plantation and effluents from factories found their way into the Davao Gulf. In Davao del Sur, huge fish kill incidents were suspected to have been caused by pesticide-contaminated runoffs. In recent years, some fish resources have decreased due to water pollution.

(3) Illegal fishing

Illegal fishing such as dynamite fishing, cyanide poisoning, and skin dive fishing using compressors are still reported in the DIDP Area. These activities have degraded fishery natural resources such as coral reefs and seagrasses. Although the "Bantay Dagat," formulated by local governments, watches illegal fishing activities, conduct of patrol works are voluntarily, and authorized manpower is insufficient.

(4) Lack of basic fisheries infrastructure

There are very few fish landing places or centers in the DIDP Area, especially in the three provinces. In terms of aquaculture, there are only less than 20 ice plants cold storage facilities and four processing plants in the DIDP Area. It is urgently to build the basic fisheries and post-harvest facilities to allow more effective processing, refining and packaging in strategic areas to develop commercial fisheries and municipal fisheries. Also, aquaculture suffers from limited support facilities such as hatcheries and R & D facilities.

(5) Insufficient transportation infrastructure

Due to the undeveloped road network, means of transporting fish is very limited in the DIDP Area. Most of the fish catch are transported by small trucks of less than 5 tons. Travel time to main markets takes too long. Lack of fish transportation infrastructure constrains fish landing activities of subsistence fishermen. It also poses difficulty in establishing competitive commercial fisheries.

(6) Unmodernized marketing system and unstable aquaculture market

One significant concern of subsistence fishers is the usual method of marketing fish catch. Middlemen buy the fish from fishers at low prices, then sell this either to the market or to another middlemen at doubled prices. As a result, subsistence fishermen derive low income from fishing, and fish becomes out an expensive commodity to a majority of consumers.

For the last ten years, many shrimp ponds have been converted to milkfish ponds especially in Davao Province due to unstable and small-scale shrimp markets. On the other hand, milkfish aquaculture is also unprofitable due to the high cost of feed and shortage of milkfish fry. These trends may also lead to encourage alternative livelihood programs such as small-scale food processing, soap making, and other small-scale businesses for municipal fishermen.

(7) Weakness of integration of fisheries-related organizations

In general, cooperative activities are not brisk in the Philippines. At present, there are few vital fisheries cooperatives like Mabini. Stagnant is due to lack of capital to sustain the operation and businesses of cooperatives. However, coastal resource management in the DIDP Area calls for the establishment of a key local level initiative organization such as cooperatives.

For minimizing recent coastal resource conflicts and inappropriate fishing activities in the DIDP Area, there is a need to integrate relevant resource management agencies to manage the resources more effectively. Although DGMB for the Davao Gulf region was organized in 1995, the Board is still weak to manage overall coastal resources. In fact, programs implemented by the Board are very few.

3.2. Prospects

3.2.1. Resource potentials

(1) Pelagic fish resource potential

Although demersal fish resources in municipal waters may have reached sustainable levels in the DIDP Area, large pelagic fish resources such as tunas are still expected to develop further, especially at the offshore of Davao del Sur and Davao Oriental. According to BFAR, an expanded fish stock assessment in the DIDP Area has been conducted in recent years to establish a more precise Total Allowable Catch (TAC).

As for aquaculture, milkfish production has increased especially in Davao Province and Davao del Sur in recent years, although there is a constraint of unstable market of aquaculture products.

(2) Geographical advantage to fish consumption areas

Geographically, the DIDP Area, especially Davao City has a high potential for commercial fishery development. The Davao Fish Port Complex (DFPC) which is the second major fishing port in Mindanao was opened in 1995. The complex is expected to serve as a center for collection, processing, storage and packaging of commercial fishery products for distribution to the Davao City area and to the international market.

(3) Favorable water quality for fish growth

Although some fishing grounds of the DIDP Area are not in good condition, most of the water quality indicators of Davao Gulf are still within the DENR water quality standards for fresh and marine waters for the propagation and growth of fish and other aquatic resources as attested by the rapid resource appraisal of Davao Gulf.

(4) Favorable marine conditions for mariculture

Shallow water marine conditions, especially in Davao Gulf are suitable for mariculture. For example, Banaybanay, Sto. Nino, and Sta. Cruz are high potential areas for mariculture of seaweed such as *Eucheuma* spp. due to high nutrients, strong currents and adequate salinity. Actually, a *Eucheuma* spp. seaweed marine culture program at Samal Island is already implemented.

(5) Human resource potential

Although the fisheries sub-sector is insufficient in human power, especially technical staff, fisheries officials, and the private sector already embarked on several local fisheries development and management initiatives. There are some local fisheries related universities and local fisheries schools and institutions in the DIDP Area. Capabilities of these local institutions should be strengthened to enable them to produce more qualified marine and inland fisheries graduates. Also, many environmental and social development NGOs and POs in the DIDP Area would provide local bases for promoting coastal resource conservation and management.

3.2.2. Opportunities for BIMP-EAGA cooperation

(1) Marine captive fisheries

All countries in the EAGA aim to conserve their respective inshore resources, while promoting their deep sea activities. Beyond this broad policy context, they differ in the assessment of actual fish stocks and willingness to let other countries become involved in the expansion of their domestic industries. Despite that, great possibilities for research exchange exist, especially on coastal resource management issues.

The following may be undertaken to promote and substantiate the BIMP-EAGA cooperation on marine captive fisheries:

- agreement on fishing in shared and adjacent waters of mutual interest to EAGA member countries;
- establishment of institutional and legal systems for compliance monitoring, and provision of resources such as speed boats for this to be effective;
- development of a strategy for planning of fish processing in order to avoid overcapacity and to encourage specialization of production within the sub-regions, and rationalization of port infrastructure planning and transport links within EAGA;
- establishment of an on-line information exchange system among EAGA member countries including aquaculture products;
- publishing and dissemination of information on private sector investment opportunities within the sub-regions;
- promotion of EAGA branded products in export markets; and

- cooperation in coastal resource management research and development.

Post-harvest facilities also provide a crucial link between production and market, and there exist possibilities for joint venture cooperation between the public and private sectors.

(2) Aquaculture and mariculture

There are several possible areas for cooperation in aquaculture in EAGA. There is plenty of room for expansion in the production of carragenan from seaweeds within the region. For example, there is a private investment proposed on a joint venture basis between a Philippine company and an Indonesian company for cultivation and semi-processing of seaweed in North Sulawesi.

It is also reasonable to promote free trade of fish fry among EAGA member countries to address the present constraints to production of some species. Establishing an on-line research information network could be one strategy to consider. Another major area of cooperation is coastal and marine resource management research and development with the Philippines as the lead country.

Chapter 4 Objectives, Strategy and Measures

4.1. Development and Management Objectives

Objectives of fisheries development and management in the DIDP Area are defined as follows:

- 1) To protect and enhance the fishery resources including coastal and marine resources through the promotion of wise use of these resources and provision of livelihood opportunities;
- 2) To integrate subsistence fishers in the mainstream of the DIDP socioeconomy through increase and diversification of income opportunities; and
- 3) To increase fisheries-based value-added production thereby establishing more competitive fishery industry in the DIDP Area.

4.2. Strategy

(1) Basic strategy

Basic strategy for the DIDP fishery development and management is established to support the economic, social and environmental objectives of the DIDP Area development. It consists of the following three components:

- 1) Further development of commercial fishery, capitalizing on pelagic fish resource potentials especially in the southern offshore of Davao del Sur and Davao Oriental, and strengthening market channels for value-added products by effectively utilizing the Davao Fish Port Complex (DFPC);
- 2) Development of municipal fishery into viable economic activities by organizing small fishers and providing support services to cooperatives; and
- 3) Selective strengthening of aquaculture based on the establishment of economic and financial viability as well as environmental soundness to diversify income opportunities for coastal people.

(2) Specific strategies

Specific strategies for the DIDP fishery development and management are presented in accordance with the DIDP strategy.

Internal Integration

- 1) Organizing small fishers into cooperatives and allowing them to enter into larger scale operation within an expanded municipal waters,
- 2) Using newly established or revitalized fisheries cooperatives as recipients of technical extension and viable economic entities for marketing and processing,
- 3) Improving existing fisheries infrastructure selectively to support the municipal fishery,
- 4) Strengthening the DGMB for fisheries and coastal resources management with the support of LGUs, local communities and NGOs/POs, and
- 5) R&D for improving traditional fishing gears and methods and aquaculture practices.

Globalization Drive

- 1) Inter-linking improved fisheries infrastructure with the DFPC to promote commercialization of municipal fishery,
- 2) Conducting a Davao Gulf fishery resources inventory, taking at least a few years to determine specific conditions with respect to distribution of fish species, coral reefs, seagrasses, and seabed conditions,
- 3) Upgrading existing mariculture of seaweed for quality control, products development and market diversification,
- 4) Establishing support centers for more viable aquaculture practices with fry production and distribution, extension and applied research, and
- 5) Strengthening the Davao Oriental State College for Science and Technology for applied research as well as for training and education in the fields of marine biology, marine and coastal environmental management, fish preservation and processing, and aquaculture and mariculture technologies.

High tech-High Services

- 1) Establishing innovative mariculture practices through experimenting in the Davao Gulf areas close to the open sea, and
- 2) Upgrading the Davao Oriental State College for Science and Technology for advanced research on marine and coastal ecosystems strengthening links with other related institutes.

4.3. Projects and Programs

The following six projects and programs are proposed in the fishery sector:

- 1) Comprehensive Davao Gulf Management Program;
- 2) Fisherfolks Livelihood Enhancement Program;
- 3) Marine Fisheries Support Facilities Improvement Project;
- 4) Integrated Aquaculture Promotion Program;
- 5) Marine Fishery Resources Inventory Project; and
- 6) Value-added Fishery Products Development and Marketing Program.

These projects are composite projects or programs, each consisting of component projects. Each project/program is described below. Profiles of these projects/programs are contained in Project Report.

(1) Comprehensive Davao Gulf Management Program

Strengthening DGMB

The Davao Gulf Management Program (DGMP) was created in 1995 to promote and ensure the continued sustainable use of Davao Gulf through proper resource management, treating the entire gulf as a single resources and ecological unit. However, accomplishments by DGMP have been very few, it has established only two fish sanctuary areas within the Gulf due to the lack of legal entity of DGMB and other financial and technical reasons.

Therefore, first, DGMB should evolve into an independent authority by a presidential decree. Second, DGMB should have more comprehensive functions and enlarged membership to ensure accountability to manage more effectively in cooperation with BFAR, DENR, and NGOs such as Save Davao Gulf Foundations and Research Institute. Functions should include the following:

- 1) to stipulate fisheries and environmental regulations in the Davao Gulf area: e.g., regulate appropriate fishing activities as well as conserve fish resources;
- 2) to formulate fisheries and coastal environmental policies and planning in Davao Gulf: e.g., to establish and expand fish sanctuaries/marine reserves, and marine research stations;
- 3) to monitor coastal management with relevant line agencies, research institutes, NGOs, and LGUs: e.g., command and control the "Bantay-Dagat" activities to control illegal fishing; and
- 4) to promote the coastal resource conservation, environmental awareness, and research activities for Davao Gulf: e.g., plan for coastal environmental awareness programs for fishers and local peoples.

Fish sanctuary expansion and management

Many fishing grounds within municipal waters in the DIDP Area have been depleted by recent human fishing pressures including illegal fishing. Given the degrading conditions of the fishing grounds, various measures will be needed to restore the municipal fisheries production especially for municipal fishers.

In order to restore the fishing grounds, some measures such as artificial reef installation, establishment of fish sanctuaries or fish reserves were conducted in the DIDP Area as well as several areas in some tropical countries. According to the recent report on the DIDP Area, establishment of fish sanctuaries is found most effective in restoring fishery resources on a sustainable basis. Therefore, fish sanctuary areas should be expanded and the existing fish sanctuary areas should be managed continuously until the fish resources restored.

(2) Fisherfolks Livelihood Enhancement Program

The people along the coast of Davao Gulf as well as the east coast of Davao Oriental depend largely on the natural resources especially fish in the municipal waters. According to the Rapid Social Survey, income of the people is derived from subsistence fishing which accounts for more than 80% of daily earnings.

However, a majority of the residents are very poor and the overall average income is below poverty threshold income level in Region XI as of 1994. Farming is neither profitable due to unsuitable soil conditions and lack of farming skills.

To mitigate the critical situation, fishers livelihood enhancement program should be implemented. This program include the following components.

Alternative livelihood enhancement for fisherfolks

Fishers along the coast of Davao Gulf and the eastcoast of Davao Oriental depend largely on small-scale fishing within the municipal waters. However, most people are very poor because fishing gears are very limited and their fishing grounds have been depleted due to recent fishing pressures. Most of the subsistence fishers have

no other way to live at present. Therefore, provision and development of alternative sources of income for the fishers should be considered.

Objectives of the project include increasing the opportunity for other sources of income for the fishers and decreasing the fishing pressures by municipal fishers in the depleted municipal water.

Fisheries skills improvement and development

The fishers along the coast of Davao Gulf and the eastcoast of Davao Oriental depend largely on the small-scale fish production within the municipal waters. Most fishermen have no specific modernized and environment-friendly fishing skills. Many fishing activities are not profitable and may lead to depletion of fish resources in the fishing grounds. One constraint is capitalization, and another is the lack of opportunities to learn modern fisheries skills. Therefore, each province should identify a pilot project site in order to conduct appropriate community-based fisheries training. Each pilot project could implement trainings on modernized fishing skills and post-harvest technology of seaweed and others.

(3) Marine Fisheries Support Facilities Improvement Project

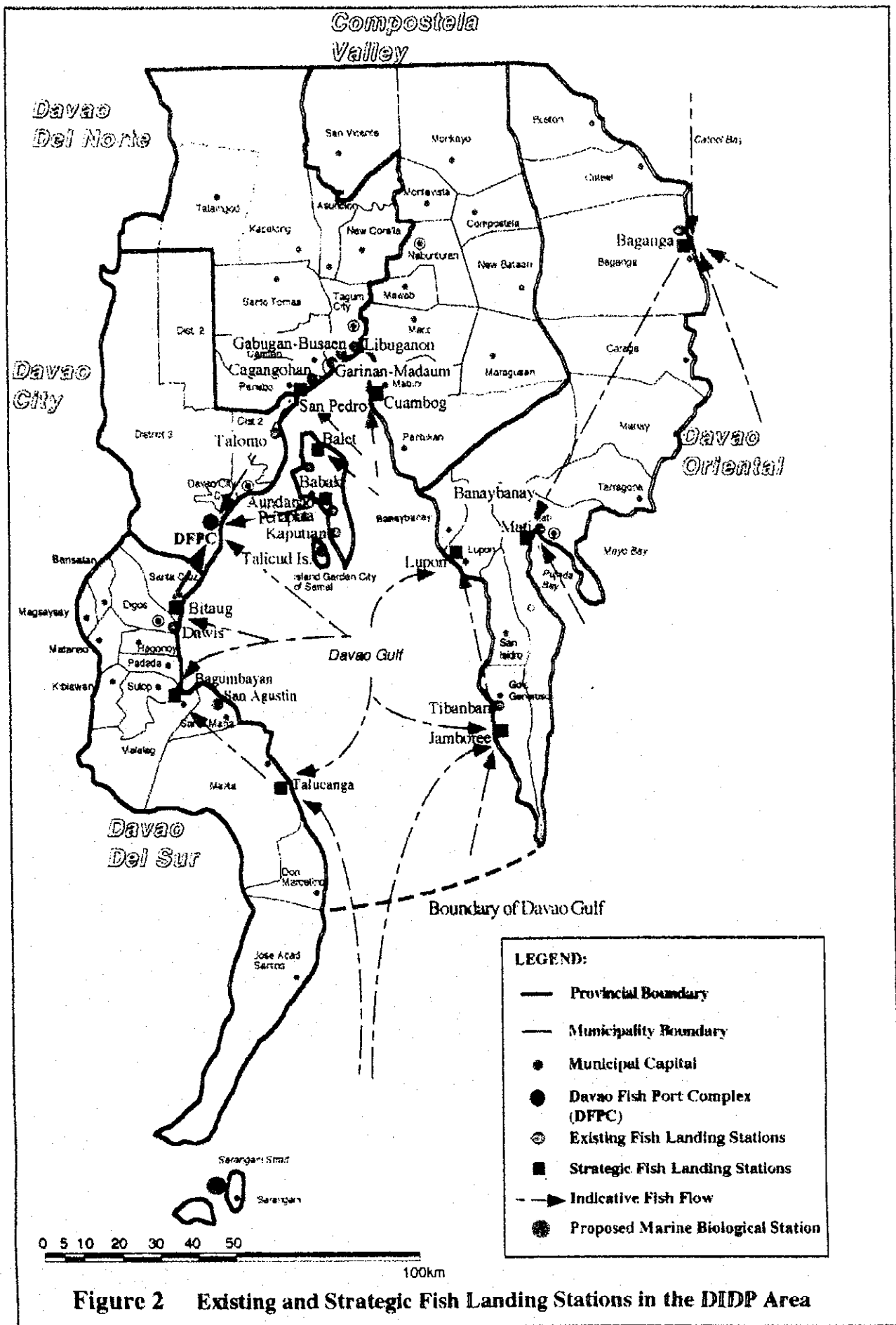
For more effective economic development activities, vital infrastructure support facilities such as roads, bridges, and communication facilities are urgently needed not only for fisheries but also for other economic activities along the coasts. For fisheries development, strategic linkages among fish landing stations, fish trading markets, and distribution centers are very important to create a competitive fishery industry by maintaining the quality of seafood products.

Also, fisheries post-harvest facilities such as ice plant and cold storage in various strategic locations are still very few or largely non-operational in the DIDP Area, although these areas may have large economic potentials for fish-based industry. Therefore, the following fisheries support facilities in the DIDP Area must be upgraded and linked with the DFPC and other existing infrastructures in adjacent areas. Figure 2 shows existing and strategic fish landing stations and indicative fish flow in the DIDP Area.

- fish landing stations,
- ice plants,
- cold storage facilities,
- fish trading markets, and
- fish distribution centers.

(4) Integrated Aquaculture Promotion Program

The DIDP Area has high potentials for freshwater aquaculture such as tilapia in Sto. Tomas, milk fish in Florida in Davao del Norte and Nabunturan in Compostela Valley. On the other hand, there are favorable marine conditions such as appropriate current and salinity for mariculture especially for seaweed cultivation around Island Garden City of Samal.



However, these aquaculture activities are still of small scale and need basic support facilities such as hatcheries and seed bank for fry. Also, the fry and products distribution channels are not well established.

To develop aquaculture industry, the following measures should be considered:

- Establishment of stable market channels for fish fries and fingerlings; and
- R & D and technical extension for potential aquaculture products.

In Davao del Norte and Compostela Valley, the coastal waters do not have much fish resource potentials as in the southern offshore of Davao del Sur. Therefore, inland fisheries resources in these provinces should be accessed for effective and efficient inland fisheries development. An inventory should be established and linked with main aquaculture products distribution channels. It will provide a very useful tool for strategic aquaculture products marketing as well as effective resource management. The inventory should include:

- location of nursery/hatchery,
- owners of the area,
- amount of fish stock and capacity,
- ecological conditions, and
- distribution channels.

(5) Marine Fisheries Resources Inventory Project

Marine fish resources inventory

One of the most important bases for the effective management of fisheries resources is good information on the fish stocks. Annual trends in catch and fishing effort provide the most important and reliable base indicating the status of fish stocks. Lack of good quality statistics on catch and effort over time makes the strategy of marine fisheries management difficult to establish due to uncertainties. Specific research projects in terms of marine resources done by research institutes are also important for effective fisheries management in the DIDP Area. In recent years, some fish stock researches have been carried out in key bays such as Pujada Bay, Balite Bay and Malalag bay.

Therefore, close collaboration among Fisheries Divisions of DA Region XI, Provincial Agriculturist Offices in the DIDP Area and research institutes such as Davao Gulf Research and Development Consortium should be promoted for improving the quality of catch and effort statistics for marine fisheries. A collaborative research could be formulated for an integrated marine fisheries resources inventory in the DIDP Area. This inventory should include the following for main demersal and pelagic fish:

- catch per unit effort (CPUE);
- catch size distribution ratio;
- catch species by landing stations;
- type of fishing gear/methods;
- type of commodity products; and
- mariculture distribution/potential area.

Strengthening DGRDC

In the DIDP Area, there are five HEIs related to fishery and marine science which are members of the Davao Gulf Research and Development Consortium (DGRDC). Although these HEIs differ in their capability to offer courses, most of them have insufficient physical facilities, financial resources, and faculties in terms of quantity and quality.

In order to improve the situation of fishery education and research in the DIDP Area, fisheries-related HEIs need to implement collaborative research among DGRDC. The project should include the following components:

- to discuss relevant issues and assist each other in fisheries curriculum development;
- to establish a network of research information;
- to develop technology and help each other in field trials or technology verification;
- to establish a marine biological station in Sarangani Island which will conduct fishery related R & D (e.g., marine ranching); and
- to conduct a collaborative marine and fishery applied research in the DIDP Area.

(6) Value-added Fisheries Products Development Marketing Program

The DIDP Area still has a lot of opportunities for expanding seafood products. The Area has DFPC and strong geographical advantage in the BIMP-EAGA context. However, the fishery industry is very dependent on traditional small scale markets, and its marketing effort is concentrated on very limited products such as tuna canning which require large amount of raw materials without much innovation. Processors and exporters should be more innovative in the utilization of seafood raw materials and should realize the recent world situations in terms of fish processing industry.

Value-added seafood products have great demand in the world market in recent years, but the Philippines, especially the DIDP Area, is not competitive in marketing the products. Utilization of the valuable seafood species in the DIDP Area has not been fully optimized. One reason for this is lack of effective market information and channels on the processing and marketing as well as information on supply and demand situations. The following are particularly important.

Marketing strategy development for seaweed products

A seaweed price regulation council may be established to ensure more stable prices of various seaweed products. The council may conduct market research and product development by mobilizing research institutes and the private sector.

R&D for value-added fish-based products

In order to develop value-added fish-based products in the DIDP Area, product innovation based on the regional characteristics of the raw materials is necessary for optimum utilization. For example, milk fish processing has already been innovated to produce smoked boneless milkfish. Dried seaweeds and refined carageenan will be another expected value-added fish-based products in the DIDP Area.

Aside from these products, some new value-added fish-based products in the DIDP Area should be researched and developed for strengthening the competitive fishery industry. This shall be undertaken through a collaborative R&D within the fishery industry stakeholders such as fishery-related institutes, fish processors, and exporters. Market niching is one of the best approaches to match selected high value and high quality fish-based products with specific market segments.

ECONOMIC SECTOR REPORT

Part 4: Mining

Mining including quarrying is a major economic sub-sector in the DIDP Area. It generated ₱1,390 million of GVA in 1995 supported by 13,691 workers, accounting for 1.6% of the DIDP GVA and 1.3% of the total employment, respectively. Mining is concentrated in Davao Province (Davao del Norte and Compostela Valley at present), which accounted for 79% (₱1,105 million) of the GVA total in 1995.

Chapter 1 Existing Conditions

1.1. Mining Administration and Activities

1.1.1. Mining administration

(1) Mines and Geoscience Bureau (MGB)

MGB, a line bureau of DENR, has the following functions cited from Section 9 of the Republic Act (RA) 7942 or the "Philippine Mining Act of 1995":

- 1) To be directly in charge of administration and disposition of mineral lands and mineral resources;
- 2) To undertake geological, mining, metallurgical, chemical and other researches as well as geological and mineral exploration surveys;
- 3) To recommend to the Secretary (of DENR) grant mineral agreements to duly qualified persons;
- 4) To monitor contractor's compliance on terms and conditions of mineral agreements;
- 5) To confiscate surety, performance, and guaranty bonds posted through an order to be promulgated by the Director; and
- 6) To deputize, when necessary, any member or unit of the Philippine National Police, barangay, duly registered NGO or any qualified person to police all mining activities.

(2) Local Government Units (LGUs)

DENR Administrative Order (DAO) 96-40, the Implementing Rules and Regulations (IRR) of RA 7942 prescribes the roles of LGUs in the implementation of mining projects within their respective jurisdictions. These rules formulated pursuant to the 1991 LGU and other pertinent laws are:

- 1) To ensure that relevant laws on public notice, public consultation, and public participation are complied with;
- 2) To approve applications for permit on small-scale mining, sand and gravel, quarry, guano, gemstone gathering, gratuitous permits, and industrial sand and gravel permits not exceeding five hectares, in coordination with MGB/Regional Office(s) and subject to valid and existing mining rights;
- 3) To receive their share as provided for by law in the wealth generated from the utilization of mineral resources and thus enhance economic progress and national development;

-
- 4) To facilitate the process by which the community shall reach an informed decision on the social acceptability of a mining project as a requirement for securing an Environmental Compliance Certificate (ECC);
 - 5) To participate in the monitoring of any mining activity as a member of the Multipartite Monitoring Team referred to in Section 185 of RA 7942;
 - 6) To participate as a member of the Mines Rehabilitation Fund Committee as provided for in Sections 182 to 187 of RA 7942;
 - 7) To be the recipient of social infrastructure and community development projects (by the contractors and the like) for the utilization of the host and neighboring communities in accordance with Chapter XIV of RA 7942;
 - 8) To act as a mediator between indigenous cultural community(ies) and mining contractor(s) as may be requested;
 - 9) To coordinate with DENR and MGB in the implementation of the RA 7942 and its implementing rules and regulations in their respective jurisdictions; in areas covered by the Southern Philippines Council for Peace and Development (SPCPD), Autonomous Region of Muslim Mindanao (ARMM), and future similar units. Appropriate offices of said units shall coordinate with DENR and MGB in the implementation of the Act and these implementing rules and regulations; and
 - 10) To perform such other powers and functions as may be provided for by applicable laws, rules, and regulations.

To play the said roles, the Provincial/City Mining Regulatory Board (P/MRB) was created. Its members are as follows:

- Regional director of MGB as chairman;
- Provincial governor/city mayor as vice-chairman;
- Small-scale mining representative;
- Large-scale mining representative; and
- DENR-duly accredited environmental NGO representative.

The MRB has accepted, processed and evaluated applications, and determined administrative charges and fees for quarry, sand/gravel, guano, gemstone gathering and small-scale mining permits.

It is notable that item 7) above prescribes the mining contractors of large-scale mining to provide the host and neighboring mining communities with social infrastructure and community development projects. This indicates the social responsibilities of large-scale mining contractors who exploit natural resources.

(3) Indigenous People's Rights Act (IRRA)

It is reported that ancestral domains, where almost all of potential mineral deposits are situated, account for 25% of total land area in the Philippines. The National Commission on Indigenous Cultural Communities/Indigenous Peoples (ICCs/IPs) or otherwise known as NCIP has been mandated to carry out the policies on ICCs/IPs, as provided in the "Indigenous People's Rights Act of 1997" (IRRA 1997). The IRRA is a new law enacted on October 27, 1997, and prescribes that

the State shall recognize and promote all the rights of ICCs/IPs, specifically the rights to ancestral domains. In this regard, NCIP has authority to issue the Certificate of Ancestral Domain Title (CADT) also covering mining-related rights.

1.1.2. Mining activities

Mining activities comprise exploration, development, utilization, and processing of mineral resources. These activities are being carried out in the Philippines under the following policy environment

(1) Mineral agreements and FTAA

The Government of Philippines declared that all mineral resources are owned by the State. Thus, mining activities are being undertaken through the combined efforts of the Government and the private sector, practically based on agreements. According to RA 7942 there are four types of mining agreements, described as follows.

- Mineral production sharing agreement (MPSA) is an agreement where the Government grants to the contractor the exclusive right to conduct mining operations within a contract area and shares in the gross output. The contractor shall provide the financing, technology, management, and personnel necessary for the implementation of this agreement.
- Co-production agreement is an agreement between the Government and the contractor wherein the Government shall provide inputs to the mining operations other than the mineral resource.
- Joint venture agreement is an agreement where a joint-venture company is organized by the Government and the contractor with both parties having equity shares. Aside from earnings in equity, the Government shall be entitled to a share in the gross output.
- Financial or technical assistance agreement (FTAA) means a contract involving financial or technical assistance for the large-scale exploration, development, and utilization of mineral resources.

(2) Small-scale mining

Small-scale mining was institutionalized in 1989 as a new dimension of mining development, since the Philippine mining industry had always been dominated by large-scale mining operations. The institutionalization was targeted to develop small mineral deposits, generate more employment opportunities, and thereby alleviate the living conditions in the rural areas as well as contribute to additional foreign exchange earnings.

Small-scale mining is prescribed by RA 7076 or the "People's Small-scale Mining Act of 1991." It defines the small-scale mining that relies heavily on manual labor using simple implements and methods, which does not use explosives or heavy mining equipment. Mining other than small-scale is defined as large-scale mining.

Small-scale mining has two main players: small-scale miners and small-scale mining contractors. Small-scale miners are Filipino citizens to engage in the extraction or removal of minerals or ore-bearing materials from the ground, under the terms and conditions of a contract. Small-scale mining contractors comprise an individual or a cooperative of small-scale miners, having entered into an agreement

with the State for the small-scale utilization of a plot of mineral land within a people's small-scale mining area. They have to be registered with the Securities and Exchange Commission (SEC) or other appropriate government agency.

RA 7076 also prescribes that all gold produced by small-scale miners in any mineral areas shall be sold to the Central Bank of the Philippines or its duly authorized representatives.

In summary, small-scale mining is livelihood business. In this context, responsibilities of small-scale mining contractors are limited. For example, small-scale mining contractors have not been responsible for the provision of social infrastructure and community development projects in the host and neighboring mining communities as prescribed in Chapter XIV of RA 7942.

(3) Mineral processing zone (MPZ)

Mineral processing means the milling, beneficiation or upgrading of ores/minerals/rocks or by similar means to convert the same into marketable products.

As for small-scale mining, DAO 92-34 Section 33 prescribes custom mills and MPZ as follows:

- Custom mills to be established and operated for safe and efficient processing of minerals or ore-bearing materials;
- Custom mills to be limited to mineral processing zones (MPZs) duly designated by LGU concerned upon recommendation by the Board;
- MPZs not to disrupt existing adaptive technological system;
- Custom mills to be constituted as withholding agents for the royalties, production share or other taxes due to the Government;
- The Board (Provincial/City Mining Regulatory Board) to recommend to the Government to construct custom mills if viable, in mining areas where the private sector is unable to establish custom mills;
- The Board to issue licenses for the operation of custom mills and other processing plants subject to pollution control and safety standards; and
- DENR/MGB to establish assay laboratories to cross-check the integrity of custom mills and to render metallurgical and laboratory services to miners.

1.2. Deposits

Figure 1 illustrates spatial distribution of mineral deposits in the DIDP Area, and Table 1 provides corresponding details of information.

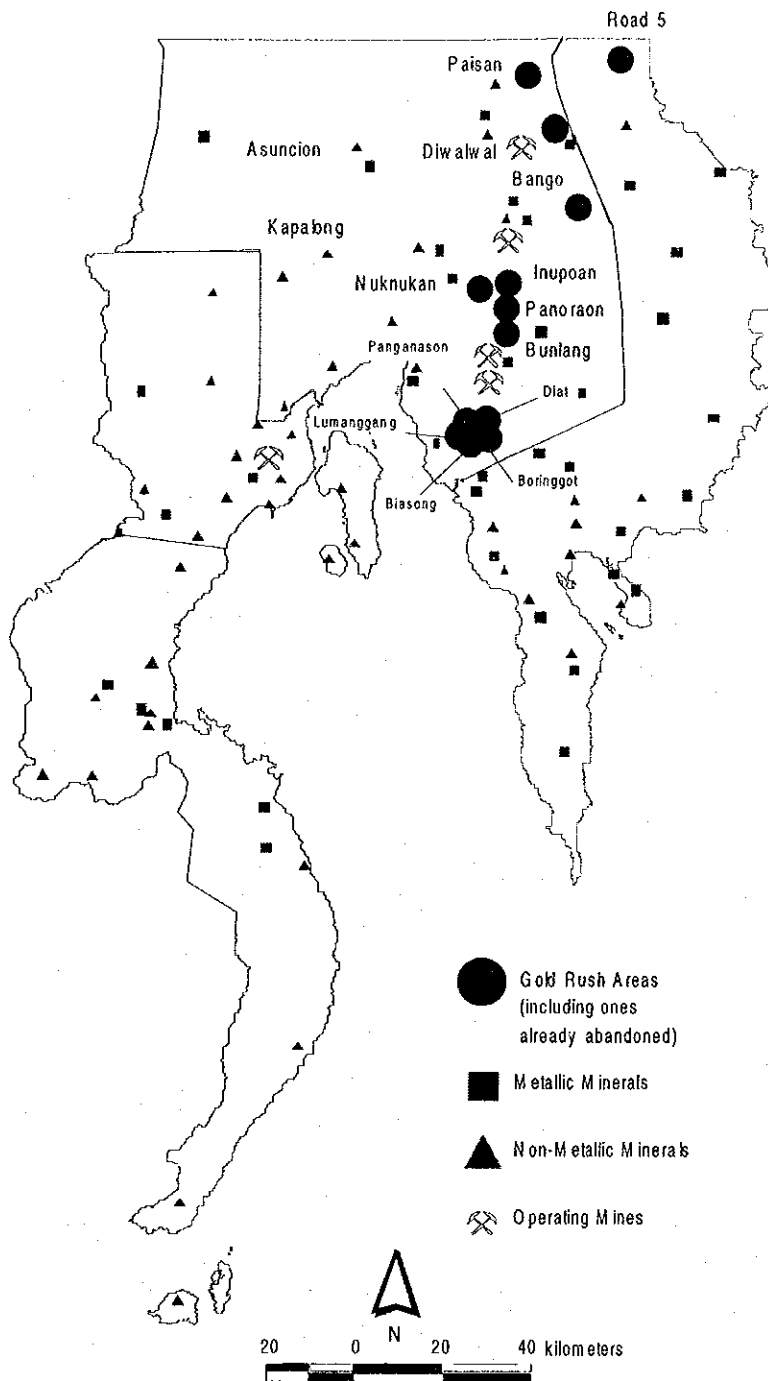
Metallic ores containing gold, silver and copper have been identified in Davao Province and Davao Oriental. Deposits of nickel and chromite extend over the municipalities of Mati, Governor Generoso, and San Isidro in Davao Oriental.

Non-metallic minerals such as limestone have been identified throughout the DIDP Area, but they are concentrated in Davao City and the municipalities of Asuncion and Kapalong in Davao Province (Davao del Norte at present).

It is reported that deposits of limestone exist in Davao Oriental, and that deposits of semi-precious stones are found in San Isidro and Mati of Davao Oriental as well as in Davao del Sur. Rock deposits in San Isidro and Mati are expected to be

potential sources of semi-precious gemstones such as jasper and agate, which may be processed into fashion accessories, decorative tiles or novelty.

Figure 1 Deposits and Spatial Distribution of Mining Resources in DIDP Area



Source: Mines and Geoscience Bureau, Region XI, DENR

In addition, sizable deposits of marble (1 million tons) are recently identified in and around Mati, Davao Oriental.

Many new deposits may be found in the DIDP Area, since the IRRA 1997 has been

promoting all the rights to ancestral domains including mining rights. A total 256,828 ha or 13.1% of the DIDP total area already approved as the ancestral domains, while another aggregate 277,974 ha waiting for the approval.

Table 1 Main Mining Resources in DIDP Area

	Average Grade	Unit	DIDP Total	Davao Province	Davao City	Davao del Sur	Davao Oriental
1. Metallic							
Gold	Total	('000 M.T.)	36,708	36,698		○	10
	10-20 ppm		931	921			10
	4.3-7.33 ppm		3,183	3,183			
	0.19-1.73 ppm		32,595	32,595			
Copper	Total	('000 M.T.)	363,590	363,590		○	○
	0.33-0.37%		105,763	105,763			
	0.43-0.44%		257,828	257,828			
Chromite	Total	(M.T.)	100,153				100,153
	33.0%		10,450				10,450
	47-48%		60,750				60,750
	50.0%		39,403				39,403
Chromite: Refractory			30,000				30,000
Nickel	Total	('000 M.T.)	475,716				475,716
	1.00%		90,718				90,718
	1.19-1.25%		385,000				385,000
Manganese	Total	(M.T.)	108,840				108,840
	17.45%		2,820				2,820
	47-50%		106,020				106,020
2. Non-Metallic							
Silica		('000 M.T.)	7,500	1,000		500	6,000
Magnesite	Total	('000 M.T.)	83,212				83,212
	15%	('000 M.T.)	106				106
	35-38%	('000 M.T.)	77,975				77,975
	40-47%	('000 M.T.)	5,131				5,131
Pebbles		('000 C.M.)	20,000				20,000
Sand & Gravel		('000 M.T.)	20,100	9,100			11,000
Limestone	(Raw)	('000 M.T.)	7,854	7,854		○	
	(Cement)		35,072		35,072		
	(Lime)		153,725		153,725		500
	(Ind.)		123		123		○
	Marble		82,000	69,000	12,000		1,000
Shale		('000 M.T.)	7,145	3,000		4,145	
Rock Phosphate		('000 M.T.)	44	44			
Guano		('000 M.T.)	112	112			
Clay	Total	('000 M.T.)	134,664			134,644	
	(Bentonitic)		830			830	
	(Fire)		133,834			133,834	
Sulfur	11.48%	('000 M.T.)	5,009			5,009	
Tuff		('000 M.T.)	908			908	
Coal							○
Dimension Stone		('000 m ³)	1,000				1,000
Semi-precious Stone						○	○

Note: ○ = The deposits are proven, but the amounts are not estimated.

Source: Mines and Geoscience Bureau, Region XI, DENR/PENRO, Davao Oriental

1.3. Production: Quite rapid growth but fluctuated

Many ores have been identified. However, reflecting their mining cost and marketability, their commercial production in DIDP Area is limited so far to gold, chromite, silica, magnesite, pebbles, sand/gravel, earthfill, limestone, and shale. Production of these minerals has rapidly increased as shown in Table 2. However, it is noted that the year 1996 was a peak of mineral production in the DIDP Area.

(1) Gold/silver

Production of processed/refined gold with 99.99 purity amounted to 215 kg in 1996. Production increased by around 800% from 1992. Gold industry is supported by many small-scale miners and around 60 processors in the DIDP Area. Small-scale miners of gold are concentrated in Mt. Diwalwal (Mt. Diwata), Monkayo, in Compostela Valley, while gold processors are agglomerated in Apokon, Tagum City (Davao del Norte), and Monkayo.

Processed gold is sold to the Central Bank of Philippines or directly marketed to domestic and foreign markets. All gold produced by small-scale miners shall be sold to the Bank, or its duly authorized representatives, as provided in the DAO 92-34.

Gold sold to the Central Bank should be statistically recorded, but sizable amounts of the direct-marketed gold including the one produced by small-scale miners might have not been registered. Therefore, actual amount of gold production in 1996 might be more than officially reported (215 kg).

According to the Industrial Questionnaire Survey on 18 gold processor respondents, 13 processors market their products to Davao City wherein a branch of the Bank is located, while seven processors market to the former Davao Province (plural answers). On the other hand, processed gold is exported to Singapore by one processor, and to Indonesia by two processors.

Gold production has been going down due to the Mt. Diwalwal (Mt. Diwata) conflict relative to mining permits, environment problems etc. to be mentioned later.

(2) Limestone/cement

Limestone production for cement manufacturing amounted to around 1.5 million tons in 1996, which increased by 229% from 1992. This is due mainly to "construction boom" in and around the DIDP Area including General Santos City, where an alternative international airport was constructed with international standard facility and structure. There is one cement factory located in Davao City with ISO 9002 certificate. Its operation rate as of November 1998 was 70% due to the economic recession.

The cement company has its own mine of limestone, silica etc. and it is a large-scale mining contractor. It has provided the host and neighboring mining communities such as Ilang and Calinan, Davao City with social infrastructure and community development projects.

(3) Other minerals

Construction materials other than limestone are also abundant in the DIDP Area: sand/gravel and marble in Davao Province, and pebbles and marble in Davao Oriental. The Area is designated to lead the development of construction

industry in the BIMP-EAGA cooperation based on these abundant construction materials.

Table 2 Mining Production in DIDP Area (1996)

			DIDP Total	Davao Province	Davao City	Davao del Sur	Davao Oriental
Volume	Gold	kg	215.4	203.6	11.4		0.5
	Chromite (Metal)	M.T.	633.0				633.0
	Silica	M.T.	145,397.0		80,456.0		64,941.0
	Magnesite	M.T.	268.0				268.0
	Pebbles	m ³	191.0				191.0
	Sand & Gravel	m ³	1,031,031.4	188,759.5	459,922.0	366,351.9	15,998.0
	Earthfill	m ³	5,033.0	5,033.0			
	Lime (cement)	M.T.	1,530,436.0		1,530,436.0		
Shale	M.T.	182,477.0		182,477.0			
Value	Gold	P '000	68,059.2	64,307.4	3,652.5		99.3
	Chromite (Metal)	P '000	633.0				633.0
	Silica	P '000	18,225.9		7,201.9		11,024.0
	Magnesite	P '000	33.8				33.8
	Pebbles	P '000	219.7				219.7
	Sand & Gravel	P '000	166,148.4	30,282.3	75,938.6	57,806.9	2,120.6
	Earthfill	P '000	571.1	571.1			
	Lime (cement)	P '000	34,953.2		34,953.2		
Shale	P '000	4,331.5		4,331.5			
Unit Value	Gold	Pesos/kg	315,970	315,902	321,019		219,627
	Chromite (Metal)	Pesos/M.T.	1,000				1,000
	Silica	Pesos/M.T.	125		90		170
	Magnesite	Pesos/M.T.	126				126
	Pebbles	Pesos/m ³	1,150				1,150
	Sand & Gravel	Pesos/m ³	161	160	165	158	133
	Earthfill	Pesos/m ³	113	113			
	Lime (cement)	Pesos/M.T.	23		23		
Shale	Pesos/M.T.	24		24			
Change from 1992 to 1996	Gold		791.9%	748.4%	(-)		
	Chromite (Metal)		35.2%				35.2%
	Silica		121.4%	0.0%	117.1%		197.1%
	Magnesite		2.5%				2.5%
	Pebbles		(-)				(-)
	Sand & Gravel		771.9%	168.0%	4535.3%	4882.5%	446.1%
	Earthfill		136.5%	(-)	0.0%		
	Lime (cement)		229.0%		229.0%		
Shale		85.6%		85.6%			
Change from 1992 to 1996	Gold		830.2%	784.4%	(-)		(-)
	Chromite (Metal)		33.7%				33.7%
	Silica		137.9%	0.0%	124.5%		197.8%
	Magnesite		2.8%				2.8%
	Pebbles		(-)				(-)
	Sand & Gravel		524.0%	180.3%	567.0%	5379.6%	475.0%
	Earthfill		154.9%	(-)	0.0%		
	Lime (cement)		183.1%		183.1%		
Shale		60.2%		60.2%			
Change from 1992 to 1996	Gold		104.8%	104.8%			
	Chromite (Metal)		95.8%				95.8%
	Silica		113.5%		106.3%		100.3%
	Magnesite		113.6%				113.6%
	Pebbles						
	Sand & Gravel		67.9%	107.3%	12.5%	110.2%	106.5%
	Earthfill		113.5%		0.0%		
	Lime (cement)		79.9%		79.9%		
Shale		70.3%		70.3%			

Note: (-) = No production or no data on production in 1992
 Source: Mines and Geoscience Bureau, Region XI, DENR

1.4. Investment Trends

Accounting for 19% of the BOI-registered project total

BOI-registered projects in the mining sub-sector amounted to ₱4.7 billion during 1990-1997 as shown in Table 3, corresponding to 19% of the total investments. These investments averaged ₱394 million per project, which is more than two times larger than the average of investment in all industries (₱188 million). By province/City, it is concentrated in Davao Province, accounting for almost 100% of the total investments, which reflects the resource endowment centering on gold ore. Foreign direct investment (FDI) constitutes 12% of the total investment as shown in Table 4, mostly by Filipino joint venture with Chinese including residents in the Philippines.

Large investments in 1996

Table 4 shows mining investments by year and by origin. Investment, particularly foreign direct investments (FDI) were concentrated in 1996. This is due to the large investment in the Kingking mine to exploit and process gold ore, amounting to ₱3.8 billion, which accounts for 80% of the total mining investments. This mine is located in Pantukan, Compostela Valley. It is reported that the mine will start operation in the year 2000 by a major mining company, while depending on the results of its on-going exploring.

Table 3 BOI-registered Projects in DIDP Area (1990-1997)

		Investment by province/City					Davao Province's Shares
		DIDP Total	Davao Province	Davao City	Davao del Sur	Davao Oriental	
Number of Projects	Total	150	34	102	9	5	22.7%
	Mining Total	12	11	1			91.7%
	Gold	10	9	1			90.0%
	Other Mining	2	2				100.0%
	Agriculture, etc.	32	9	15	5	3	28.1%
	Manufacturing	62	6	52	3	1	9.7%
Service	44	8	34	1	1	18.2%	
Project Cost (mill. Pesos)	Total	28,250	7,053	19,378	847	971	25.0%
	Mining Total	4,725	4,709	16			99.7%
	Gold	4,133	4,117	16			99.6%
	Other Mining	592	592				100.0%
	Agriculture, etc.	2,512	1,088	496	245	683	43.3%
	Manufacturing	5,858	201	4,976	602	80	3.4%
Service	15,155	1,056	13,891		208	7.0%	
Employment Generation (persons)	Total	18,947	9,174	6,928	1,439	1,406	48.4%
	Mining Total	4,446	4,408	38			99.1%
	Gold	3,286	3,248	38			98.8%
	Other Mining	1,160	1,160				100.0%
	Agriculture, etc.	6,383	3,234	1,061	873	1,215	50.7%
	Manufacturing	4,911	1,135	3,019	566	191	23.1%
Service	3,207	397	2,810			12.4%	
Percent Shares of Project Cost	Total	100.0%	100.0%	100.0%	100.0%	100.0%	
	Mining Total	16.7%	66.8%	0.1%			
	Gold	14.6%	58.4%	0.1%			
	Other Mining	2.1%	8.4%				
	Agriculture, etc.	8.9%	15.4%	2.6%	28.9%	70.4%	
	Manufacturing	20.7%	2.8%	25.7%	71.1%	8.2%	
Service	53.6%	15.0%	71.7%		21.4%		

Note: Some of projects have no employment generation.

Source: Board of Investments (BOI), Region XI

Table 4 BOI-registered Mining Projects in DIDP Area by Year and by Origin (FDI)

		Total	1990	1991	1992	1993	1994	1195	1996	1997
Number of Projects	Total: Gold	10	1	1	1		1		5	1
	Other Mining	2			1				1	
Project Cost (mill. pesos)	FDI: Gold	4	1	1					2	
	Other Mining									
Employment Generation (persons)	Total: Gold	4,133	21	15	5		16		4,061	15
	Other Mining	592			113				479	
FDI's Shares in Project Cost	FDI: Gold	509	21	15					473	
	Other Mining									
Employment Generation (persons)	Total: Gold	3,286		48	55		38		3,121	24
	Other Mining	1,160			410				750	
FDI's Shares in Project Cost	FDI: Gold	1,846		48					1,798	
	Other Mining									
		12.3%	100%	100%					11.7%	

Note: Some of projects have no employment generation.

Source: Board of Investments (BOI), Region XI

Chapter 2 Prospects and Constraints to Development

Mining industries in the DIDP Area are mostly labor-intensive and small-scale, though large companies are also operating. Gold processing is capital- and electricity-intensive, and its profitability depends heavily on cost of labor and electricity as well as cost of raw ores. According to the 18 gold processor respondents of the Industrial Questionnaire Survey (IQS), their strength lies on quality, price of their product, and their production technology/skills.

2.1. Prospects

The mining sub-sector in the DIDP Area has good prospects with a favorable wind of improving business environment as described below.

(1) Deposits of rare metals

Apart from gold and silver, there are ore deposits of rare metals such as nickel, manganese, and chrome in the DIDP Area. Such rare metals are used to manufacture alloys for high precision steel products and materials, which are "growth products" in high tech industrialization. Abundant resources of construction materials constitute another promising factor.

(2) New copper and gold project

This is the Kinging mine project, already mentioned. The mine is expected to produce 1.386 million tons of copper concentrates and 163,800 kg of gold. This project will contribute to economic growth and export expansion in the DIDP Area, while depending heavily on market situations that have always been unstable.

(3) Open and established mining policy of the Central Government

In addition to liberalization of gold transaction in 1992, the Government enacted RA7942 and DAO 95-23 (IRR) in 1995 to promote mining industry. Institutional arrangements are as follows.

- **Open to foreign capital:** RA 7942 allows 100% foreign capital in exploration and mineral processing. The same apply for a Financial and Technical Assistance Agreement (FTAA). This has activated foreign investments in mining business led by Australia, USA, and Canada throughout the Philippines including the DIDP Area.
- **Strong incentives:** Mining permits automatically grant incentives such as exemption from taxes on mining related pollution control facilities, carry over of income losses, accelerated depreciation as well as tax holidays and others prescribed in the 1987 Omnibus Law (EO226).

(4) Peace and order improvement

This is one of the key factors in industrial investment. Exploration and mining had not been very active in the DIDP Area as expected due mainly to less geological information related closely to peace and order conflicts. Recent improvement of peace and order situation has activated mining business. It is reported that a foreign enterprise has been exploring limestone in Davao del Sur.

(5) Agglomeration of gold processors

Some 60 small-scale gold processors in the DIDP Area are expected to grow

into viable economic entities for sustainable industrial development in the DIDP Area.

(6) Organized small-scale miners

Small-scale miners are independent, and sometimes work on contract bases. Generally, they share 30% of ore's value, and the remaining 70% goes to the financiers. They are organized into several cooperatives for their business, welfare etc. Such cooperatives are expected to lead a sound development of mining business.

(7) BIMP-EAGA linkages

These linkages are expected to lead to complementary relationships between EAGA member sub-regions. According to an agreement among them, the Philippine sub-region centering on the DIDP Area will contribute to providing construction materials including sand and gravel.

The 18 gold processor respondents of the IQS testify their strong expectation from the BIMP-EAGA. Six and 10 respondents said that its impact would be strongly positive or positive, respectively. Some of them regard Indonesia and Brunei as good export markets and good partners for trade.

2.2. Constraints

The mining sub-sector in the DIDP Area is promising in terms of factors mentioned before, but it has been facing constraints as described below.

(1) Severe competition

A large mine in Davao Province was closed due mainly to a fall in the price of copper. Metallic ores and metals are mostly international commodities, and their operations are very sensitive to world market prices. Based on demand-supply situation, copper prices went down particularly between 1992 and 1993, while production of copper concentrates has increased in the world led mainly by Indonesia, Chile, and China. Similarly, chromite mining temporarily stopped operation due to a fall in the market price.

(2) Mining permit conflict

1) Mt. Diwalwal conflict

This is a conflict over Mineral Production Sharing Agreement (MPSA) at Mt. Diwalwal (Mt. Diwata), the most flourishing gold rush area at present. According to the documents of the Mines and Geoscience Bureau (MGB), Region XI, focal points on the conflict are summarized below.

- A corporation, which is an assignee of another corporation having Exploration Permit (EP) 133 that expired on July 5, 1994, obtained MPSA No. 128 covering around 5,000 ha.
- The Local Government Code of 1991 (LGC 1991) was enacted with a provision devolving the authority to grant mining permits on small-scale mining to LGUs from the Central Government.
- Small-scale miners did not hold Small-scale Mining Contract as required by Law, neither were small-scale gold processors holders of Processors Permit.

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- Several cooperatives of small-scale miners petitioned to the Provincial Mining Regulatory Board (PMRB) for the segregation and declaration of Diwalwal as People's Small-Scale Mining Area (PSSMA). PMRB segregated 40 ha at Mt. Diwalwal, but the miners interposed objection. They wanted 7,329 ha as PSSMA under DAO 66, series of LGC 1991.
 - On January 6, 1998, the Mines Adjudication Board (MBA) ruled the exclusion of area covered by DAO 66, occupied and actively mined by small-scale miners on or before August 1, 1987 in the MPSA application of the said corporation, which will be given in due course.

On September 23, 1998, the President issued a memorandum to DENR's Secretary ordering the following, among others:

- Stop all those conducting mining operations without mining permit, license, mining contracts/agreements or ECC;
- Stop all those processing ore without processing permit and ECC;
- Implement DAO 98-01 declaring a moratorium on mining and mining-related activities at Mt. Diwalwal;
- Strictly enforce permit requirement under DAO 97-38 on the use of mercury and DAO 97-39 on the use of cyanide; and
- Stop massive environment pollution caused by illegal mining operators.

Illegal activities should be stopped. Small-scale mining, which is originally livelihood business, are nowadays practically "large-scale mining" using explosives and heavy mining equipment. In addition, small-scale miners have been supported by "financiers," who are expected to be responsible in part for the present situation.

2) Conflict between NCIP and MGB

This conflict is related to authorities on mineral lands and mineral resources. Processing of all mining rights applications at MGB are suspended, since Section 56 of the "Indigenous Peoples Rights Act of 1997" (IRRA 1997) - Existing Property Rights Regimes," is not explicitly defined regarding "by whom property rights within the ancestral domains already existing and/or vested upon effectivity of this Act, shall be recognized and respected."

According to Section 59 of IRRA 1997, "All departments and other governmental agencies shall henceforth be strictly enjoined from issuing, renewing, or granting any concession, license or lease, or entering into any production sharing agreement, without prior certification from NCIP or the National Commission on Indigenous Cultural Communities (ICCs)/Indigenous Peoples (IPs) that the area affected does not overlap with any ancestral domain." This certification based on a field based investigation to be conducted by the Ancestral Domain Office will not be issued without the free and prior informed and written consent of ICCs/IPs.

Thus, there is a situation that foreign mining investors are confused as to what government agency they should negotiate with, and thereby mining investments may slow down.

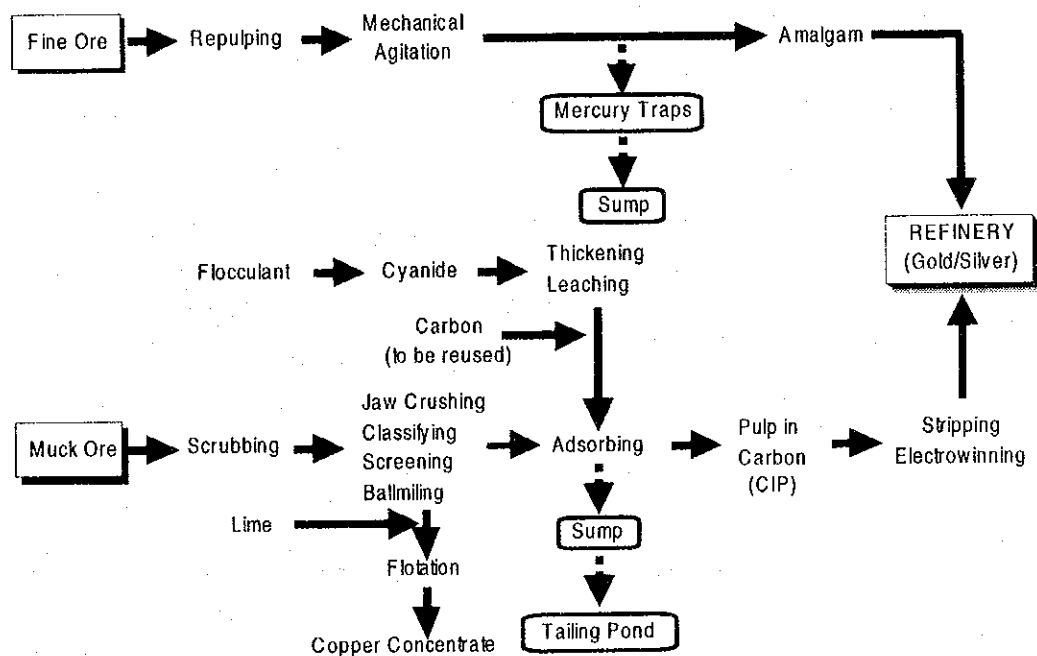
(3) Idle production facilities/low rate of operation

This is partly connected with the mining permit conflict mentioned above, as well as environmental problems. According to the IQS, nine gold processors out of 18 respondents answered that their most critical problem was idle production facilities and low rate of operation. In line with the mining permit conflict, "moratorium of all mining related activities will be effective until such time when all legal, safety and environmental requirements are complied with."

(4) Environmental problems including work safety

Mining actually is to exploit natural resources, and as such is naturally not environment-friendly. Gold processing using cyanide or mercury as illustrated in Figure 2 is highly sensitive to degrading environment. Thus, wastes ought to be adequately treated. Of the 18 gold processor respondents in the IQS, some 14 processors dump their industrial wastes, while 12 processors have their own dumping sites. Monitoring of emission gas and waste water is done by 14 processors, and 12 processors have "Pollution Control Officers."

Figure 2 Simplified Process of Gold Refining



Source: JICA Study Team

However, there are reports that mercury and cyanide laden wastes have been discharged into rivers in and around Davao del Norte and Compostela Vally.

The following is part of the "Report on the 1996 Study of River Systems Drafting Mining Areas and of Marine Environments affected by Mining and Milling Operations in the Philippines" by MGB.

- In the Diwalwal area, mercury (Hg) level far exceeds the limit set by the DENR (0.002 mg/li) with one sample (DVO-040Wn) registering at 1.98 mg/li or an alarming 99000% of the set limit. (page 5)

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- This value diminishes downstream away from the mining area but still goes over the limit up to the sampling site at the confluence of Naboc Rver and Agusan River. (page 5)
 - In other areas in Davao Province, Hg values are just within the set limit except in the actual mining areas and near the processing plants in Tagum and Apokon. (page 5)

However, mercury pollution may spread to Agusan River, one of the large drainage systems in Mindannaο supporting agriculture. A lecturer at the workshop on "Health and Environmental Effects of Mercury due to Mining Operations" held at Manila in November 1997 concluded as follows.

- Mercury contamination of the river systems is localized to about 10 km from the Diwalwa mining and gold processing area.
- The main Agusan River is only affected in certain portions. Although the levels of mercury in solution in the river fall quickly downstream, the persistence of relatively high mercury levels in the stream sediments could be a long-term pollution situation/concern that requires a long-term systematic assessment, monitoring and remediation.

Also, air pollution caused by discharged gas with inorganic mercury has been evident around gold buying stations in Monkayo and gold processing plants concentrated in Apokon, Tagum City in Davao del Norte.

Of the 18 gold processors, some 10 recognized that their environmental problems were water pollution and industrial wastes, while air pollution and noise were regarded as third and fourth critical problems. Only three processors answered that they treated such pollution by themselves.

It has been found that inorganic mercury is relatively easy to discharge outside living organisms. On the other hand, methylmercury transformable from inorganic mercury wherever bacteria are active, is not easy to discharge outside living organism.

Methylmercury accumulates inside the brains of living organisms, and when it accumulates to over 50 ppm, it causes incurable disease like the Minamata disease in Japan. An inspection revealed that one school child at Apokon, Tagum City suffered from methylmercury contamination, although mercury concentration was within an allowable level at 20 ppm. Fortunately, the people have not been used to eating fish coming from the contaminated river, which is an accumulator of methylmercury. However, such contamination will become worse and more serious unless adequate countermeasures are taken as a matter of urgency.

Work safety is also a serious problem. Weak structure of tunnels sometimes triggered accidents causing deaths. Hydrolicking causes not only water pollution, but also tunnel destruction. Unmanaged disposal materials including waste gravel causes landslide combined with steep mountain slopes. It confirms the comment that gold rush areas sit back to back with accident.

(5) Less public acceptance

Small-scale gold processors including the ones properly operating their plants have faced complaints from residents around their plant location due to environment

pollution relating to their operation. People movements against pollution have become active. The processors feel uncomfortable, and sometimes face difficulty in acquiring waste disposal/dumping sites. Such situations ought to be adequately addressed not only for the residents but also for the gold processors.

(6) Other critical problems

Other critical problems to gold processing gathered from the IQS are summarized below:

a. Infrastructure related

- High cost of electricity: This is pointed out by some 13 processors. Gold processing using ballmill is electricity-intensive, and therefore the processors expect lower cost electricity, though the cost is around ₱2.65 per kWh (Davao del Norte Electric Cooperative).

b. Other external problems

- Depreciation of Peso: Some 13 processors pointed out this as a problem. The Philippine Peso has been depreciated from ₱25 per US\$ to ₱ 40 per US\$, i.e., around 38% depreciation. This would cause not only price hike in imported raw materials such as cyanide, mercury, and others, but also weaken the purchasing power of buyers.
- Unstable supply/lack of local raw materials: This is pointed out by 9-10 processors, and closely connected with the moratorium of all mining activities in the short term on the one hand. On the other hand, the nature of mining is that raw ore sourcing depends on chance. To find out ores with good quality is not always assured.
- Hard access to low interest loan: Some 10-15 processors pointed out that many loans are available, but interest rates are high, ranging from 15% per year or more. High interest rates are an obstacle not only for gold processors but for other industrialists.

Chapter 3 Development Strategy

3.1. Development Goal/Vision

The mining sub-sector in the DIDP Area is expected to continue growing through mobilization of abundant local resources of gold, silver, copper, cement, construction materials, and rare metals like chromite, nickel etc.,

A development goal/vision for the sub-sector in the 21st century could be established as follows by materializing its prospects to the maximum extent and adequately addressing the constraints:

- 1) The mining sub-sector in the DIDP Area shall be established as a productive economic sub-sector and a leading sector in the BIMP-EAGA cooperation;
- 2) The mining sub-sector in the DIDP Area shall be a sound economic sub-sector, environment-friendly and socially acceptable; and then
- 3) The mining sub-sector in the DIDP Area shall contribute to a sustainable community development.

In summary, the development of mining sub-sector is expected to proceed properly incorporating the three aspects concerning regional development: economic, environmental, and social aspects for its sustenance.

The 18 gold processors in the IQS shall focus strategically on the following factors for their survival/growth:

- Modernize production process and reduce energy cost (12 answers out of 18 respondents);
- Strengthen manpower development (10 of 18); and
- Recycle/reuse industrial wastes (7 of 18).

Likewise, their specific strategies are summarized below:

- Expansion of market centered in Davao City at present to Mindanao as a whole and Luzon, and expansion of export markets including the EAGA sub-regions;
- Modernization of production process centering on mechanization and others including automation, computer aided design, engineering-testing;
- Production technology development corresponding to the basic strategy of modernization of production process; and
- Strategic investment in waste treatment/pollution control as well as in expansion of production.

3.2. Development Strategy

Development strategy for the mining sub-sector in the DIDP Area should be established in order to attain the goal/vision. At the same time, the sub-sector strategy ought to be supportive of the strategy of mining contractors and mineral processors including gold processors. Further, it should be well in line with the DIDP regional development strategy/phasing composed of Internal Integration, Globalization Drive, and High Tech-High Service up to the year 2016. As a whole, development strategy for the mining sub-sector in the DIDP Area could be established as follows.

3.2.1. Strategy under Internal Integration

(1) Proper management of mineral development

This strategy is essential for the mining sub-sector in the DIDP Area to become a sound economic sub-sector characterized as environment-friendly and socially acceptable. Indigenous resources including mineral resources should be utilized by and for the benefit of local people under the Internal Integration strategy. In this context, proper and equitable management of mineral development including mercury pollution control and mine rehabilitation should be strategically pursued. This may be effected through open information system and community involvement as well as strict enforcement of relevant laws and regulations to avoid illegal activities.

(2) Strengthening of inter-industry linkages

Localizing value-added is one component of the Internal Integration strategy, and a key strategy for mining in the DIDP Area to become a productive economic sub-sector. Processing of minerals including gold, silver, marble, and limestone should be strategically pursued. Further, forward linkages with jewelry making as well as with market places should be strengthened.

3.2.2. Strategy under Globalization Drive

(1) Establishment of export channels

The Globalization Drive strategy pursues external market-driven development. Establishment of export channels should be a strategy focusing on trade of construction materials, gold and silver abundant in the DIDP Area, in order to attain the goals/vision of the mining sub-sector, i.e., leading sector in the BIMP-EAGA cooperation. To this end, some merchandising and market functions are expected to be developed.

(2) Responsibility enhancement of mineral developers

Globalization drive will necessitate a sort of global standards for mining contractors and mineral processors for their exports to survive in the world market, particularly in markets of developed countries.

The environmental compliance certificate (ECC) is only a minimum precondition for mining development. In addition to this, mining contractors/miners who exploit natural resources should be responsible for their activities that affect natural environment and local communities. In this context, some integrated arrangements need to be established, which will be the contractor's responsibility. This will contribute to environmental protection and community development in the DIDP Area. Otherwise, they might not be able to sustain their activities due to unacceptability to both local people and the world market.

3.2.3. Strategy under High Tech-High Service

(1) Facilitation of R&D supports

The High Tech-High Service strategy pursues external resources/market driven development in the DIDP Area. Under the strategy, the mining sub-sector in the DIDP Area should strategize facilitation of R&D supports by the public sector including colleges and universities to attain higher competitiveness. To date, there is

no substantial public support for R&D on gold processing in the DIDP Area, although some eight processors out of the 18 IQS respondents have their own R&D staff. Also, 10 processors said that government supports for production technology development should be strengthened.

(2) Integration with tourism development

This aims at mining community development even after the mining activities are terminated. Landscape in and around some mining sites is attractive and could serve as tourism spots. It is not rare in the world that mining areas have been successfully developed and integrated with tourism, e.g., Aspen in USA and Ashio in Japan. To this end, a holistic approach is essential including livelihood rebuilding for mining workers.

Chapter 4 Development Plan

The development plan of the mining sub-sector in the DIDP Area is composed of development framework, development projects/programs to be implemented until the year 2016, and policy recommendations on the sub-sector development.

4.1. Development Framework

Gross value added (GVA) and employment of the mining sub-sector in the DIDP Area will be ₱2,586 million and 14,000 workers in 2016, respectively as shown in Table 5. These estimates were derived from the following considerations.

Table 5 Development Framework of Mining and Quarrying in DIDP Area

(in 1995 constant prices)	Unit	1995	2016	AAGR 1996-2016
Gross Value-Added (GVA)	mill. Pesos	1,390	2,586	3.0%
Employment	persons	13,543	14,017	0.2%
Labor Productivity	Pesos/person	102,660	184,490	2.8%

Note: AAGR = Annual average growth rate

Source: JICA Study Team

1) Positive factors

- New projects like a planned Kingking project producing copper and gold will increase in the future based on the on-going exploration activities. Development of limestone and construction materials including marble is also promising.
- Mineral development in ancestral domains in the DIDP Area may progress, since potential mineral deposits are mostly situated there.

2) Negative factors

- The growth of mining sub-sector including gold processing continues to depend on demand in both domestic and export market. Accordingly, a rapid growth is not expected, particularly taking into account international market stagnation of metal market as well as peso-US Dollar exchange rates.
- As a matter of course, the growth of mining sub-sector in the DIDP Area also will be dependent on mineral reserves such as those of gold, silver, copper, limestone, marble, semi-precious stones, and so on. However, how much and how long they are minable has not been defined due to lack of reliable data.

3) Conclusion

There are two different factors for GVA growth above: positive and negative. These factors might be offset. Another consideration might be more important. Framework of GVA growth in the mining sub-sector should be a guideline to adequately develop the sub-sector, since its rapid growth has entailed environmental problems such as mercury pollution. In this context, it could be assumed that a 3% growth per annum is, a stable growth, set from 1995 to 2016.

Employment in 2016 is estimated to be 14,000 workers considering increase in labor productivity due partly to modernization of production including mechanization. Also, it is considered that formalization of many small-scale miners

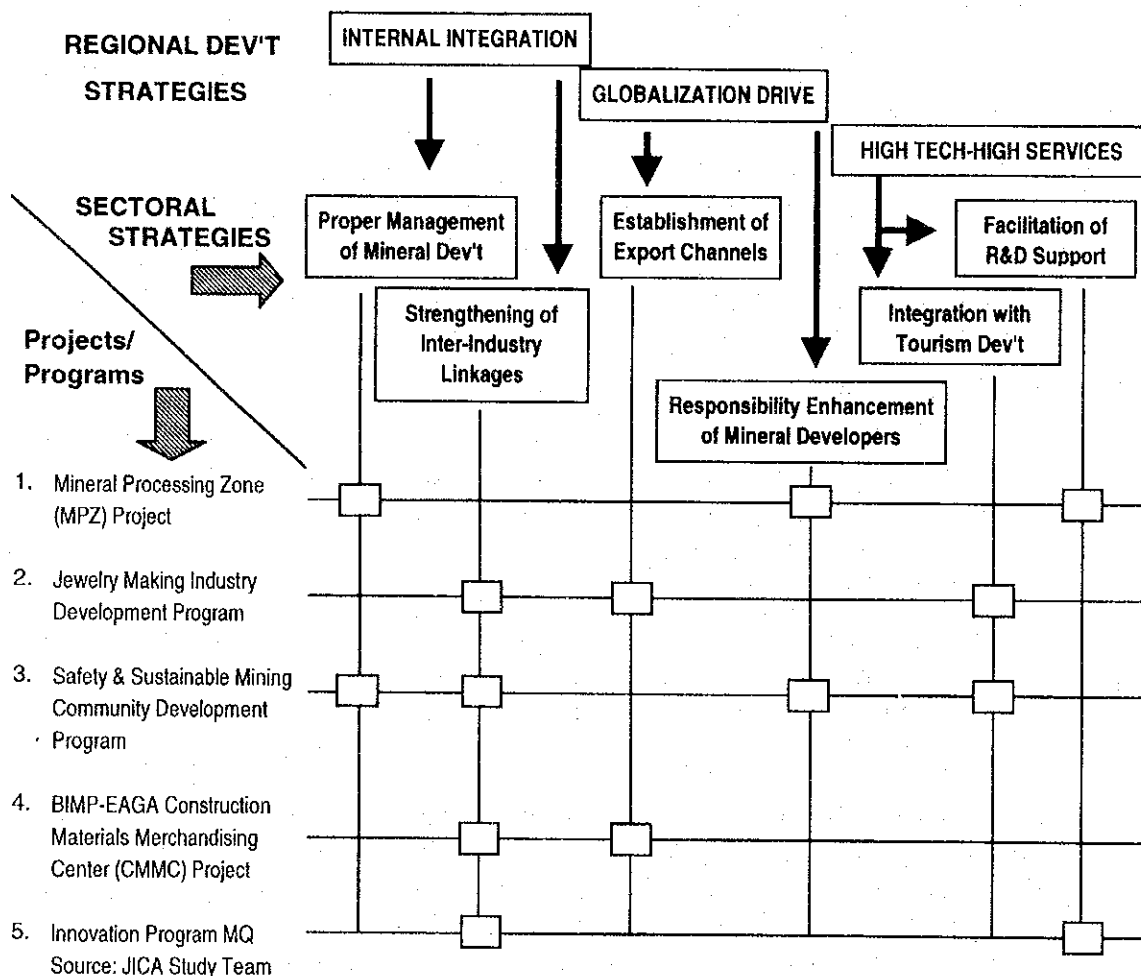
will be counted statistically.

In the meantime, restructuring of the sub-sector will proceed. Quality and responsive enterprises will grow or survive through modernization and proper management of pollution control. Others will face a difficulty, and might disappear within the globalizing economy. This is a harsh reality that should be recognized by mining contractors and mineral processors.

4.2. Development Projects and Programs

There are many activities to be undertaken for the attainment of development goals/vision and framework of the mining sub-sector in the DIDP Area toward the year 2016. The development strategy already established plays a role of integrating such activities into development projects/programs to attain the development goals/vision. In other words, the projects/programs should incorporate elements of the development strategy as shown in Figure 3, which illustrates inter-relationships between strategies and development projects/programs.

Figure 3 Inter-Relationships between Dev't Strategies and Projects/Programs



To clarify terminologies, "Project" is to develop, install, operate, and manage functions/facilities serving specific objectives including pertinent infrastructure development at designated site. "Program" is sometimes a complex of projects and

institutional measures to be implemented over a longer term not necessarily with designated site development.

(1) Mineral processing zone (MPZ) project

1) Background and objectives

Gold processors are facing the difficulty of low public acceptance which is initially coming from their own fault (i.e., environmental problems including mercury pollution).

For their growth and survival, environment-friendly and socially acceptable mineral processing is essential. Marble processing is promising, but it should be environment-friendly and socially acceptable as well.

In the context of promoting small-scale mining, MPZ is prescribed as the site to accommodate custom mills toward establishment and operation of safe and efficient mineral processing (RA 7076 and DAO 92-34).

MPZ project proposed here is the development of site to accommodate not only custom mills but also other mineral processing plants. Objectives of this MPZ are:

- To address the said situation through a sound development of mineral processing; and
- To create a good environment for both mineral processors and community/people through incorporating proper management of the processors' activities, their enhanced responsibilities, and facilitation of R&D support.

2) Components and benefits of the project

MPZ is largely classified into two categories: gold processing zone (GPZ) and other mineral processing zones including processing marble, silica etc. Components of the project are as follows:

- Development of a tract of land for relocation or location of mineral processors;
- Installation of common service facilities for water supply and treatment, waste disposal, worker's welfare, and MPZ management office with multi-purpose functions as well as roads, greenery/buffer zone, electricity supply and telecommunications; and
- Specific to gold processing: installation of a new gold processing technology in place of existing amalgamation method and R&D support functions.

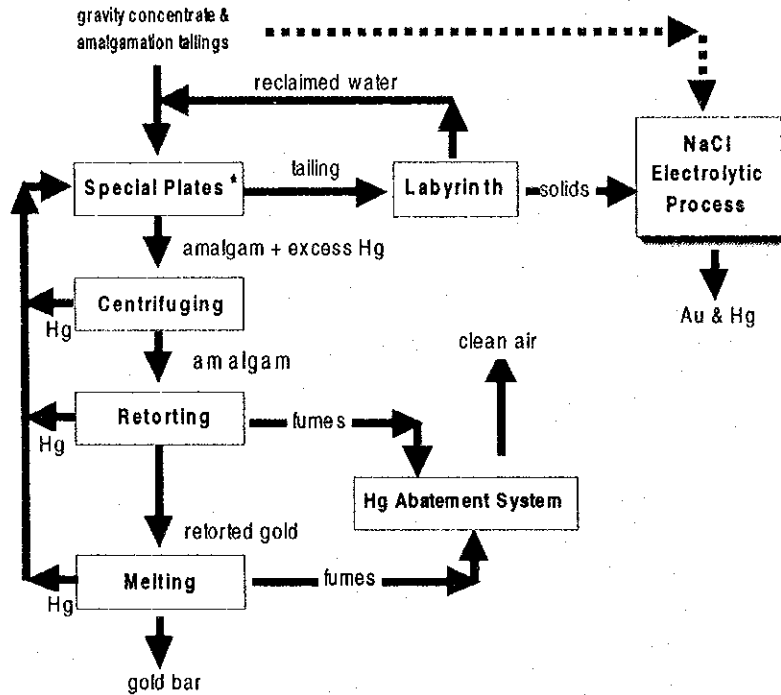
This environment-friendly MPZ will be supported by enhanced responsibilities of mineral processors to share the installation of common service facilities for environmental protection. Pollution monitoring by MPZ management body will contribute not only to improvement of pollution control, but also to lower the cost. The case of each processor hire "Pollution Control Officer" proves to be very costly. Collective location of processors might be conducive to reduction of electricity cost when power is purchased directly from NPC.

Gold processors in the DIDP Area use carbon-in-pulp (CIP) or amalgamation method: the former uses cyanide for thickening and leaching of gold element, the latter uses mercury for amalgamation with gold. In MPZ, amalgamation method is expected to be replaced by new processing technology, e.g., UNECA as shown in

Figure 4.

UNECA was developed in Venezuela and used by Amalgamation Centers. UNECA uses special-amalgamation plates and a new leaching technology (NaCl electrolytic process) developed by the Center of Mineral Technology in Rio de Janeiro, Brazil.

Figure 4 Unit of Gold Extraction and Controlled Amalgamation (UNECA)



Note: * Amalgamation can be replaced with NaCl electrolytic process or other leaching process.
 Source: Mr. Markku Kohonen, UNIDO Country Director (UNECA Processing Centers, from International workshop on "Health and Environmental effects of Mercury due to Mining Operation," November 1997, organized by National Institute for Minamata Disease, Environment Agency, Japan with DOH and UP-Manila

According to a report at the international workshop on "Health and Environmental Effects of Mercury due to Mining Operation" held at Manila in November 1997. Benefits of UNECA Processing Centers are summarized below.

Benefits for miners

- Improved gold recovery from gravity concentrates;
- Better price of gold sold to banks or dealers (gold is already melted in UNECA centers.);
- No mercury vapor exposure;
- No need to buy mercury illegally; and
- Access to information on improving mining and mineral process technique, and obtaining legal mineral titles and financial support.

Benefits for the general public

- No mercury emission in amalgamation and in gold melting operations;
- Information on the danger of mercury vapor exposure and mercurialism caused by fish infection;
- Advice for fish consumption and women prone to pregnancy and children;

- Preliminary diagnostic of mercurialism and medical orientation; and
- Advice for those who want to start an artisanal mining operations.

As such, UNECA Processing Centers have played a role not only on improved gold recovery and mining decontamination, but it also serves as an information center. According to the same source, investments in an UNECA center are estimated to amount to US\$250,000. A center in Venezuela can charge US\$ 1 per kg of concentrate processed. Assuming that the concentrates weigh between 20 and 60 kg with grades ranging from 2,000 to 5,000 g/ton, the cost of US\$30 to 60 charged by the center represents 2-5% of the gold content in the concentrates. Processing 500 kg of concentrates daily, which is approximately the amount treated by the center in Venezuela, income is around US\$10,000 per month which almost covers the operating cost. With this high cost, governments may also subsidize the centers.

3) Implementation of project

A MPZ project will be implemented according to the following steps and procedure:

- Designating MPZ site by LGU concerned upon recommendation by the Provincial/City Mining Regulatory Board (MRB);
- Formulating a MPZ development plan with the said components by MPZ developer while proceeding acquisition of MPZ site;
- Approving the MPZ development plan by MRB;
- Developing the MPZ;
- Organizing mineral processors for their location into the MPZ, and establishing their cooperative when necessary;
- Establishing a custom mill by the private sector or the Government (based on Section 33 of DAO 92-34);
- Creating incentives and financing measures for relocation/location of mineral processors while mobilizing foreign assistance to environmental protection facilities;
- In case of gold processing zone (GPZ), relocation of existing CIP plants and installation of new amalgamation technology like UNECA as a custom mill is expected to be registered as a modernization project eligible for special incentives by BOI; and
- Establishing a MPZ management body with R&D, monitoring and manpower training functions by the MPZ developer and mineral processors or their cooperative.

Location of MPZ

Tagum City in Davao del Norte already identified two candidate site for MPZ development. A marble processing zone is viable in and around Mati, Davao Oriental. Compostela Valley has many candidate sites scattered over Monkayo, Pantukan, Mabini, and Maco, among others. This MPZ is expected to be developed guided by LGU wherever sizable number of mineral processors are agglomerated. LGUs should monitor activities as processors end to degrade environment. Assuming that the minimum number of the processors is 10, development scale of MPZ could be 1-10 ha depending on their activities and the

area of greenery/buffer zone. Amendment of land zoning and/or revision of land use plan may be necessary for the development of MPZ in some municipalities.

Options of MPZ developer

It would be ideal for a cooperative or association of mineral processors to develop a MPZ, which may be realized in Tagum and Monkayo. Development by LGU through the PAIC alliance is also viable in and around Mati for a marble processing zone. Otherwise, the private sector may develop MPZ in close cooperation with LGUs and mineral processors. In any case, LGU initiative and intervention may be a key to the successful development of MPZ.

Timing for implementation

MPZ project will continue to be implemented one by one even after the year 2016 depending on growth of mineral processing. However, MPZ (gold processing) in Tagum and Monkayo is a sort of urgent project, and should be implemented during Phase I (1999-2004).

(2) Jewelry making industry development program

1) Background and objectives

Gold, and its associated product like silver are the basic metal of jewelry. The DIDP Area, particularly Davao del Norte and Compostela Valley have some 60 gold processors and three gold buying stations. A jewelry making training center is already operating in Tagum City, which is a joint project of DOST, DTI, Tagum City, Davao del Norte Province, and the Tagum National Trade School which is the base of the center. Jewelry making industry has already grown centering on Tagum City. On the other hand, there is a situation that sizable amounts of gold have been exported and processed into jewelry in foreign countries like Singapore and Hong Kong.

Based on these conditions, this program aims to promote further the development of jewelry making industry through expanding backward linkages with gold processing to localize value added. At the same time, this should be integrated with tourism development which will contribute to expansion of local jewelry market. Also, this program aims to establish export channels through strengthening of market functions pertinent to gold/silver.

2) Components and benefits of the program

As mentioned above, this program does not directly belong to mining sub-sector but aims at a concerted development between jewelry making industry and tourism with the following components:

- Development of jewelry village or estate to accommodate jewelry makers in and around tourism site;
- Fostering of jewelry designers and institutionalizing of existing jewelry training center in Tagum; and
- Strengthening of market functions on gold/silver through expansion of gold buying stations, establishment of central market in line with the BIMP-EAGA cooperation, and establishment of market information network through Internet.

The jewelry village will benefit jewelry makers in terms of tourists' market

generation and become an attraction in tourism itself. Fostering designers is expected to increase value added of jewelry. Market functions on gold/silver will contribute to price setting of gold/silver based on market mechanism which benefits jewelry makers, and promotes expansion of export channels of gold/silver beneficial for gold processors.

3) Implementation of the program

This program will be implemented through a close coordination/cooperation between DOST, DTI, DOT, LGUs, tourism developers and jewelry makers.

Development of jewelry village or estate will be implemented by the private sector including tourism developer or by LGUs supported by DTI/DOT.

Fostering/training jewelry designers will be implemented through the expansion of existing jewelry making training centers in Tagum City and/or through establishing designer course at college or vocational school. Institutionalization of existing jewelry training center is the first importance, since it has been housed temporarily in one of the classrooms of the campus of Tagum National Trade School (TNTS). In this regard, efforts to establish the training center should be materialized through mustering resources of TNTS, DTI, DOST, TESDA, the government of Davao del Norte and Tagum City, jewelers association and the Tagum Chamber of Commerce and Industry.

Additional gold buying station will be established by the private sector in coordination with

the Central Bank of Philippines to assure adequate trading of gold. Establishment of central market on gold/silver and market information network is expected to be led by some flagship trading company that will emerge from severe competition.

Timing for implementation

Considering the development stage of jewelry making industry, this program will be implemented as follows:

- Development of jewelry village or estate: Phase 1 to Phase 2 (1999-2010),
- Fostering jewelry designers and institutionalization of the Tagum Jewelry Training Center: start from Phase 1 (1999-2004),
- Establishment of gold buying station: Phase 2 (2005-2010), and
- Establishment of central market on gold/silver and market information network: start from Phase 1 (1999-2004).

(3) Safety and sustainable mining community development program

1) Background and objectives

Responsibilities of large-scale mining contractor

In case of large-scale mining, Chapter XIV, DAO 96-40 prescribes the responsibilities of large-scale mining contractor/permit holder/lessee for the development of mining communities as follows:

- To assist in the development of the host and neighboring communities and mine camp to promote the general welfare of the inhabitants living therein (Section 134, a);

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- To assist in developing mining technology and geosciences as well as the corresponding manpower training and development (Section 134, b); and
 - To allot annually a minimum of 1% of direct mining and milling costs necessary to implement Paragraphs (a) and (b) of this Section: Provided, That the royalty payment of 1% of the gross output for the Indigenous Cultural Communities, pursuant to Section 16 hereof, may include the aforementioned allotment to implement Paragraphs (a) and (b) hereof (Section 134, c).

Section 135 of DAO 96-40 prescribes that the following activities or expenditures shall be considered in enhancing the development of host and neighboring mining communities:

- Establishment and maintenance of community schools, hospitals, churches and recreational facilities which will be open to the general public whether or not they are mine employees;
- Construction and maintenance of community access roads, bridges, piers and wharves;
- Establishment and maintenance of communication, waterworks, sewerage and electric power systems which are accessible to mine employees and members of the community;
- Development and maintenance of community housing projects for mine employees and members of the community;
- Establishment of training facilities for manpower development for mine employees and members of the community; and
- Establishment of livelihood industries for the dependents of the mine employees as well as for other members of the community.

These provisions are well considered in terms of a concerted development between mining activity and community.

Section 136 of DAO 96-40 prescribes the roles of large-scale mining contractor/permit holder/lessee in the development of the host and neighboring communities as follows:

- To coordinate with proper authorities in providing development plans for the host and neighboring communities (Section 136, a);
- To help create self-sustaining income generating activities, such as but not limited to, reforestation and production of goods and services needed by the mine and the community. Where traditional self-sustaining income generating activities are identified to be present within the host and/or neighboring communities, the contractor/permit holder/lessee shall work with such communities towards the preservation and/or enhancement of such activities (Section 136, b); and
- To give preference to Filipino citizens, who have established domicile in the host and neighboring communities, in the hiring of personnel for its mining operations. If necessary skills and expertise are currently not available, the contractor/permit holder/lessee must immediately prepare and undertake a training and recruitment program at its expense (Section 136, c).

Different responsibilities between small- and large-scale mining contractor

Small-scale mining contractors including small-scale miners and their cooperatives have not been responsible for the development of the host and neighboring mining communities. This is probably because small-scale mining originally did not cover a huge tract of land, the miners are residents in the mining area, and as livelihood businessmen, they can not afford to take on the community development. It is also assumed that small-scale mining causes a minimal negative impact on environment.

Table 6 summarizes the provisions on mining development funds. A large-scale mining contractor should establish the Mining Rehabilitation Fund (MRF) consisting of the Monitoring Trust Fund (MTF) and the Rehabilitation Cash Fund (RCF). On the other hand, small-scale mining contractor is not directly responsible for the People's Small-scale Mining Protection Fund (PSMPF), which is supported by 15% of the national government share of the internal revenue tax of production share due the Government.

Table 6 Provisions on Mining Development Funds

	Mining Act (RA 7942) (Large-scale Mining)	Small-scale Mining Act (RA 7076) (Small-scale Mining)
Definition of Contractor	Contractor means a qualified person acting alone or in consortium who is a party to a mineral agreement or to financial or technical assistance agreement. - Section 3 (g)	Small-scale mining contractor refers to an individual or a cooperative of small-scale miners, registered with the Securities and Exchange Commission or other appropriate government agency, which has entered into an agreement with the State for the small-scale utilization of a plot of mineral land within a people's small-scale mining area. - Section 3 (e)
Funds Established by Contractor	<p>Contingent Liability and Rehabilitation Fund (CLRF) - Section 180 (in the form of the Mine Rehabilitation Fund and the Mine Waste and Tailings Fees)</p> <ul style="list-style-type: none"> • Mine Rehabilitation Fund comprising Monitoring Trust Fund (MTF) and Rehabilitation Cash Fund (RCF) - MTF to cover maintenance and other operating budget necessary for the Monitoring Team (less than P50,000) - RCF to ensure compliance with the approved rehabilitation activities and schedules for specific mining project phase, including research programs as defined in the EPEP/AEPEP <p>(10% of the total amount needed to implement the EPEP or P5 million, whichever is lower)</p>	<p>People's Small-scale Mining Protection Fund - Section 20 (The Board will act trustee of the fund.)</p> <ul style="list-style-type: none"> • 15% of the national government share of the internal revenue tax of production share • Used for information dissemination and training of small-scale miners on safety, health and environmental protection • Used for the establishment of mine rescue recovery teams, and to address the needs of the small-scale miners brought about by accidents and/or fortuitous events

Note: EPEP = Environmental Protection and Enhancement Program

AEPEP = Annual Environmental Protection and Enhancement Program

the Board = Provincial/City Mining Regulatory Board

Source: RA 7942 = Philippine Mining Act of 1995, RA 7076 = People's Small-scale Mining Act of 1991

2) Objectives of the program

A safety and sustainable mining community development program proposed here is targeted to small-scale mining in view of proper management of mineral development, responsibility enhancement of mining contractor/developer as well as strengthening of inter-industry linkages, especially with tourism development.

Many houses/shacks in mining areas are built on steep slopes, accessible only by narrow and steep roads. The residents, e.g., more than 20,000 in Mt. Diwalwal (Mt. Diwata), mostly comprise miners, workers for service business and their families. This is not a rare landscape close to mining sites in the DIDP Area. This is exactly a community, but in general unsafe and vulnerable to disasters or accidents. Mining activities are not perpetual, and will terminate after all the economically feasible ores are mined, and then such structures will be abandoned. This is also a well-known story.

In view of resource saving or environmental conservation and social aspect, such communities should be safe and sustainable. Not only do they have a right to live and enjoy a safe life, they are also expected to restore the depleted environment and build their new livelihood after the closing of mining sites.

To this end, this program aims to institutionalize mining development into an established safety and sustainable community through the following components.

3) Components and benefits of the program

This program targeted to small-scale mining will be implemented through a holistic approach as follows:

- Establishment of "People's Mining Council" (PMC) with an open information system and functions described below as an alternative institution for "City/Provincial Mining Regulatory Board" (the Board) toward an equitable and proper management of mining development with the following functions.
 - Recommendation on mining project which will be one of the preconditions for the approval by the Board (for small-scale mining);
 - Approval of "Mining Community Development and Management Plan" to be submitted by mining contractors or their association, targeted toward the safety and sustainable development; and
 - Arbitration/coordination of mining related conflicts in cooperation with MGB and the Board.
- Establishment of "Mining Development Foundation" for both the activities of PMC and its own activities such as monitoring and reporting mining activities in view of work safety and environmental protection/rehabilitation, reforestation, and so on.

Mining resources in principle are not a property to be privately owned and utilized. Also they should be equitably and properly utilized without critical negative impacts to the environment. If utilized, some benefits or compensations should be ensured to concerned/affected people. The PMC is expected to be organized to realize these ideas.

PMC will be organized by the councilors representing the people in and around the

mines, and chaired by the president of the Foundation who will be elected by the councilors. Concerned barangay captain will be automatically one of the councilors.

PMC will function over the administrative boundary, because mines and mining activities sometimes encompass two or three municipalities belonging to different provinces. This is also one of the benefits expected from PMC.

A Mining Community Development and Management Plan (MCDMP) to be submitted by mining contractors or their association to PMC will contain the following elements:

- Land use plan including residential area, waste disposal site, depleted mining area (which may be used for waste disposal);
- Town planning (housing and infrastructure including facilities for education, health etc.) with safety guard and appropriate regulations including landscaping;
- Environmental protection and rehabilitation plan including reforestation; and
- Long-term development plan including tourism development and livelihood rebuilding even after the mining resources are depleted.

4) Implementation of the program

This program will start from establishing PMC in existing and future small-scale mining areas by the people's initiative. LGUs and the Central Government may amend relevant laws and regulations to place PMC as a legal institution.

The Mining Development Foundation (MDP) will be funded by capital of mining contractor including the financier to small-scale miners and a partial allotment of excise tax and fees on mining activities. (excise tax: 2% of sales of non-metallic minerals, 1-2% of sales of metallic minerals; fees: P5/ha per annum for prospecting, P50/ha per annum for Mineral Production Sharing Agreement (MPSA) and Financial and Technical Assistance Agreement (FTAA)). In the meantime, these fees are very cheap, but these are expected to be raised to support the foundation. As another option, the foundation may mobilize the People's Mining Protection Fund prescribed by RA 7076.

The mining contractor including financier of small-scale miners will implement some of the development projects (e.g., housing, water supply, tourism facilities) and rehabilitation projects contained in the Mining Community Development and Management Plan in cooperation with LGUs in the mining areas.

Project location and timing for implementation

This program will be implemented one by one for small-scale mining areas depending on progress and scale of their mining development. Accordingly, this program will proceed as follows:

- Establishment of the people's mining council for existing mining areas :Phase 1 (1999-2004), and several months before the approval of new mining project;
- Establishment of the mining community foundation for existing mining areas: Phase 2 (1999-2004), and one year after commencement of newly approved project;
- Formulation and implementation of a mining community development and

management plan : Phase 2 (2005-2010) and onward; and

- As an urgent project, a master plan for the “Rehabilitation of Gold Rush and Downstream Areas of Mt. Diwalwal in Compostela Valley: Phase 1 (1999-2004).

(4) BIMP-EAGA construction materials merchandising center (CMMC) project

This project is related to both mining and manufacturing industries. In view of promoting the BIMP-EAGA cooperation and closer relation to manufacturing, this project is grouped into the manufacturing sub-sector. Details of this project are contained in Project Report of the Study.

(5) Innovation program MQ (mining and quarrying)

1) Background and objectives

To date, there is no substantial public R&D support for mining and gold processing industry in the DIDP Area. Gold processors expect government supports for their production technology development, as revealed by the IQS conducted for the Study. Also, colleges/universities in the DIDP Area have no course offerings for geology and mining engineering, Courses are more specialized in business management, commerce, and education.

Mining and mineral processing technology will be further developed. In the future, it is viable that almost all of mining-related works are mechanized including remote control robots. A new gold processing technology is already commercialized to increase gold recovery and avoid mercury pollution as seen before.

Section 135 of DAO 96-40 prescribes contribution of the large-scale mining contractor to the development of mining, geosciences and processing technology and the corresponding manpower training and development. In addition to this, this proposed program aims to innovate the mining and quarrying industry in the DIDP Area through facilitating R&D support and strengthening inter-industry linkages.

2) Components and benefits of the program

This program will consist of the following components:

- Establishment of mining-related courses in colleges/universities in the DIDP Area such as geology and mining engineering, among others;
- Strengthening of public R&D support centering on application of high and advanced technologies to mining and mineral processing industries so that they can be innovated; and
- Strong promotion for strategic location of high tech industry such as electronics industry which is a major user of rare metals including gold, chromite and nickel, and thereby pursue a combined development of mineral processing industry and high tech manufacturing.

This program will contribute not only to innovation of mining industry, but also to formation of a foundation for industrial development of the DIDP Area toward the year 2016 and onward.

3) Implementation of the program

3) Implementation of the program

Courses for geology and mine engineering is expected to be established in the Davao Oriental State College of Science and Technology, Mati, or USEP Tagum, Davao del Norte. Public R&D support will be implemented by DOST or MGB.

Timing for implementation

This program will start during Phase 2 (2005-2010), and will expand during Phase 3 (2011-2016) and onwards.

4.3. Policy Recommendation

The mining sub-sector development in the DIDP Area will achieve its goals/vision well led by the projects/programs already proposed. This section recommends successful implementation policies for some of the projects/programs.

1) Re-definition of small-scale gold mining

The City/Provincial Mining Regulatory Board (the Board) has been very well operating in the DIDP Area except for small-scale gold mining. A conflict at Mt. Diwalwal (Mt. Diwata) has not yet been solved due to complicated situations involving many kinds of concerned people and organizations.

As an approach to better solution, it is recommended that the Government re-define the small-scale gold mining so that use of explosives or heavy mining equipment are allowable. In compensation for this, small-scale gold mining contractors should shoulder the responsibilities equivalent to those of large-scale mining: responsibilities for the development of the host and neighboring mining communities.

In any case, financiers behind small-scale miners are expected to shoulder part of the responsibilities in the present situation of Mt. Diwalwal conflict.

2) Establishment of "medium-scale gold mining"

One of the causes of Mt. Diwalwal conflict may be a large difference in the responsibilities between large- and small-scale mining. Based on RA 7942, large-scale mining contractor should be responsible for the development of the host and neighboring mining communities. Such heavy responsibilities have made small-scale contractors reluctant to become large-scale contractors.

As a compromise, "medium-scale gold mining" could be considered, limiting its responsibility, e.g., only to the development of the host mining community. The Safety and Sustainable Mining Community Development Program proposed by the Study will be more viable if the medium-scale gold mining is created, since the program's basic concept is to enhance the responsibilities of mining contractors, and thereby sustain mining community.

3) Mobilization of foreign funds

UNIDO and the Government has a standing agreement that the former will grant US\$200,000 to the latter in order to establish the laboratory for monitoring and relevant R&D. This will be established in the DIDP Area. It is recommended that MGB Region XI make an effort to mobilize such foreign funds for the MPZ project and the Safety and Sustainable Mining Community Development Program including an urgent mining areas rehabilitation project, both already proposed.

