
planned are appropriate for their needs.

6) Formulation and implementation of an accreditation scheme

This strategy would improve the credibility of NFE skills training programs and convince industry and would-be employers of the desirability and quality of such trainings. The scheme would call for constant involvement of industry in establishing standards and necessary skills for accreditation. It becomes imperative, therefore, that before training packages are made, there should be a study to identify those skills which industry needs.

5.2.3. Technical and vocational education and training (TVET)

(1) Constraints and prospects

Constraints

Prior to 1994, technical and vocational education and training (TVET) was inefficiently planned and implemented, with several government organizations overseeing programs. The Technical Education and Skills Development Authority (TESDA) was created by the National Education Act (RA 7796 of 1994) to integrate the activities of the former National Manpower and Youth Council, the Bureau of Technical and Vocational Education of DECS, and the Apprenticeship Program of the Bureau of Local Employment of DOLE. Many obstacles still persist to TVET improvement such as inadequate investment and a weak market. TESDA itself has internal deficiencies that retard correction of the TVET system. The following are constraints facing the TVET system in the DIDP Area.

- 1) Government investment in technical and vocational education nationwide is low, and the DIDP Area receives lower than average investment.
- 2) Training courses do not match the needs of the labor market, partly because of inadequate staffing and partly because of a lack of systematic and system-wide performance monitoring.
- 3) Facilities and equipment are generally inadequate.
- 4) The number of master trainers and instructors is insufficient.
- 5) The quality of instruction in public training institutions is both technically and methodologically outdated. Most instruction is purely theoretical, with little practical application. Instructors have little incentive to upgrade their technical and teaching skills. At the same time, the large number of poor people who cannot afford private training will continue to need public institutions, at least in the medium terms.
- 6) Neither secondary schools nor TVET institutions offer sufficient job counseling, aptitude testing or other kinds of assistance in securing training and employment.
- 7) LGUs have neither the financial nor technical capacity to plan or implement marketable and properly targeted training.

Prospects

The DIDP Area's growing and increasingly sophisticated economy will resolve some systemic problems. As the labor market expands and diversifies, the private sector can be expected to support training in necessary skills. Over time, market

forces will sort the productive from the non-productive institutions, allowing more effective use of resources. The DIDP Area does not yet have the kind of market that can demand quality training, but it has the opportunity to create a system that will attract industrial investment.

The development of TVET system will take place in the following favorable circumstances, applicable to the DIDP Area.

- 1) The new organizational structure, with TESDA responsible for nearly all technical and vocational education, has the potential to improve the system by rationalizing investment, supervising quality and collaboration with the private sector, both in terms of training institutions and employers.
- 2) The expected rapid growth of the labor market, both regionally and internationally, will create demand and quality control.
- 3) The emphasis on dual training will help overcome lack of practical experience.
- 4) The BIMP-EAGA relationship can help set training standards, develop support mechanisms and provide a source for technical assistance in skills that are new to the DIDP Area.

The following are specific conditions to support the development of TVET system in the DIDP Area.

- i) Presence of some TVET training institutions of varying expertise,
- ii) Clear, relevant and doable mandates of TESDA as a lead agency through RA 7796,
- iii) Growing awareness and support of the Government for TVET in agriculture and fishery through the Agricultural Modernization Law,
- iv) Greater autonomy/flexibility of TESDA Regional and Provincial offices,
- v) Apparently increased dedication/commitment of TESDA DIDP Area officials,
- vi) Legislative and executive support via the Dual Technical Training Law, and
- vii) Availability of trainable manpower.

(2) DIDP TVET objective

The policy framework within which TESDA operates as the lead agency of the Government in formulating and continuing technical education and skills development plans and programs are sound, relevant, doable and sustainable. The DIDP TVET will be conducted within this setting. The objective of the DIDP TVET is to fast track the DIDP Area development in order to capture the internal and global markets as envisioned.

(3) DIDP strategy in TVET

To attain the objective effectively, the DIDP strategy in TVET should follow the phasing of the DIDP Area development.

In Phase I for the Internal Integration, the TVET system in the DIDP Area will have to refocus on the agriculture and fishery sectors with the view to upgrading traditional skills in order to adapt to diversifying needs (e.g. new crops/varieties,

alternative farming systems, and various practices of aquaculture). Also, it will have to be made accessible to disadvantaged groups, including OSYs, women, elderly and other socially deprived.

In Phase 2 for the Globalization Drive, as the DIDP socioeconomy is exposed to expanding markets and facing diversifying opportunities, the TVET system will have to respond to changing needs of industries and emerging structure and market incentives. For this, TESDA will have to operate efficiently, internally and externally, and clients need to be duly consulted.

The High Tech – High Services strategy in Phase 3 may introduce a wide range of high earning employment opportunities associated largely with increasing foreign investments. To capture such opportunities, the TVET system will have to be oriented increasingly to high quality skills training through exchange of information world-wide and a training system open to the rest of the world.

(4) TVET strategies

- 1) The administration of the TESDA Regional Office and provincial offices should be strengthened through:
 - increased funds for hiring more qualified staff, equipment, machinery and supplies,
 - increased funds for other operating expenses,
 - scholarship grants to deserving staff, and
 - technical support in areas where TESDA is weak such as but not limited to agriculture and fisheries.
- 2) Identified and well-defined technicians in agriculture and fishery with corresponding required minimum knowledge, attitudes, skills and social or leadership abilities could be one factor for turning high tech from resource-based approach. Efforts have to be exerted towards addressing the above problem by tapping existing institutions with expertise.
- 3) For a generic solution, the nagging issue of mismatch between available manpower and the requirements of industries should be addressed through institutionalized guidance and counseling at highschool level directed by information from well-studied/researched data gathering, collation, projection and interpretation. Placement services should be part of this project. A grant with counterpart funds for this concern undertaken by TESDA itself should indeed be very useful.
- 4) There has never been a situation where one single training institution has all the needed machinery, laboratory, manuals/training modules, books and other references. Since these are expensive resources, it is proposed that common laboratory and library facilities be selected among training institutions, including the Regional Training Center
- 5) The concept of dual tech training has worked very well on a post-industrial environment. It is proposed that this option be thoroughly studied and modified to suit culture and level of development in the DIDP Area. Since there is a severe lack of competent and credible guidance counselors in highschools, it may

become necessary and important to offer scholarship grants for them.

- 6) The enhancement of any activity can not be sustained without support from research. This concern should be institutionalized at TESDA and funded through the Agriculture Modernization Law as well as special funds earmarked for the purpose. The scheme of research approval and funding should follow the DOST model.
- 7) There is a strong need to establish and implement a management information system (MIS) and monitoring and evaluation units at the regional as well as the provincial offices.
- 8) Current government and private training institutions after selection based on agreed criteria can be tapped by TESDA to become training providers with foreign technical and financial assistance. This strategy can become even more desirable if brought to the level of the municipal government. Perhaps what could be done is to pilot test the concept with counterpart contributions from LGUs selected on the basis of project proposal.

5.2.4. Health

(1) Health problems and constraints

Existing problems and constraints related to health conditions, services and facilities in the DIDP Area have been identified through visits to health facilities, interviews with health personnel, and analysis on secondary data. Also a series of consultative workshops were conducted with provincial/City health staff, municipal/district health officers, public health nurses, midwives and leaders of barangay health workers associations to identify specific conditions in different areas of the provinces and the City.

Health problems

Of all the health problems identified, the following are particularly conspicuous as characteristic problems in the DIDP Area as a whole.

- 1) Infant and maternal mortality rates, decreasing rapidly in recent years in all the Davao provinces and Davao City, are still relatively high in the former Davao Province and Davao Oriental, higher than respective averages in Region XI as shown in Table 5.9.

Table 5.9 Infant and Maternal Mortality Rates, 1995

(Unit : per 1,000 live births)

	Davao Province	Davao City	Davao del Sur	Davao Oriental	Region XI	NCR	Philippines
Infant Mortality Rate	57	29	48	59	52	32	49
Maternal Mortality Rate	164	110	149	165	160	119	180

Source: Statistical Yearbook, 1996

- 2) Incidence of water-borne diseases is high due to poor access to safe water, particularly in Davao Oriental ensured only for 47% (1996) of households, and also low coverage ratios by sanitary toilets, particularly in Davao Oriental (39% in 1990) and Davao del Sur (38%).
- 3) There exist environmental health hazards due to mercury contamination among gold miners and community members nearby, and chemical spraying at banana plantations.
- 4) The number of hospital beds is insufficient, particularly in Davao Oriental followed by Davao Province, and more so at public hospitals as shown in Table 5.10.
- 5) The number of Main Rural Health Centers is grossly insufficient as shown in Table 5.11, which hinders the delivery of primary health care services and the proper functioning of a referral system, resulting in overloads on health facilities at higher tiers.

Table 5.10 Number of Public and Private Hospital Beds, Ratio of Population and Poverty Incidence

	Davao Province	Davao City	Davao del Sur	Davao Oriental	Philippines
Number of Public Hospital Beds	230	200 ¹⁾	160	410 ²⁾	43,229
Ratio to Population	1 : 5,180	1 : 3,385	1 : 2,584	1 : 1,651	1 : 1,587
Number of Public & Private Hospital Beds	1,300	1,345 ³⁾	242	1,813 ⁴⁾	80,800
Ratio to Population	1 : 916	1 : 503	1 : 1,709	1 : 555	1 : 849
Poverty Incidence	N.A.	32.8% ⁵⁾	62.2% ⁶⁾	23.0% ⁷⁾	35.5%

Note: ^{1), 2), 3)} – figure in 1996

⁴⁾ – figure in 1991

Source: DOH Region XI

⁵⁾ PPDO, 1990; ⁶⁾ NEDA, 1994; ⁷⁾ FIES Primary Results, 1991

Table 5.11 Number of Main Rural Health Centers, Required and Existing, 1995

	Davao Province	Davao City	Davao del Sur	Davao Oriental	Region XI	NCR	Philippines
No. of MRHCs Required*	60	50	34	21	254	473	3,431
No. of MRHCs Existing	20	17	13	9	94	366	2,335
Satisfaction ratio of requirements (%)	33	34	38	43	37	77	68

* Based on the standard MRHC – population ratio of 1 : 20,000

Source: National Statistical Yearbook, 1996

Constraints

Health-related constraints to the DIDP Area development have been identified as follows.

1) Poverty

The private sector is already dominant in the provision of health services in the DIDP Area, and their activities tend to be constrained by the high poverty incidences. The number of beds at private hospitals, for instance, shares over 80% of the total number of hospital beds available in the Area (Table 5.10). Davao Oriental has the smallest number of hospital beds per population, as private sector activities are constrained, among others, by the high incidence of poverty (62.1% in 1994).

2) Imbalance between urban and rural areas

The provision of health services is biased against rural areas with respect to health personnel, facilities and types of services. Davao City, for example, has geographically highly skewed ratio of hospital beds to population. Most secondary and tertiary level hospitals, both government and private, are concentrated in Poblacion, while only one government hospital outside Poblacion is the Paquibato hospital with total bed capacity only of 10 beds. The number of health personnel in the DIDP Area largely meets the standard, except dentists, but their distribution is not adequate. In addition, the number of pharmacists is very short at the community level.

3) Insufficient Main Rural Health Centers

The number of Main Rural Health Centers is insufficient in the DIDP Area as mentioned above. This makes the delivery of preventive health care services difficult at the primary level. Patients tend to go directly to the secondary level health facilities. As a result, a referral system is not functioning properly.

4) Inadequate health equipment and instruments

Despite the DOH standardization policy for health services, personnel, equipment/instruments and facilities, they are not adequately met at most hospitals and laboratories. Many secondary and even tertiary hospitals have not been able to perform up to their capacity due to non-functioning or lack of equipment/instruments. There are a very few rural health units having dental care service facilities. Barangay health workers kits are no longer provided by LGUs in some areas.

5) Insufficient drug management system

After the devolution, the drug management system at the local level is less efficient as the procurement procedure is not vertical from the Central Government down to the local. The procurement of drugs and medical supplies now depends on LGU's will to budget for them. Availability of basic essential drugs is not adequate in health centers and hospitals at all the levels.

6) Lack of integration and feedback of health related data

Basic health data from the community health databoard are not integrated into

the Field Service Health Information System and the hospital information system. Utilization of health data by local government officers for planning and implementation is rarely practiced.

7) Poor coordination

The devolution of health services resulted in separation of management of public health and hospital services. The provincial government is responsible for the operation of hospitals, while the municipal government is in charge of health centers. Coordination is limited between the two sectors, and there is no integrated plan for health services at different levels of LGUs to maximize their health resources.

8) Inadequate health finance

Since the devolution, LGUs are responsible for financing health services. The provincial government provides funds for drugs, salaries and other operational expenses of government hospitals. The municipal government supports the supplies, drugs and operations of health centers. The budget for health goes mainly to personal services as health personnel have more benefits than other government personnel because of the Magna Carta for Public Health Workers enacted before the devolution.

9) People's perception and attitude toward health

People's perception and attitude toward health vary widely. Some IP's go to health facilities only when the sickness becomes very serious, while people in urban areas have dependency mentality to health services. The absence of self-reliance on the part of people and the absence of commitment among some health personnel are constraints to optimizing health services with limited resources.

(2) DIDP health objectives

Adequate health services constitute an important part of the minimum basic needs, and as such a necessary condition for the DIDP Area development. Health development in the DIDP Area should contribute more positively to realizing a self-reliant society consisting of healthy people interacting one another in various fields. Further, the DIDP Area should establish its fame as a center for advanced medical services. Thus, objectives of the DIDP health sector are:

- 1) to improve access to health services for all as part of the minimum basic needs;
- 2) to contribute to changing people's perception and attitude for a more self-reliant society with healthy people, and
- 3) to provide advanced medical services for a high image of the DIDP Area.

(3) DIDP strategy in health sector

The DIDP health objectives may be attained most effectively by introducing strategic elements in steps in line with the DIDP strategy. The improvement in health services in Phase I for the Internal Integration should address to the problems noted above, including the high poverty incidences, imbalance in health service provision between urban and rural areas, insufficient Main Rural Health Centers,

and progressively inadequate health equipment and instruments at lower tiers in the DIDP Area. In particular, provision of health services should be improved for indigenous peoples, remote communities and deprived peoples to vitalize their livelihood and help to integrate them into the DIDP socioeconomy.

As the health services delivery is improved, people's perception and attitude toward health are expected to change. In fact, the improved health services will have to be supported increasingly by dedicated LGUs, community initiatives and self-reliant people. Health development in Phase 2 for the Globalization Drive should contribute to a dynamic and self-reliant society consisting of healthy people as a basis for active human interactions with in-migrants and visitors from other regions and countries. The number of visitors to the DIDP Area will increase as tourism establishes as an export winner under the Globalization Drive strategy. These may result in certain types of communicable diseases to increase and undesirable social habits to spread. The health sector strategy needs also to address to these problems.

Advanced medical services may be provided as existing facilities are upgraded and health personnel trained through early development. Advanced medical researches may also be established in the DIDP Area. These functions may cater to the needs not only of the DIDP Area with higher income levels but also of other regions in Mindanao or even the BIMP-EAGA countries in line with the High Tech – High Services in Phase 3. Also, use of herbal medicines and traditional medical care, if streamlined, may appeal increasingly to international visitors.

(4) Health sector strategies

Specific strategies for the health sector are established responding to the constraints identified and in line with the DIDP strategy clarified above. Aspects covered by the strategies are (1) health care delivery system, (2) health personnel, (3) coordination, (4) nutrition, (5) social sensitivity, (6) environmental health, (7) health information, (8) health finance, (9) awareness, and (10) service quality.

1) Health care delivery system

Access to existing barangay health facilities should be improved for isolated puroks in large barangays. Institutionalizing the clustering of families in every purok will allow the people to identify health needs and problems and to find solutions. Strengthening the purok network will facilitate the planning and implementation of health programs that are adaptable to specific situations of different communities.

To complement existing health facilities, mobile clinics and diagnostic laboratories are needed to provide basic health services to people in remote areas. For coastal municipalities such as Jose Abad Santos and Sarangani in Davao del Sur, Samal Island in Davao del Norte, and Boston, Cateel, Baganga and Caraga in Davao Oriental, a floating emergency clinic or ambulance is necessary to facilitate the referral of patients. Vehicles should be provided to health personnel to increase mobility in providing services.

In Davao City, lying-in clinics in every strategic district such as Malabo, Mintal, Marilog and Baguio will strengthen the referral system in hard-to-reach areas. In Malabo, the hospital building constructed several years ago should be

provided with equipment and personnel to start its operation. Some health centers in Poblacion need to be expanded to accommodate the growing number of patients.

The implementation of the National Drug Policy program needs to be strengthened to reach the people in barangays by forming a multi-sectoral coordinating body at the provincial and municipal levels. It has the following functions:

- a) to establish community drugstore organizations in underserved areas;
- b) to monitor the prices and quality of drugs in the market to make sure that there is proper selection of drugs to be analyzed;
- c) to inform the people about the rational use of drugs;
- d) to encourage the people to use herbal drugs that are endorsed by DOH and to document the experiences with other herbal drugs that can be tested by experts;
- e) to establish a simplified drug purchase mechanism for the DIDP Area to make the purchasing and distribution of drugs more efficient, effective and equity oriented; there should be a weekly replenishment of drugs in barangays especially for tuberculosis and other endemic diseases such as paragonimiasis in Cateel, Davao Oriental; and
- f) for the provincial committee to monitor and control the prices of drugs in different municipalities.

A national NGO that has experience in making drugs available, affordable and accessible to the people can be the lead agency for this program.

2) Health personnel

Continuing education programs should be provided to health personnel and community health workers to make them more effective administrators, trainers, community organizers, implementers of culture sensitive health programs, and health educators. After the devolution, health personnel have more administrative and added executive functions as members of the Local Health Board. More visiting professors and experts should be used to give seminars for them.

Postgraduate courses can be provided by correspondence to help health professionals upgrade their knowledge and skills without leaving their posts. Traditional birth attendants should be constantly trained on the aseptic and emergency procedures in assisting deliveries. Leaders of barangay health workers should have management training.

Training on peer monitoring should be conducted to all health personnel and barangay health workers. Regular monitoring of peers and supervisors is needed to maintain the provision of quality health services. Training community health workers for all the elements of primary health care is important instead of having a barangay health worker who know everything but cannot effectively deliver health services due to overloaded works and status as a volunteer.

3) Coordination

Regular meetings of municipal health officers and the provincial health officer is necessary to monitor health programs and conditions, and to plan for health services at different levels of LGUs. Coordination with the community, NGO's and the private sector is necessary to supplement the limited health resources of LGUs. Involving the community in formulating the plan is important to make sure health programs are responsive to health needs of the people. NGOs can provide technical and financial support in implementing health programs in the community, and they can also go to underserved areas to provide medical consultations and conduct health education.

Other government agencies implement other health-related activities such as water and environmental sanitation, health education at school and nutrition program for pre-school children. Clarification of roles among different agencies will avoid overlapping of functions and reduce the load on LGUs.

4) Nutrition

Good nutritional conditions of people and particularly children should be ensured as the basis for socioeconomic development. Intensification of vegetable home gardening program is one strategy to make nutritious food available and affordable to families. Concomitant to this is the need to do massive information education campaign to encourage people to eat more vegetables. Local production of processed food supplements will be helpful to make the nutrition program sustainable.

5) Social sensitivity

Halfway homes or rehabilitation centers are necessary for mentally ill patients and substance abusers. These facilities will hasten the rehabilitation of the patients because they will be in an environment where people of the same situation are staying together with specialists who know best how to deal with them. In addition to the existing Davao Mental and the Regional Rehabilitation Center for Drug Dependents, need for more facilities may deserve a careful study, first.

Health facilities should be sensitive to the needs of the elderly population and persons with disability. Flexibilities in providing health services for working mothers and single parents should be considered such as extended consultations after office hours and sometimes on weekends. Davao del Norte is planning to come up with a center for women in crisis to prioritize the health services for women as components of the maternal and child health program.

6) Environmental health

Cases for health hazards associated with agro-chemicals should be established through cohort and case control studies. Information dissemination should be conducted on proper use of agro-chemicals and other toxic substances.

Organization of a Barangay Sanitary Inspectors Association (BSIA) in every barangay is important to ensure the proper maintenance of water and environmental sanitation. The BSIA is a local initiative of the municipal health officer of Matanao, Davao del Sur and the provincial sanitary supervisor.

7) Health information

The system of collecting health data should be reviewed from the community up to the provincial level. Some information about target accomplishments in the vertical programs may be replaced with information about community participation in such programs. Community health databoard can be institutionalized as one of major support programs by LGUs.

Computerization of data at the municipal level should be done to facilitate the reporting system. Communication facilities should also be upgraded for more efficient information dissemination. Databank related to ill effects of chemicals used in banana plantations and mining industry needs to be established. Also retailers of agro-chemicals, mercury and cyanide should properly inform their clients how to handle the chemicals.

Developing health information materials that are sensitive to health beliefs and practices of various peoples is important to effectively increase the knowledge and change the health practices. Having an audio-visual van is also necessary to make health education more interesting. Learning from innovative health programs of other communities should be encouraged by exchange programs.

8) Health finance

A long-term strategy is to implement the National health Insurance Program (NHIP) in a manner that is based on levels of economic development in different areas. For some areas, the NHIP can be introduced immediately like in Davao City and Tagum City where there is good quality health services both in the public and the private sectors. In other areas, however, a "fee for service" scheme should be implemented first to make the people aware of expenses of health services. A prerequisite is to upgrade the health provider's technical capabilities and to improve their attitude in serving their patients.

Since 1993, the fee for service scheme is implemented in Malalag to allow the LGU to implement quality health services to the people. The collection of revenues both for curative and preventive health programs including consultations and immunization were made possible through the enactment of a Local Revenue Code that was initiated by the municipal government.

The innovative health financing schemes implemented in some municipalities in Davao del Sur are worth replicating in the whole of the DIDP Area. The community drug insurance program or Botika Binhi implemented in 10 barangays in Magsaysay, Matanao and Sulop since 1985 may be expanded to make quality drugs available and affordable in barangays.

The discrepancy between the standard requirements and available facilities, equipment and supplies in different hospitals may be partly addressed by encouraging local investors to manufacture some facilities and supplies using indigenous materials such as hospital beds from bamboo. Medical equipment may be locally assembled and health equipment technicians trained.

Privatization of some health related services will be helpful to reduce the burden on LGUs such as operation of water system and proper waste disposal. Community based water system organizations or the Barangay Water System

Association may be strengthened to make them responsible for the maintenance of water systems. Formation of community networks to recycle and reduce garbages is an innovative way of waste management that will make waste disposal a concern and responsibility of the people.

9) Health awareness (value development)

Early age health education is a strategy to change people's value for health. The City Social Services and Development Office has 39 programs and services including the child's early age development. Another strategy is to promote the idea of self-reliance and the traditional "Bayanihan system". Training of health personnel on capability building and team organizing is another strategy. Value of health services may be promoted among LGUs by orienting LGUs to health programs at different levels through advocacy, consultation, information dissemination and performance monitoring.

Traditional medicines should be encouraged by using the Davao Regional Herbal Processing Plant (DRHPP). LGUs may purchase herbal medicines in tablet form from the DRHPP to make them accessible and available to the people. Farmers of lagundi, sambong and tsaang gubat should be organized to produce raw materials for the Plant to ensure sustainable supply.

10) Health service quality

Tertiary hospitals in the DIDP Area should be upgraded with better equipment/instruments and more qualified health professionals as well as expanded capacity. Some of them are already central facilities in Mindanao for some government programs. Incentives to further upgrade the facilities and services are provided by the potential to make them centers of excellence serving the BIMP-EAGA countries as well, particularly in the fields requiring more attention as the number of visitors and in-migrants increases.

5.3. Strategy for Environmental Development

5.3.1. Environmental management

(1) Existing environmental problems

Various types of environmental problems have been identified in the DIDP Area through field surveys, interviews, analysis on data and information collected and workshop discussions. They are discussed below, classified by management field into: forest and watershed management, coastal management, living environment management/pollution control, and protected area management. Environmental management administration is also discussed.

Forest and watershed management

1) Denudation of forest and soil erosion

Encroachments by squatters and settlers on upland gives rise to degradation of forestland. They practice kaingin, cultivate on slopes, and construct houses on slopes or in forestland. Denuded land caused by these activities can be found throughout the DIDP Area even within protected areas. Denuded land can generate soil erosion and land slides during the rainy season. In consequence of forest denudation, riverbeds and the coasts are sedimented by siltation.

Inappropriate exploitation works for mining including disposal of mine tailings and construction of access roads are also responsible for the degradation of forest and soil.

2) Flooding

The DIDP Area is located in a typhoon-free zone. However, many people and land are affected by flooding. In Davao City, approximately 4,000 families were affected by flashfloods in May and June 1994 (Provincial Ecological Profile, Davao Del Sur, 1994). Flood prone areas are found in each province and the City. Forest denudation and narrow watershed with limited discharge capacity are main factors affecting flooding.

3) Improper land use

Hillyland and highland areas (higher than 500m elevation and above 18% slope) account for 70% of the total DIDP land area. Hillyland and highland areas are indiscriminately and often extensively cultivated without proper soil conservation measures.

Coastal management

1) Encroachment on shorelines by squatters and settlers

Some parts along shorelines of Davao Gulf and the east coast of Davao Oriental are occupied by squatters, settlers, fishponds and beach resorts. Illegal occupancy on shorelines was pointed out at the workshops except for Davao del Sur. Most structure on the shorelines may be illegal. The following activities degrade ecosystems such as mangrove forests and coral reefs, and deteriorate seawater quality in the DIDP Area:

- construction of houses and other structures (encroachment on beach, gathering of construction materials etc.), and
- daily activities (discharges of wastewater, generation of solid wastes, gathering firewood etc.).

Major shorelines occupied by squatters and settlers are found in Maco, Pantukan, and Mabini in Compostela Valley, Panabo and Tagum City in Davao del Norte, Panacan, Agdao, Magsaysay, and Santa Ana in Davao City, and Mati in Davao Oriental.

2) Degradation of coastal ecosystem

The shorelines of the DIDP Area consist of rocky shores, coral reefs, sandy beaches and tidal flat types. Each shoreline has a different ecosystem, which has been degraded by human activities to a different degree. Causes of degradation of coastal ecosystem are illegal activities, inappropriate coastal use, and land-based human activities.

Illegal activities such as destructive fishing give rise to degradation of coastal ecosystems, especially coral reefs. Dynamite fishing is still practiced although the number of cases are decreasing, while other illegal fishing practices have expanded throughout the DIDP Area.

Coastal ecosystem can be affected by land-based human activities. This

deterioration of coastal ecosystems is brought about by sedimentation on the coast due to soil erosion and landslides caused by deforestation, upland farming, quarrying and other activities. It is difficult to rehabilitate damaged coastal ecosystem caused by sedimentation, especially coral reefs. More seriously sedimented coasts are found in Santa Cruz - Santa Maria, Malalag Bay in Davao del Sur, and in Mati, Balete Bay in Davao Oriental.

3) Pollution of sea water

The seawater along the coast is polluted in the DIDP Area directly or through rivers by sedimentation, discharging of domestic sewage and industrial wastewater, solid wastes dumping and leaks of oil by accidents and others. Coastal areas faced with populated areas are polluted by untreated discharge of wastewater from households, poultry farms, and various industries.

Along the coast off Davao City, Balete Bay and other populated areas, coliform levels of seawater, which is an indicator of pollution by human activities, are comparatively high. The first red tide was identified in Balite Bay and Pujada Bay in 1996. Shellfish was poisoned by red tide planktons containing paralytic shellfish poisons.

It is reported that pesticides used in banana plantations and mercury from gold processing plant flow into the sea (the workshop in November). No scientific data, however, have been obtained to verify these phenomena.

Living environment management

1) Inappropriate solid waste management

At present, municipal governments have responsibilities for waste collection. In the DIDP Area, however, only wastes generated in Poblacion are collected by municipal governments, especially at markets and along major roads. According to 1990 Census by NSO, collection coverage rate in Davao City was 21% while collection rate of other provinces ranges in 1 - 4 % (Table 5.12). Therefore, even some areas in Poblacion are not covered due to lack of collection vehicles and lack of disposal sites.

Most wastes are dumped into open areas, rivers and valleys by municipal governments and individuals. Capitals of provinces and the City have dumping sites located in mountain or hilly areas in Davao City and Nabunturan in Compostela Valley or on shorelines for Mati in Davao Oriental. However, such dumping sites are not properly located from environmental viewpoint. Although there is no water quality data, surface water and groundwater may be polluted by leachates from dumping sites. Leachates containing high organic matters and metals seep out from garbages and flow into rivers and permeate into groundwater. Garbages are scattered around dumping sites. Residents living around disposal sites complain about scattering garbages and foul odors. For example, a disposal site of Mati is located close to houses. According to the Mati municipal government, the disposal site must be closed as soon as possible due to complaints from residents. Thus, even existing dumping sites managed by municipal governments are not desirable from hygienic and landscape points of view.

Table 5.12 Solid Waste Management System in DIDP Area

(Unit : %)

Solid Waste System	Davao Province	Davao City	Davao del Sur	Davao Oriental
Picked up by Track	4.3	20.8	1.2	2.3
Dumping in individual	27.1	19.3	13.9	17.8
Burning	53.9	47.9	71.9	63.1
Composting	7.2	3.2	3.4	4.6
Burying	2.6	3.1	4.5	4.2
Feeding to animals	3.2	0.9	3.5	5
Others	1.7	4.7	1.6	3

Source: 1990 Census of Population and Housing, Davao Province, Davao City, Davao del Sur, Davao Oriental Province, and NSO

2) Air pollution

In the capitals, especially Davao City, traffic volume is increasing rapidly, leading to rising air pollutants (the workshops in November). Provincial governments can not control smokes from vehicles due to lack of smoke tester. Traveling vehicles also generate noise, and cause traffic congestion on major roads in the capitals during commuting times. These urban environmental problems may become serious, as the urbanization proceeds.

3) River water pollution

River environment in the DIDP Area is deteriorated due to various types of pollution such as sedimentation due to soil erosion, discharges of organic matters, and discharges of toxic substances. Riverbeds are sedimented by soil erosion and landslides. Denuded forests cover the DIDP Area widely. Soil erosion and landslides occur in denuded areas. Eroded soil flows into rivers or the sea directly during rainy seasons. Mining activities cause sedimentation by tailing; for example, the Monkayo river has been sedimented on foot of Mt. Diwata, Monkayo, Compostela Valley. Sedimentation in riverbed gives rise to deterioration not only of environment for river benthos but also of coastal environment.

Organic matters are discharged from domestic sewerage, poultry farms and other industries. The Hagonoy river in Davao del Sur is polluted by sugar mill and others.

4) Mercury/cyanide poisoning

Since the early 1970's, small-scale gold mining has been undertaken in the northeast of Mindanao Island. At the beginning, mercury was used exclusively for gold processing. At present, both cyanide and mercury are used for processing.

In Apokon, Davao del Norte, there are gold processing plants located in residential areas. According to toxicological health assessment conducted by the National Poisons Control and Information Services, University of the Philippines 1996, schoolchildren had been exposed to mercury and cyanide

poisoning from the plants. Mercury and cyanide were found at alarming levels in blood and urine samples taken from the schoolchildren. Information obtained on these matters is limited, but same kinds of problems may be found in other gold rush areas such as in Monkayo, Compostela Valley.

5) Pesticides

Pesticides are sprayed in banana plantations by aircraft. According to the Ecological Profile of Davao Province, banana plantations use four or five different types and brands of pesticides twice a month. At present, there are no scientific data related to pesticide effects on residents, river waters and coastal environment. However, the Ecological Profile of Davao Province mentioned that populace near banana plantations, especially plantation workers, are suspected to various kinds of illness or birth defects due to prolonged contact with spray mists.

Protected area management

1) Conflicts between protected area management and encroachment

There are nine protected areas in the DIDP Area consisting of a natural park and protected landscapes/seascapes under the NIPAS. In the Mt. Apo Natural Park, settlers are encroaching on, and cultivating in the protected areas. There are approximately 2,000 settlers including 15 tribal communities in the Mainit Hot Spring Protected Landscape/Seascape. They are cultivating for coffee, coconut, fruit and other cash crops, also exploiting small-scale mining and building houses within the protected area.

As a result, conflicts between settlers and park management occur. It is reported that boundaries of protected areas cannot be identified by people due to no land markers (the Davao Oriental workshop).

2) Improper delineation of park boundaries

The Pujada Bay Protected Landscape/Seascape (21,200 ha) was established in 1994 under Proclamation No 431. It covers the whole Pujada Bay, excluding the Pujada Island. This protected area also covers part of Poblacion of Mati including the pier under the Philippine Port Authority, dumping site, houses and others that were constructed before the establishment of the protected area.

According to the NIPAS, 1992, "Protected Landscapes/Seascapes" are defined as areas of national significance which are characterized by harmonious interactions of man and land while providing opportunities for public enjoyment through recreation and tourism within the normal lifestyle and economic activity of these areas. In principle, a "Protected Area" is identified portion of land and water set aside by reasons of their unique physical and biological significance, managed to enhance biological diversity and protected against destructive human exploitation. Therefore, the present delineation may be inappropriate.

3) Lack of visitors' environmental awareness

The Mt. Apo Natural Park is a tourism destination for mountain climbing and camping. Garbage is littered by visitors, and scattered around camping sites within the Park due to lack of environmental awareness. Scattering garbage,

especially leftover food may lead to transformation of ecosystem due to increase in specific omnivorous species.

Environmental management administration

1) Lack of implementation and enforcement of laws and regulations

A large number of laws and regulations have been promulgated, related to environmental management. In addition to government agencies related to environmental management such as DENR and LGUs, various task forces, committees and NGOs have been involved in environmental management. Conflicts among related agencies are one reason for persisting environmental problems. The environmental laws and regulations are not properly implemented and enforced (the workshop in November). The reasons include the lack of human resources, lack of environmental staff training and awareness to environmental management, lack of necessary data and information, and limited budgets.

Pursuant to the Local Government Code of 1991, some of DENR's functions have been devolved to LGUs. However, both provincial and municipal governments do not have sufficient financial and human resources to conduct environmental management for functions devolved from DENR. In fact, human resources are not sufficient even at the central level.

2) Limited human resources

The most staff members of DENR (PENRO and CENRO) and LGUs are foresters, agricultural specialists and civil engineers. However, environmental management covers not only forest, but also terrestrial and marine ecosystems, pollution control and solid waste management. Also environmental management issues will change associated with urbanization and industrialization in the DIDP Area so that specialists for new fields will be required.

3) Limited staff training

PENRO, CENRO and environmental sections of LGU, such as Provincial ENRO and Municipal ENRO do not have opportunities for attending training programs. As on-the-job training alone would not be effective, combination of on-the-job training and off-the-job training is required for environmental staff training. Especially, knowledge of environmental laws should be enhanced for staff members who belong to the environmental sector.

4) Lack of necessary data and information

Data and information necessary for environmental management are largely lacking. Absence of scientific data on environment makes it difficult to formulate an effective management plan.

There are many on-going environmental projects and programs implemented in the DIDP Area by DENR and LGUs such as forest management. These projects and programs cannot be evaluated due to lack of data and monitoring capability. For example, although reforestation projects can be implemented without detail forest coverage data and monitoring, how much the projects contribute to increasing forestland cannot be estimated.

(2) Objectives for DIDP environmental management

The environmental objective for the DIDP Area development was defined in Section 3.1. More specific objectives for DIDP environmental management are defined to address the existing environmental problems identified above that may become critical as the DIDP Area develops without proper management interventions. They cover the management of watershed and critical areas and resources, control of pollution and environmental health hazards, and environmental management administration as follows.

- 1) To improve the management of watershed areas that have been degrading due to fast depletion of forest resources, encroachment into protected areas by upland communities, improper land use and management especially in upland/ hillyland, and inappropriate mining activities, resulting in more serious soil erosion and land slides, more frequent and significant flooding, and larger amount of sediment yields.
- 2) To protect and improve coastal and marine resources that have been degraded due to increased sediments from upper watersheds, pollution by wastewater discharges and solid waste dumping, illegal fishing activities, and squatters.
- 3) To prevent urban pollution in larger urban centers in the face of population pressure and rapid urbanization, including solid waste dumping and littering, traffic congestion and noise pollution, air pollution, poor drainage and degrading quality of surface water and groundwater.
- 4) To reduce the risk of environmental health hazards, represented by mercury/ cyanide poisoning of mining communities and their neighbors, and chemical spraying at banana plantations.
- 5) To increase the resources to be allocated to, and enhance the capacity for, environmental management, through human resources development, promotion of environmental awareness, increased participation of local communities, and establishment of environmental database.

(3) DIDP strategy in environmental sector

To attain the objectives for DIDP environmental management effectively, various strategic measures should be taken in line with the DIDP strategy, which combines, in time and space, the Internal Integration, the Globalization Drive, and the High Tech – High Services strategies. Phase 1 for the Internal Integration should address the improvement of watershed management and the protection of coastal and marine resources, which would restore the healthy resources base for sustainable development. Other components of the strategy are promotion of environmental awareness and increased participation of local communities in environmental management.

In Phase 2 for the Globalization Drive, the issue of soil erosion and degradation needs to be addressed particularly related to expansion of area under export and other industrial crops. The strategy will have to address also the issue of environmental health hazards and pollution associated with resource-based industries.

Urban pollution is an increasingly important issue to be addressed under both the Globalization Drive and the High Tech – High Services strategy. As socioeconomic activities diversify, environmental staff will need to be trained in a wider range of fields. Exchange of environmental information will become increasingly more important and far reaching as the DIDP Area development is pursued under the High Tech – High Services strategy through Phase 3. A regional or sub-regional center may be established in the DIDP Area for an international environmental databanking and network.

(4) Environmental management strategies

Specific strategies for environmental management in the DIDP Area have been established corresponding to the major issues defined above. It is presented below with four components: capacity building, natural resources use, ecosystem conservation, and preventive pollution control.

1) Capacity building

Despite many laws and regulations for environmental management, various environmental problems exist due to lack of environmental capability and necessary environmental data. Issues identified in this aspect are: 1) human resources development for LGUs, 2) community and private sector organizing, 3) environmental monitoring and database development, 4) EIA enforcement, and 5) promotion of environmental awareness.

Human resources development for LGUs

After the devolution, LGUs have become most important players for environmental management. The following should be undertaken for LGUs human resources development.

i) Establishment of Municipal ENRO

Municipal governments can establish municipal environment and natural resources officer (Municipal ENRO) according to the 1991 LGC, but none has been established in the DIDP Area. Major tasks of Municipal ENRO are as follows (DENR, Manual of Operations for Devolved General Management Functions):

- To establish, maintain, protect and preserve watersheds, tree parks, mangrove, greenbelts, communal forests and similar forest projects like industrial tree farms and agro-forestry projects; and
- To coordinate with government agencies and non-governmental organizations in the implementation of measures to prevent and control land, air and water pollution with the assistance of DENR.

A municipal environmental management plan should also be established reflecting municipal characteristics. Environmental management may be effected with management plans of neighboring municipalities coordinated through Municipal ENROs.

ii) Development of Provincial ENRO staff capability

LGUs of the DIDP Area have established Provincial ENROs, respectively. Most staff members are foresters. As environmental problems diversify in the DIDP Area, other experts will become important to deal with air and water pollution, ecosystem conservation especially of coastal areas, and hazardous/toxic wastes.

iii) Government staff training

Opportunities for training are lacking for DENR staff and particularly for LGUs officers in environmental sections. Both on-the-job and off-the-job training should be provided to LGUs officers.

Community and private sector organizing

The Government initiatives are usually taken for environmental management due to public nature of the environment and natural resources. Environmental management, however, requires understanding and support of communities and the private sector, as the management capability of governments is insufficient and major resource users are people and the private sector.

Resource users should be involved in environmental management through the following:

- i) participation of local communities and resource users in environmental monitoring and patrol: e.g. resort owners involving in patrol of resort area as part of obligation under the permission to establish resorts;
- ii) establishment of community environmental managers as a liaison between the community and governments; and
- iii) leasing fishery ground to fishermen's group conditional on an additional responsibility to monitor and patrol against illegal activities.

Environmental monitoring and database development

Development of environmental database is urgently needed covering both terrestrial and coastal environment to provide scientific base for environmental management. The database may be operated and maintained by DENR and DIDP offices and assessed by LGUs.

EIA enforcement

The Philippine Government has established her EIA system, but its operation is hampered by the lack of experts to review EIA reports and the lack of knowledge and understanding by the private sector. The following should be undertaken:

- i) to reinforce EIA experts of DENR,
- ii) to inform updated information to PENRO regarding any EIA, and
- iii) to disseminate the purport and procedures of EIA.

Promotion of environmental awareness

Effective environmental management calls for sharing of information on existing environment and problems, community participation, environmental education, and ensuring of flow of environmental information between governments and

people. Targets and emphasis of promoting environmental awareness are summarized in Table 5.13.

Table 5.13 Targets and Emphasized Points for Promotion of Environmental Awareness

Approach	Points to be Emphasized
School education	To understand the necessity of protection and conservation of environment To seize an opportunity for participating in environmental programs
Mass media	To understand environmental policy and regulations
Seminar/workshop	To understand the necessity of protection and conservation of environment
Distribution of printed matters	To recognize environmental problems and issues
Campaign/event	To seize an opportunity for participating in environmental programs
Seminar/workshop	To understand measures for environmental management To realize needs to participate in environmental programs
Distribution of printed matters	To understand environmental policy and regulations

Source: JICA Study Team

2) Natural resources use

Appropriate natural resources use may be expressed as “competent governments and staff managing natural resources based on scientific data in cooperation with people and the private sector”. The following are specific conditions for this.

i) Clarification of functional division among governments and central agencies

Confusion arises from unclear or duplicating management functions as in the case of mineral resources. Management functions of various agencies should be defined clearly and followed strictly.

ii) Coordination between central agencies and LGUs, and between neighboring LGUs

Coordination is essential as administrative boundaries do not represent ecosystem units.

iii) Enhancement of natural resources monitoring

Effectiveness of reforestation and reasons for low value reported for the fish catch per unit effort in the DIDP Area, for example, are difficult to evaluate without scientific data. Natural resources monitoring should be enhanced to establish more scientific data.

iv) Promotion of community-based natural resources management

v) Promotion of environmental awareness

3) Ecosystem conservation

Environmental management zoning is required to minimize conflicting uses of natural resources and adverse effects of human uses on environment. Three types of areas may be defined: preservation, conservation, and restoration areas. Criteria for the zoning are given in Table 5.14. Some parts of preservation and conservation areas can be established for the protected area under the NIPAS Act.

Table 5.14 Criteria of Environmental Management Area for DIDP Area

Management Components	Preservation Area	Conservation Area
Forest	<ul style="list-style-type: none"> Mossy forest Old growth forest 	<ul style="list-style-type: none"> Area facing a preservation area based on mossy forest and old growth forest
Slope	<ul style="list-style-type: none"> Area with slope above 50% 	<ul style="list-style-type: none"> Area with slope in range of 18 - 50%
Landscape		<ul style="list-style-type: none"> Unique landscape
Wildlife	<ul style="list-style-type: none"> Habitats of endangered species 	
Coral reefs	<ul style="list-style-type: none"> Intact coral reefs with good to excellent coral conditions 	<ul style="list-style-type: none"> Area facing a preservation area
Mangrove	<ul style="list-style-type: none"> Slightly disturbed mangrove forest with more than xx ha, and moderately disturbed mangrove forest with more than xxx ha. 	<ul style="list-style-type: none"> Mangrove area facing a preservation area based on mangrove forest
Endangered marine species	<ul style="list-style-type: none"> Nesting sites of sea turtles 	

Source: JICA Study Team

Preservation area

A preservation area is defined as the area where utmost effort are exerted to protect target environment. The preservation area corresponds to Core Zone in the NIPAS zoning. The areas to be included are:

- areas rich in natural resources and well preserved,
- areas with high ecological value including scientific value, and
- areas ecologically sensitive especially to human activities.

Conservation area

A conservation area is defined as the area surrounding a preservation area to function as a buffer and to reduce the impact of human activities on the preservation areas. Human activities should also be restricted. A conservation area intends to provide and contribute to the following:

- serving as physical barriers from human activities,
- rehabilitating the natural environment and expanding wildlife habitat, and
- supporting the sustainable use of natural resources.

Restoration area

A restoration area is defined as area requiring rehabilitation from view points of ecosystem and natural landscape, and prevention of natural disasters. Restoration areas to be included are:

- areas where deterioration of environment is anticipated, and
- areas which affects coastal environment.

4) Preventive pollution control

Promotion of preventive pollution control

i) Pollution control officers

The pollution control office (PCO) system was established by amending Memorandum Circulation No. 1 of 1981. According to the Circulation, industrial, commercial and manufacturing establishments and the private sector can appoint PCO(s). PCO should monitor pollutants, supervise operation and maintenance of pollution control facilities, and report to DENR. Appointment of PCOs should be promoted.

ii) Incentives for pollution control

Incentives should be given to the private sector to encourage pollution control such as tax rebates for pollution control device, subsidies for better production processes, and technical supports as well as penalties against violations.

iii) Monitoring

DENR and LGUs should strengthen environmental monitoring capacity in advance of facing serious pollution problems.

Infrastructure of appropriate solid waste management systems

A solid waste management system consists of collection/haulage, transportation, intermediate treatment, and disposal. More specific requirements as below should be determined for different urban centers.

i) Collection and haulage

- to increase collection ratio
- to ensure and increase regular collection (e.g. in rainy season)
- to promote segregation for recycling

ii) Transportation

- to increase collection vehicles
- to establish transfer station(s)

iii) Intermediate treatment

- to promote recycling
- to promote composting

iv) Disposal

- To construct phased sanitary landfill site(s)

-
- To improve existing open dumping site(s) from view points of environment

5.3.2. Land development

(1) Land related constraints

Various constraints apply to land development in the DIDP Area. Most constraints related to protection or limited use have legal basis. Other constraints are either physical/natural or caused by human interventions.

1) Physical/natural constraints

Slope

In the DIDP Area, steep land having slope over 30% occupies 8,100 km² or 41.2% of the total DIDP land. Including moderately sloped land, about 60% of land in the DIDP Area has slopes larger than 18%. Relatively flat or gently sloped area with the slope smaller than 8% occupies 5,021 km² or 25.5% of the total DIDP land.

Land morphology

The DIDP Area is characterized by the dominance of highland and hillyland areas. The highland area with elevation 500 m or higher covers 8,083 km² or 41.1% of the total DIDP land area. The second largest is hillyland which is steep land with slope over 18% and lower than 500 m in elevation, covering 4,788 km² or 24.3% of the DIDP land area.

Erosion susceptibility

A large area in the DIDP Area is classified as severe erosion susceptibility area, covering 8,474 km² or 43.1% of the total DIDP land. Lands of severe and moderate erosion susceptibility altogether cover 74.5% of the DIDP land area.

2) Land use – induced constraints

According to the assessment by the Provincial Planning and Development Offices of sustainability of land use in the DIDP Area, some land areas are over-used, resulting in declining productivity and/or degrading land. In the provinces of Davao, del Norte, Compostela Valley, Davao del Sur and Davao Oriental having the combined land area of 17,228 km², a total of 2,322 km² is identified as over-used. This consists of 1,287 km² over-used in alienable and disposable lands and 1,033 km² in forest lands.

3) Constraints due to environmental hazards

Flood prone area

According to the Regional Physical Framework Plan, the total area with poor drainage and subject to frequent flooding are estimated as follows: 1,404.3 ha in the former Davao del Sur, 612.8 ha in the former Davao Province, 363.25 ha in Davao Oriental, and 129.1 ha in Davao City. Davao del Sur has the largest flood-prone area in the Digos areas. Compostela Valley and Davao del Norte have flood prone areas along the Agusan and Tagum rivers, including the municipalities of Monkayo, Compostela, Sto. Tomas, Asuncion, Tagum and Carmen.

Salt water-intruded areas

Salt water-intruded areas are found along coastal areas which are intensively utilized also for fishpond and other aquaculture activities. These areas are located in the coastal municipalities of Davao Oriental, and municipalities between Maco in Compostela Valley and Panabo in Davao del Norte. In Davao del Sur, coastal areas from Hagonoy down to Don Marcelino have areas of salt water intrusion.

Volcanic fault lines

There are three major active fault lines in the DIDP Area. The first extends from Tarragona, Davao Oriental and stretches up to the municipality of Monkayo, Compostela Valley. The second major fault line lies between the municipalities Mati, Davao Oriental and New Corella, Davao del Norte. The third major fault is located between municipalities of Tagum, Davao del Norte and San Vicente, Compostela Valley.

4) Protected agricultural land

Under the Network of Protected Agricultural Areas or Network of Area for Agricultural Development (NPAA/NAAD), some agricultural lands are protected against any form of irreversible conversion such as urban uses to keep and preserve the highly suitable agricultural land for long-term food security of the Country. The NPAA/NAAD lands consist of the following:

- i) All irrigated and potentially irrigable lands,
- ii) All alluvial plains that are highly suitable for agricultural production and/or can be devoted to food production as determined by BSWM,
- iii) All sustainable lands that are traditional sources of food, identified by DA and recorded for reference/information at PPDO,
- iv) All crop lands that supports the existing economic scale of production required to sustain the economic viability of existing agricultural infrastructure and agriculture-based enterprises in the province,
- v) All productive lands in low calamity-risk areas that are suitable for the production of economic trees and other cash crops, and
- vi) All agricultural lands that are ecologically fragile and whose conversion will result in severe environmental problem.

On the basis of these definitions, BSWM specified the NPAA/NAAD as consisting of the following categories.

- a) **Highly restricted conversion:** This covers the most efficient agricultural lands which are the traditional sources of food and cash crops. These are the most stable crop lands and they can be grown to a wide range of crops with minimum to moderate levels of farm management requirements. These lands are usually supported by large investments in infrastructure.
- b) **Moderately restricted conversion:** This covers moderately efficient lands planted to agricultural crops but which require high level of farm management inputs. Various characteristics and qualities of these lands limit their use to a

narrower range of crops, mainly agro-industrial crops. The conversion of these lands to non-agricultural uses will depend on the result of a comparative social benefit-cost analysis.

- c) **Conditionally restricted conversion:** This covers lands which are marginal to agricultural use and more suited to agro-forestry projects, fishponds or saltbeds. To sustain production in these areas, a high level of farm management is required. The conversion of these lands to non-agricultural use requires an intensive analysis of environmental impact, particularly on the stability of uplands and adjacent lowlands.

5) Other protected lands

Forest reserves

Entries of illegal occupants and introduction of any economic activities shall be banned in forest reserves and other areas identified for protection in order to maintain ecological balance.

Mangrove areas

Conversion of any mangrove area should be avoided because this will cause adverse effects on fisheries and marine lives.

National parks

Introduction of new economic activities in national parks will be strictly prohibited while upland agricultural will be controlled and strictly managed and supervised.

Military reserves

There is a military reserve in Sto. Tomas, Davao del Norte. This area shall be preserved and restricted from any form of conversion.

6) Protection lands

Protection lands comprise NIPAS areas, Non-NIPAS areas including buffer strips and easements along rivers, severely eroded areas, and part of NPAA highly restricted for conversion. Of the total area of the four Davao provinces, 54.0% is identified as protection land. This ratio varies slightly among the provinces: 57.7% in the former Davao Province, 53.8% in Davao del Sur and 48.1% in Davao Oriental (Table 5.15). Of the total protection land in the four provinces, the largest area is due to severe erosion susceptibility covering 3,606 km² or 38.8% of the total. Non-NIPAS areas cover 3,668 km², while NIPAS areas are much smaller covering 619 km². In Davao del Sur, the NIPAS area covers 422 km², of which 408 km² fall in the Mt. Apo National Park. NIPAS areas in the former Davao Province consist of the Mangrove Swamp Forest Reserve in Babak (44.5 ha), the Pindasan island wilderness area in Mabini (14.8 ha), and the Mainit Hot Springs National Park in Nabunturan (1,415 ha). NIPAS areas in Davao Oriental are the Aliwagwag watershed (8,200 ha) in Cateel, the Sumlog watershed (4,000 ha) in Lupon, and the Sudlan watershed (890 ha) in Mati.

Table 5.15 Protection Lands in Three Davao Provinces

(Unit : km²)

	Davao Province	Davao del Sur	Davao Oriental
NIPAS	15	422	182
Non-NIPAS	1,879	817	972
Severely Eroded Area	2,176	713	717
NPAA - highly restricted	624	165	616
Total Protection Land	4,694	2,118	2,487
Total Land	8,130	3,934	5,166

Source: PLUC – TWG, PPDO, Davao Province, 1995;
PPDO Davao del Sur; PENRO, Davao Oriental

7) Ancestral domain claims

Enactment of the Indigenous People's Rights Act (IPRA) on 27 October 1997 has established the IPs' rights and mandates to award Certificates of Ancestral Domain Claims (CADCs). CADC areas can be claimed in the forest land (or non-A & D area). The total CADC area is huge in the DIDP Area covering over 10% of the total DIDP Area at present (Tables 5.16, Figure 5.1). There is no limit to claiming CADC areas, and it is likely that the area be increased.

(2) DIDP land management objectives

Land development in the DIDP Area is constrained physically by the large portion of land having large slopes, the dominance of highland/hillyland areas, and large extent of land susceptible to erosion as described above. Some lands are already over-used by human activities. Water and land regimes are particularly interacting in the DIDP Area through human interventions as exemplified by flooding and salt water intrusion. Land use conflicts are acute between agricultural and urban/industrial uses in rapidly urbanizing areas, and also between forest protection and livelihood of upland communities. Ancestral domain claims add another dimension to the land development and management in the DIDP Area.

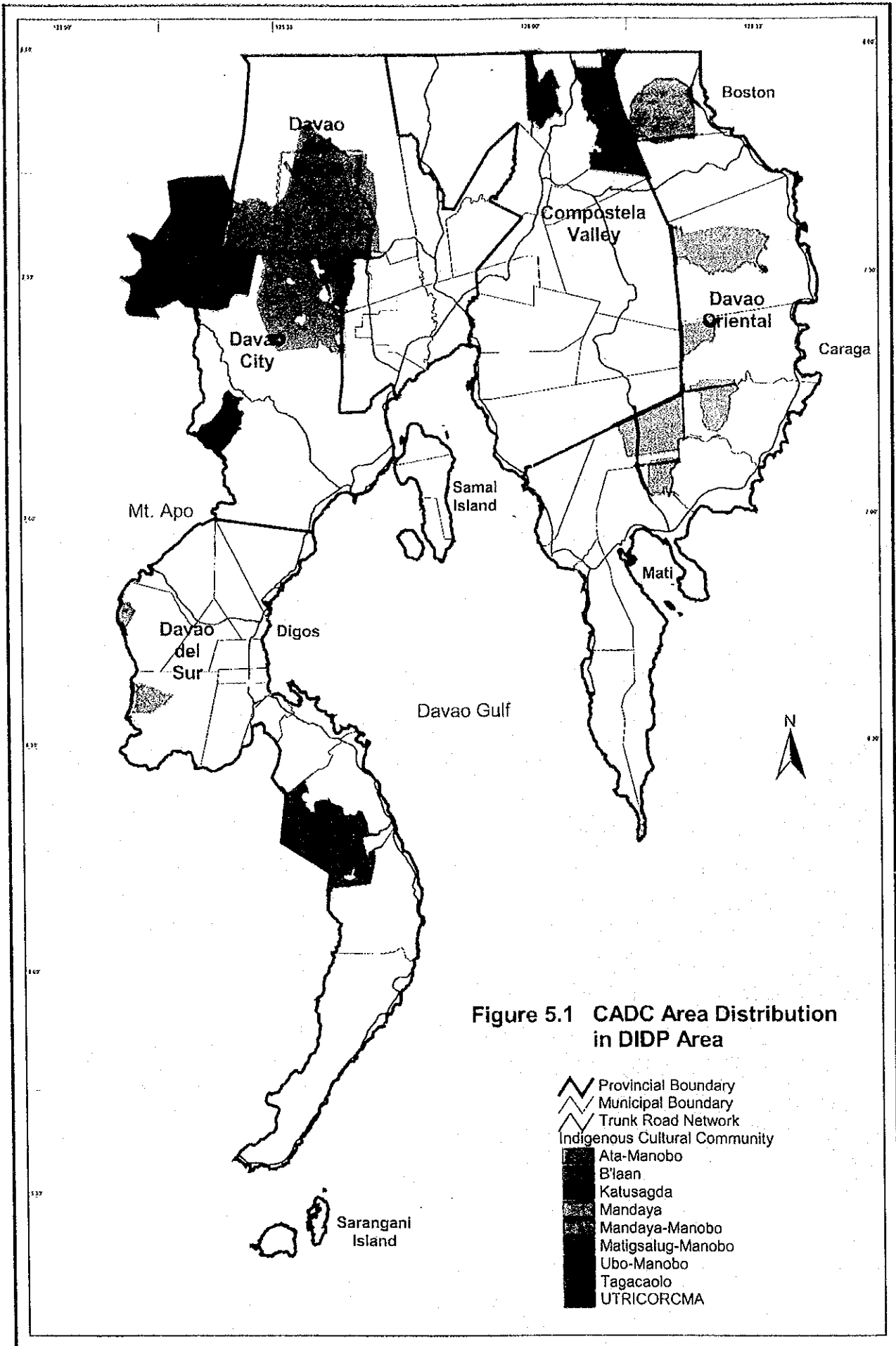
More important land-related issues for the overall DIDP development are identified as (1) rationalization of land use, (2) integrated land and water resources management, (3) land tenure improvement, and (4) enforcement of land-related laws and regulations. Objectives for DIDP land management are defined to support the economic, social and environmental objectives of the DIDP Area development. They are expressed as follows:

- 1) To preserve and enhance land productivity for land-based economic activities;
- 2) To improve land tenure of small farmers and upland communities as a prerequisite to enhancing their social conditions; and
- 3) To protect and improve natural environment through land and water resources management.

Table 5.16 List of CADC Areas in the DIDP Area

Province/City	Municipality /District	Barangay	Total Area (ha)	Indigenous Peoples	Number of Beneficiaries	Date
Davao del Norte	Talaingod	Binongbong, Simong, Kaabakahan, Tibucag, Kabulling, Malid, Dalingding, Paiton, Lumabag, Angelo, Igang, Dalingdigan, Dago hoy, Tibi-Tibi, Mesolong, Cabadiangan, Mangane, Menopal, Sumindan, Malapanit, Lomondong, Pandarasdasan, Maloco	65,683.00	Kaylawan, Langilan of the Ata-Manobo Talaingod	5,140	21-Oct-1997
Davao del Norte	Sto. Tomas	Talos, San Jose	12,600.00	Ata-Manobo		1996/3/11
Compostela Valley	Monkayo		30,000.00	Mandaya, Dibabawon, Manguangan, Nanobo		1996/6/27
Davao City	Paquibato	Tapac	9,363.00	Ata-Manobo	5,292	26-Aug-1995
Davao City	Paquibato	Malabog, Colosas, Pandaitan, Parase embac	22,634.00	Ata	3,074	26-Feb-1998
Davao City	Baguio	Tambobong	8,236.00	Obo-Manobo	780	27-Feb-1995
Davao City	Marilog	A part of CADC area of South Cotabato				
Davao del Sur	Magsaysay	Maibo	7,027.47	B'laan	4,123	26-Aug-1995
Davao del Sur	Matabo	Colonsabak, Dongan Pekong				
Davao del Sur	Malita	Tagacaolo	33,730.74	Tagacaolo	27,700	26-Aug-1995
Davao Oriental	Manay	Taokanga	6,916.00	Mandaya	1,092	28-Oct-1997
Davao Oriental	Caraga	Sangab	5,200.00	Mandaya	668	28-Oct-1997
Davao Oriental	Boston	Nabunga, Simulao, San Jose, Cawayanan	17,112.00	Mandaya-Manobo	17,112	25-Sep-1997
Davao Oriental	Mati, Lupon	Tagbinonga, Don Salvador, Don Mariano Marcos	5,000.00	Mandaya	165	21-Oct-1997
Davao Oriental	Lupon	Marayag & Calapagan	18,820.00	Mandaya		Apr-1996
Davao Oriental	Baganga	Mahan-ub	20,189.00		1,174	
			256,828.21		61,180	

Source: Land Management Services, DENR Region XI



(3) DIDP strategy in land sector

The objectives for DIDP land management are pursued effectively by adopting specific strategies in steps in line with the DIDP strategy. In Phase 1 for the Internal Integration, the restoration of sustainable production capacity of land shall be undertaken. This involves more rational use of overused lands through improved land management and enforcement of land-related laws and regulations. Another component of the strategy is to improve land tenure through establishing ancestral domain claims and completing the CARP implementation.

Vitalization of livelihood of indigenous cultural communities and support to ARC's will expand and diversify the resource base, which will be an essential condition for pursuing the Globalization Drive in Phase 2. Increasingly important in this phase is resolution of land use conflicts between agricultural and urban/industrial uses through proper land use planning. High value land development will become increasingly important in Phase 3 for the High Tech – High Services development. In particular, high-grade urban land use should be realized for various services and amenity facilities through urban land use planning.

(3) Land development strategies

Specific strategies for the DIDP land development and management are established corresponding to the land-related issues identified above.

1) Land use rationalization

Land resources in the DIDP Area are at present over-used in some areas and under-used in some others. Forestlands have been encroached upon by those seeking livelihood opportunities. Improper farming practices including slash and burn are still undertaken in hillyland to highland areas. The rapid population growth is applying increasing pressure on land resources in urban and rural areas. Rationalization of land use is a prerequisite for sustainable development of the DIDP Area.

The following are important components of the land rationalization strategy.

- i) A realistic and practical delineation of land use classification for environmental management: namely, protection, conservation, and restoration areas

As mentioned in the section of environmental management, more realistic and practical delineation of areas for forest preservation, conservation and restoration should be undertaken. Large protected areas may be reclassified partly into conservation areas where limited and sustainable resources use may be allowed, depending on land suitability. Conservation forest areas could then be the main device to absorb the population pressure on forest lands.

- ii) Introduction of appropriate farming technology on slopes in uplands and hillylands

Introduction of technology for appropriated farming practices on slope lands is necessary to protect slopes in uplands and hillylands. Creation of livelihood as well as protection of slopes by employing appropriate farming

technology such as contour farming and SALT should be undertaken through extension services to upland farmers.

iii) Correction of land use on over-used land in agricultural areas to realize suitable land use

Some lands are over-used, and conversely some others under-used in terms of land productivity. This will undermine the sustainability of the land. The mismatches in agricultural land use should be corrected by conversion in accordance with land suitability.

iv) Land use conversion for crops on under-used land to maximize the productivity

Some lands are still under-used vis-a-vis their productivity. To meet the food security for increasing population as well as the DIDP's economic growth, optimal land use should be pursued to increase productivity of land.

v) Formulation and implementation of proper urban land use plans to prevent indiscriminate land use conversion from agriculture to urban uses

Fundamental to the issues of land use conversion is the considerable increase in population in the DIDP Area which has created an acute competition for the use of land. The land suitable for urban uses is in most cases also suitable for agricultural land; hence conflicts between uses of land. The DIDP Area will experience a rapid urbanization, and some areas are designated as PAIC areas. Furthermore, the land use conversion of agricultural land has a negative effect on the CARP promotion. Therefore, a comprehensive land use plan should be formulated by municipality based on inter-agencies coordination to avoid the indiscriminate conversion of agricultural lands.

vi) Formulation and implementation of disaster-preventive settlement plan

Various disaster prone areas exist in the DIDP Area such as areas of habitual flooding, seismic risks, fault line, erosion susceptibility, riverbanks easement or salt water intrusive coastal area. To prevent disaster damages, it is required to prepare a disaster-preventive settlement plan. The plan would include:

- Delineation of disaster prone area,
- Identification of people living in the area,
- Resettlement plan,
- Livelihood programs, and
- Resettlement housing program (government supported, or self help)

The plan would be better prepared at the municipality level because people are more likely to accept the relocation site close to where they live.

2) Integrated land and water resources management

Community-based resources management is a viable idea to be applied to the DIDP Area development. To substantiate the idea, local capacities for land resources management need to be enhanced, involving LGUs, NGOs and POs as well as local people and communities.

The following are strategic elements for land resources management.

i) Establishment of base-line data on land resource and regular up-dating

Consistent inventory data on land resources constitute the basis for land resource management. Without figuring out the actual conditions of land resources, no management plan can be made. The base data must be consistent. Even when there are land resource data, sometimes data from different sources are inconsistent with each other, which hampers the correct judgment on the land resources. Regular up-dating of the data is another requirement. The base-line data would better be stored in a computer system with map information like a GIS to help quick and precise data inquiry and retrieval.

ii) Information and education campaign (IEC) to enhance awareness of local people for sustainable land use and management

In land resource management, local people based management measures are effective with the limited governmental capability. For this purpose, local people must understand the importance of the land resource management from the viewpoints of sustainable development and resources use.

iii) Human resources development in land resource management

Comprehensive municipal land use plans should be the basis for land management. Land reclassification is under the authority of cities and municipalities according to the 1991 LGC, and municipal planning offices prepare land use plans in coordination with DAR and other concerned agencies, which become a basis for land use conversion. Also, the municipal officials are in the best position to observe and monitor what is happening within their community or neighborhoods, and evaluate changes. To achieve better land use management, therefore, it is essential to develop capability of municipal officers.

iv) Comprehensive planning by municipality

Management of land resources is inherently related to water resources management. Improper land use and management cause water related problems. A typical case is deforestation and improper mining activities causing water pollution such as high siltation and toxic chemicals and affecting even coastal and offshore environment.

Comprehensive land use plans by municipality should build in watershed management, and their implementation and monitoring should be coordinated with neighboring municipalities through Municipal ENROs as recommended in the section on environmental management.

3) Land tenure improvement

CARP

As mentioned in the land use conversion, from land use plan view point, formulation and implementation of comprehensive land use plans by municipality backed by the land use ordinance is a must to reflect the DAR's idea

about the CARP. This would provide the basis for the CARP promotion at the municipal level.

Ancestral domain claims

Because the CADC areas are located in the forest area occupying a large area, the management of the CADC areas in environmentally sound manner is critically important. To manage the CADC land effectively, the following should be addressed.

- i) Establishment of clear rules on territorial matters between the IPs within CADC areas and other beneficiaries of other forest related project/programs within the CADC areas.

The CADC areas may overlap with other forest related programs like CBFM, etc. In fact, according to an interview with the person in charge of CADC Area of Land Management Services, DENR, there is a conflict between the IPs and non-IPs in the Talaingod CADC area. Though they are both supposed to be respected, further rules of CADC should be established when any CADC area overlaps with other forest related program/project areas.

- ii) Establishment of clear rules on the right of accessibility of outsiders/investors to use/exploit resources within CADC areas

In principle, outsiders are not allowed to enter the CADC area for resource use or stay. However, with the approval of the tribal committee, the outsider can enter to use the resources within the CADC area as long as their operation follows a CADC management plan prepared as mandated by the IPRA. This possibility has potentially both positive and negative implications. It may attract investments from outside to maintain environment in a sustainable way and to create livelihood such as agro-forestry use in the CADC area. However, this type of operation may undermine the empowerment of the IPs, and go against the philosophy and principle of the IPRA, leading possibly to disintegration of IP communities. Therefore, clear rules of the accessibility of outsiders must be established.

- 4) Law enforcement

There are problems on environment or land use; there are laws and regulations to the problems, and there are violators of the regulations. This situation can be resolved only through strict enforcement of regulations and laws. This is rather a prerequisite than strategy. To that end, the following should be effected:

- a) Stiffer penalties, and
- b) Enhancement of monitoring capacity in GOs, POs, and NGOs.

5.4. Strategy for Spatial/Infrastructure Development

5.4.1. Transportation

(1) Constraints

Inadequate transportation facilities and services constrain economic growth as well as social and urban development in the DIDP Area. Constraints in the transport

sector have been identified through the analysis on data and information, field observations, interviews and discussions at provincial/City workshops. Limited traffic counts were also conducted at selected intersections in Davao City. Major constraints are described.

Roads and road transport

1) Inadequate road system

The road system in the DIDP Area is still inadequate with only one artery passing through the Area, limited access points from outside, network deficiencies, and generally poor surface conditions. Road density of all the roads is 0.63 km/km² in the DIDP Area, higher than averages in the Philippines, Mindanao and Region XI, but national roads constitute only 9% of the total road length, and only 48% of the national road length is paved. Inter-provincial roads are insufficient, and coastal roads in Davao del Sur and Davao Oriental are dilapidated in some sections.

2) Poor rural access

Access to remote rural areas is constrained by the topography dominated by mountainous and rolling terrains and peninsulas. Some sections in the highland are subject to landslide risks. Habitual flooding further aggravates the situation, and some remote villages are isolated during major floods.

3) Inadequate urban transport system

Most urbanized areas have inadequate road systems, causing already serious traffic congestions during peak times. Volume capacity on major urban and inter-city roads is becoming insufficient against the rapid increase in vehicles (8.5% per annum during 1990-96). Mass transit does not meet the increasing demand for passengers and cargo movements within and between larger cities. These conditions are observed most seriously in Davao City. Poor drainage in central areas makes the situation even worse. Traffic management in the City is generally poor.

Ports and sea transport

4) Limited public port facilities

The DIDP Area has many private ports but limited public port facilities. Sasa Wharf, owned and operated by PMO-Davao under PPA, supports commerce and trade functions of Davao City, handling 65% of imported cargoes and 35% of total cargo throughput under PMO-Davao. Mati Wharf is not fully operated. Passenger ferry services are available only at Sasa Wharf and Sta. Ana Pier.

5) Limited commercial ports

Private ports handled 56% of the total cargo throughput of 6.2 million tons in 1996, and 1.43 million tons or 95% of exported cargoes. Many private ports are used almost exclusively to ship out certain commodities – mostly bananas, followed by some other fruits and vegetables, and cement. These facilities are not generally available for other commercial purposes.

6) Underdeveloped shipping routes

Inter-regional cargoes transport is dominated by limited destinations/origins. Of the total cargo volume to/from Region XI, 44% was with NCR, followed by 24% with Central Visayas in 1994. Inter-regional passenger movements to/from Region XI have more balanced O – D structure. In either case, however, inter-regional shipping does not make additional stops within the DIDP Area. Also coastal shipping is largely undeveloped. Moreover, shipping services to/from remote islands are at best sporadic and unreliable.

Air transport

7) Limited airport facilities and capacity

The Davao International Airport (DIA) is the only airport providing for regular inter-regional and international air services. In fact, it is the most important airport in Mindanao, handling 40% of passengers and 60% of cargoes in the island. The Mati airport caters only to private chartered flights. The DIDP Area also has 17 private airports/airstrips, but they are not any part of public air services.

Domestic air traffic at the DIA is rapidly increasing in recent years for both passengers and cargoes. The number of passengers increased at the average annual rate of 8.4% during 1988-96 to reach 849,000 in 1996, and the cargo volume increased almost three-fold or 14.5% per annum on an average during the same period to exceed 30,000 tons in 1996. Existing capacity and services are fast becoming inadequate to meet the rapidly increasing demand.

Other constraints

8) Lack of fund

Lack of fund is a major constraint to improving the transport sector in the DIDP Area. For instance, the budget allocation for artery/secondary roads in the DIDP Area was only 8.6% of the total highway budget in the Country in 1997. Although the road transport industry is developing rapidly especially in Davao City and cargo handling at Sasa Wharf is operated by private companies, private sector participation in the transport sector is still limited.

9) Difficulty in right-of-way acquisition

Right-of-way acquisition is difficult due to squatters and densely populated settlements especially in coastal areas. This constrains the realignment or expansion of existing roads and construction of new roads.

10) Environmental constraints

Construction/expansion of roads along the coast and in highland/hillyland areas calls for environmental considerations, especially when the roads pass through flood-prones areas and sections of land slide risks. Expansion of port-facilities needs to be planned with considerations on marine and coastal ecosystems as well as land access to them. Environmental considerations for infrastructure projects in the DIDP Area should be more broadly based, including social environment.

(2) Objectives for DIDP transport development

The transport system in the DIDP Area constitutes an essential part of island-wide transportation of Mindanao, linked also with the national transport system, as the Area, centering on Davao City, has been established as a trade and distribution center in the Southern Philippines. The transportation development in the DIDP Area, therefore, aims to establish an *Integrated Multi-Modal Transport Network* consisting of road, water and air transports linking with other regions of Mindanao and the Philippines. Different modes of transport must be developed in an integrated manner to allow smooth and cost-effective transfer of people and goods. Another concept of the transport network is integration of three levels of transportation system: 1) international and inter-regional transportation, 2) intra-regional transportation and 3) urban and rural transportation including farm-to-market roads. These three levels of transportation system should be closely linked through functional terminal facilities such as airports, seaports and bus terminals. Basic structure of transport network is shown in Figure 5.2.

(3) DIDP strategy in transport sector

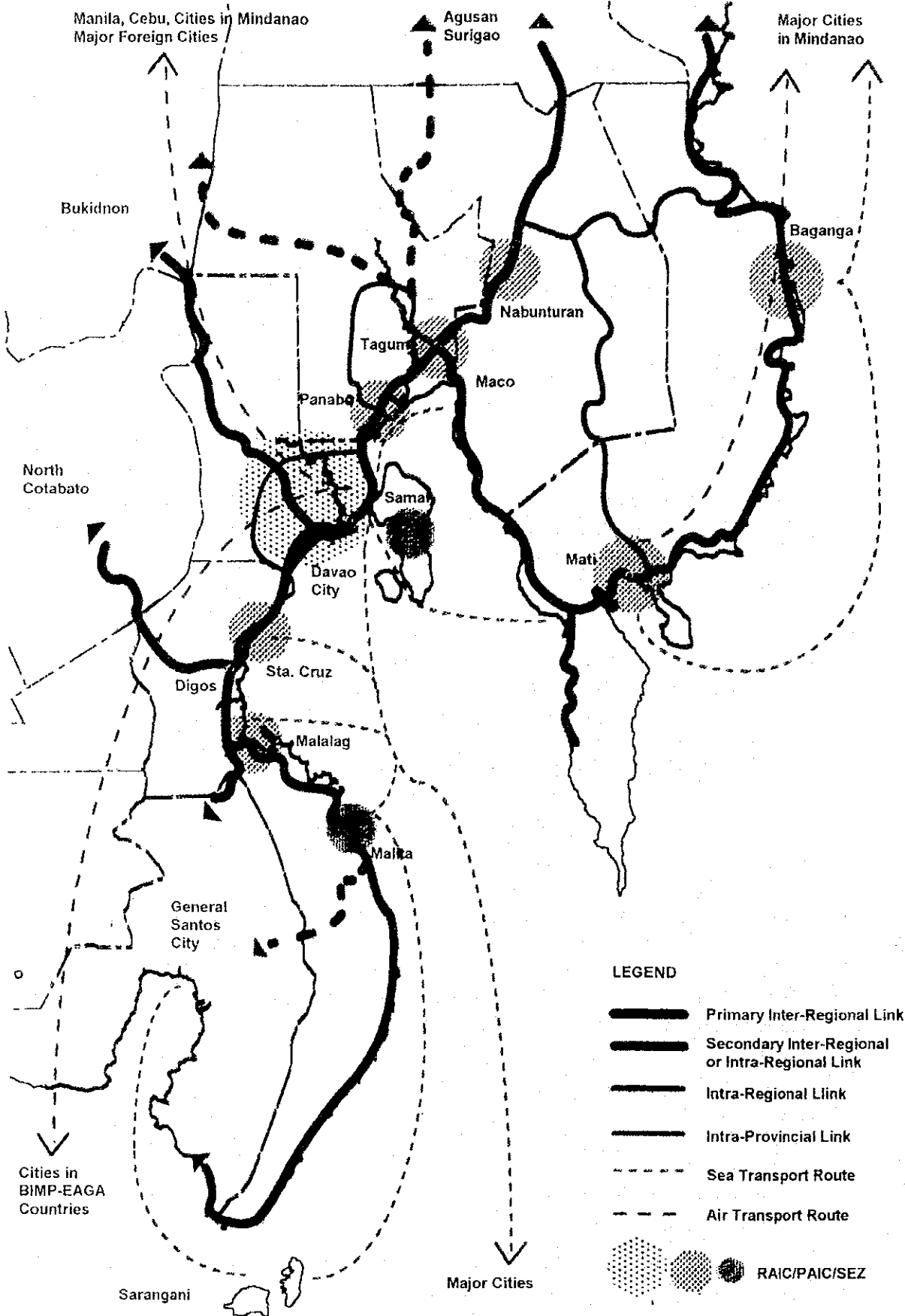
To establish the integrated multi-modal transport network in steps under the DIDP strategy, the following need to be undertaken. The initial emphasis should be placed on linking different parts of the DIDP Area by road and shipping services in line with the Internal Integration, while selected inter-regional road sections may also be improved during Phase 1. The following constitute the Internal Integration strategy:

- to strengthen intra-regional road system,
- to improve rural access and farm-to-market roads,
- to improve urban traffic management especially for Davao City and other larger urban centers,
- to establish coastal shipping routes selectively, and
- to provide regular shipping services to remote islands.

Improved links between different parts of the DIDP Area will expand both the market and the resource base for various agro-products. To further expand the market and the resource base, inter-regional links should be strengthened with improved road system and terminal facilities. Increasing agro-products shall be exported in Phase 2 under the Globalization Drive. To increase marketing and processing capacities, urban transport system should also be strengthened. The improved road system and terminal facilities would also contribute to domestic and international tourism. Thus, the following constitute the Globalization Drive strategy:

- to strengthen inter-regional road system,
- to improve feeder ports and airport facilities, and expand shipping and air transport services,
- to strengthen urban transport system for Davao City and other larger urban centers, and
- to upgrade transport infrastructure serving international tourist attractions.

Figure 5.2 Structure of Transport Network in the DIDP Area



Further socioeconomic development under the High Tech – High Services strategy will increase the flow of peoples and commodities, necessitating not only the capacity expansion of transport infrastructure but also service upgrading for business travelers, international tourists and high value commodities. The following High Tech – High Services strategy may be introduced earlier for Metropolitan Davao or otherwise during Phase 3:

- to establish alternative inter-regional highways,
- to extend shipping and air transport network to neighbouring countries,
- to upgrade international/inter-regional access points such as DIA and Davao Port,
- to introduce an urban rail transit system serving more advanced coastal areas, and
- to connect Samal Island with the mainland.

(4) Internal integration strategy

- 1) Strengthening intra-regional road system: unpaved road sections traversing coastal areas of Davao Oriental and Davao del Sur such as (a) Mati – Baganga – Boston, (b) Lupon – G. Generos and (c) Malalag – J.A. Santos – Sarangani coastal roads and alternative intra-regional routes; (d) Montevista – Compostela – Cateel, (e) Compostela – Maragusan – Mati, and (f) Tagum – Panabo circumferential roads should be improved and paved.
- 2) Improvement of rural access roads: rural and farm-to-market roads should be improved and/or constructed to all-weather roads to support efficient transport of agricultural products, starting from existing vegetable producing areas; a community-based alternative system for rural road improvement and maintenance should be established utilizing self-help efforts.
- 3) Improvement of urban traffic management: traffic management schemes such as signalization, channelization, improvement of traffic law enforcement etc. should be conducted at major intersections in urbanized areas, especially in Davao City; traffic bottlenecks such as bridges, major loading/unloading points should also be improved or widened.
- 4) Establishment of coastal shipping routes: to provide efficient and alternative transportation services for the increasing agricultural products of the Area, coastal shipping network connecting rural settlements to markets should be established.
- 5) Providing regular shipping services to remote islands: the connection between Sarangani and Balut Islands and mainland is very weak, and shipping service is available only between G. Santos City at present; regular passenger/cargo ship services should be provided for Sarangani and Balut Islands.
- 6) Introduction of fast ferry service: to enhance tourism and other potentials of the islands of Samal and Talikud, the service frequency of existing ferry boats including roll-on/roll-off ships between Davao City and berths in the islands should be increased, and new type modernized boats be installed to increase the passengers' convenience. Berth facilities needs to be improved.

(5) Globalization drive strategy

- 1) Strengthening inter-regional road system: the existing primary inter-regional roads: (a) Davao City – Tagum – Agusan, (b) Davao City – Digos – G. Santos City, (c) Davao City – Bukidnon, (d) Tagum – Mati, and (e) Digos – North Cotabato roads should be widened to four lanes; a well developed inter-regional road network could support expansion of economic activities, especially along the advanced corridors in the DIDP Area.
- 2) Strengthening urban transportation system for Davao City: urban radial and circumferential road network in Davao City including a coastal road should be established to meet with increasing traffic demand and rapid urbanization due to the concentration of population and economic activities; some heavy traffic intersections need to be replaced to grade separation structure. A new urban rail transit system should be introduced to an initial section within the City to decongest high density areas.
- 3) Establishment of terminal facilities: Integrated transportation terminals connecting both provincial and city/intra-municipal public transportation services will support the establishment of multi-modal transport network in the DIDP Area; Davao City and other urbanized municipal centers should establish this kind of terminal facilities.
- 4) Improvement of facilities of feeder ports: to support the PAIC development and to establish coastal shipping network, a number of ports should be improved or constructed together with maritime navigation aids and communication facilities: these ports will also play a role of feeder function to Davao Port; it was tentatively identified that the feeder ports could be located at coastal PAIC/SEZ centers such as a) Mati, b) Malalag, c) Baganga, d) Sta. Cruz, e) Malita and f) Maco.
- 5) Improvement of air services network: the facilities of the Mati airport should be rehabilitated and upgraded to promote various domestic air routes for passengers and international routes for export of products in the Area; the establishment of an intra-Mindanao air network should also be promoted under this strategy.
- 6) Upgrading transportation infrastructure and services serving tourist attractions: efficient road network, rapid passenger ferry and frequent roll-on/roll-off services will serve tourists with shorter travel time to reach tourism destinations; the upgrading of the Davao International Airport and the Mati airport and various air routes will increase the domestic/international tourist arrivals.

(6) High tech – high services strategy

- 1) Establishment of alternative inter-regional highways: in addition to existing interregional routes, road sections such as (a) Assuncion – Agusan, (b) Kapalong – Talaingod – Bukidnon, and (c) Malita – G. Santos City roads should be established as new alternative inter-regional linkages.
- 2) Extension of an urban rail transit system serving more advanced coastal areas: urban rail system traversing the coastal urbanized areas in Davao City and surrounding municipalities should be constructed to provide rapid and reliable public transportation service for the passengers.

-
- 3) Upgrading international/inter-regional access points: the existing berth facilities and yard area at Sasa Wharf should be expanded and cargo handling equipment should be improved; to support the expansion of containerized cargoes for export and to overcome the site limitation of Davao Port in the future, a new international port designated as a container terminal should be established in Panabo; the existing Davao International Airport should be upgraded to increase their operational efficiency and service levels, safety and security as one of gateways of the Philippines to reach major commercial centers and tourism destinations.
 - 4) Connection of Samal and Talikud Islands with the mainland: a bridge connection is considered an important option not only for Samal Island but for the DIDP Area as a whole; the development of Samal and Talikud Islands should be planned during Phase I, and the bridge construction considered based on subsequent development.

5.4.2. Power and energy

(1) Constraints

Characteristics of DIDP energy situations

Energy situations in the DIDP Area may be characterized by the following:

- 1) Dependency but not deficiency in power supply,
- 2) Low power generation cost but high distribution cost, and
- 3) Abundant renewable energy largely unutilized.

The total power installed capacity in the DIDP Area is only 100 MW in 1996 from the Maco power barge, while the total power demand is 193 MW. The DIDP Area is served by the Mindanao grid, which has sufficient power capacity with hydropower, diesel generators and new geothermal power.

Because of the dominance of hydropower in the Mindanao grid, delivery prices of power from NPC are relatively low. The distribution cost of power, however, accounts for 45-50% of the total consumer prices. The distribution cost tends to rise as NPC can now sell power directly to large consumers, leaving the distribution companies with small consumers.

The DIDP Area is not facing power shortages, but some 40% of households are deprived of electricity. Electrification ratios in the DIDP Area are summarized in Table 5.17. These ratios are based not on the total number of households, but on the number of households within the areas covered by respective rural electric cooperatives (RECs). On the other hand, some barangays and households not connected with any REC's network have self-generating systems.

Table 5.17 Electrification Ratio in the DIDP Area (1996)

	Barangays			Households		
	Coverage	Connected	Electrification Ratios	Potential	Connected	Electrification Ratios
DIDP Total	1,160	730	62.9%	547,776	309,579	56.5%
Davao Province	460	312	67.8%	229,445	86,334	37.6%
Davao City	180	132	73.3%	159,976	141,638	88.5%
Davao del Sur	337	167	49.6%	112,000	48,583	43.4%
Davao Oriental	183	119	65.0%	46,355	33,024	71.2%
Reference:	Total number of households in 1995 (Census of Population)					
	• Davao Province: 232,366 (229,445 above in 1996)					
	• Davao City and Davao del Sur: 332,259 (do. 271,796)					
	• Davao Oriental: 78,533 (4,355)					

Source: Davao City/Davao Oriental (Southern Mindanao Statistical Yearbook 1996), others (RECs)

The DIDP Area has solar, bio-mass and micro-hydro potentials, which can contribute to rural electrification in remote and isolated areas. Geothermal potentials have also been identified in Davao Province. Exploitation of these resources, however, is minimal. No private company has invested in renewable energy development, although two micro-hydro plants have been proposed.

Constraints to DIDP energy development

According to the NPC's forecast (low growth scenario), power demand in the Mindanao grid will increase at 11% per annum over 1997-2010. While NPC has prepared a power development plan to meet the rapidly increasing demand in Mindanao, the DIDP Area may face particular constraints in pursuing its economic development balanced with social and environmental concerns. Development of renewable energy may also have particular relevance to the DIDP Area due to its situations outlined above. Constraints to energy development in the DIDP Area are summarized.

- 1) Lack of critical masses of electricity users and demand due to less developed economy in most part of the DIDP Area, and scattered distribution of settlements and low household density in rural areas.
- 2) Low and non-differentiated NPC power tariff that tends to limit RECs and DLPC to improve management and power supply services on the one hand, and to discourage private independent power generation on the other.
- 3) Low collection efficiency of electricity bills and large system losses in distribution, which combined are both a result of low investment in rehabilitation and maintenance and a hindrance to further investment.
- 4) Difficulty in acquiring the right-of-way for power transmission due mainly to increasing land prices.
- 5) Possible social and environmental problems associated with large power plants in the future, and difficulty in assuring public acceptance for implementation.
- 6) Depletion of forest resources for firewood.
- 7) Dependence on major power plants located outside of the DIDP Area that makes transmission and distribution costs higher and rural electrification more difficult.

(2) Objectives for DIDP energy development

Energy development in the DIDP Area should support the DIDP Area development in economic, social and environmental aspects. Accordingly, objectives for DIDP energy development are defined as follows:

- 1) to meet the growing demand for power to support high economic growth and rapid industrialization,
- 2) to improve living conditions in rural areas and vitalize rural socioeconomies through electrification, and
- 3) to contribute to protection of naturale environment through electrification and use of new/renewable sources of energy.

(3) DIDP strategy in energy sector

Rural electrification constitutes important part of the Internal Integration strategy, and two pronged approach may be initiated in Phase 1. This combines the extension of transmission lines and exploration of renewable energy resources. Mobilization of LGUs alliances and NGOs in energy development is pursued and IEC should be conducted.

Renewable energy, especially solar has been proved to be financially viable in remote hilly villages. A credit program should be formulated based on the cooperative model where villages could jointly guarantee a loan for purchase of solar and other equipment. Successful investors should be allowed to sell to the grid at a price that would warrant some profits. The Government should provide guidelines for the wheeling and banking of electricity from renewable sources.

Reliable and ample power supply is an essential condition for accelerated industrialization in Phase 2 for the Globalization Drive. The private sector should be encouraged to invest in both power transmission and distribution, and power development. Incentives such as tax holidays and accelerated depreciation should be provided for the construction of transmission lines to encourage RECs or the private sector to expand or enter into the operation. The private sector should be brought in to build, operate and own a length of distribution lines to a community and allowed to charge a transmission fee through its network. Encouragement of use of energy saving device, energy efficient buildings and lighting materials, modification of motors etc. may facilitate local manufacturing of energy efficient products, contributing to the Globalization.

As a major power plant is established within the DIDP Area, an energy-industry complex may be formed with energy intensive industries. Urbanization should be guided to create critical mass of power demand to encourage the private sector in power development and supply.

Exploration of new energy sources may stimulate the High Tech – High Services development through Phase 3, including geothermal, tidal wave, OTEC, hydropower and wind energy. These renewable energy resources will become increasingly more important to achieve the full electrification by the year 2018 as envisioned by NEA.

(4) Energy sector strategies

Specific strategies for the energy sector are established consisting of strategic elements discussed above under the DIDP strategy and some additional elements as well. It is presented under five titles: (1) diversification, (2) rural electrification, (3) demand side management, (4) energy complex formation, and (5) deregulation.

Diversification

- 1) Promotion of power generation in addition to two planned power plants in Digos toward energy best mix, including the following:
 - natural energy resources such as solar, wind, tidal waves and biomass,
 - power generation from municipal wastes,
 - geothermal energy in Davao del Norte, and
 - mini-hydropower; and
- 2) Maximum utilization of local fuel resources to replace partly the use of firewood and cocoshells such as briquettes and bamboo charcoal, and residues derived fuel/charcoal.

Rural electrification

- 1) Improvement of power supply reliability and reduction in system losses in distribution;
- 2) Mobilization of LGUs and NGOs in energy supply expansion through the following:
 - survey and exploration by DOE/EDC, LGUs, NGOs, and RECs for new energy sources,
 - mobilization of LGU alliances and NGOs for self-reliant and energy-conserving societies, and
 - LGUs support for right-of-way acquisition and coconut tree cutting for transmission and distribution lines;
- 3) Formulation of a credit program based on the cooperative model to encourage business associations and cooperatives to enter into power and energy business; and
- 4) Enhancement of transparency in power supply costs by RECs through the establishment of a separate account for distribution component.

Demand side management

- 1) Wider adoption of peak/off-peak retail tariff to smooth out demand fluctuations;
- 2) Promotion of energy saving device, facilities and commodities; and
- 3) IEC for energy conservation and lifestyle conducive to the realization of self-reliant society.

Energy complex formation

- Establishment of an energy-industry complex comprising a power plant and energy intensive industries incorporating the following:

-
- realization of the Mindanao petroleum refinery as prompted by BOI associated with the two planned power plants in Digos, and
 - contribution to amenity creation through joint establishment of common service facilities by locators in the complex.

Deregulation

- 1) Price rationalization through the following:
 - adequate tariff levels to ensure new investments in the DIDP power sector,
 - tariff arrangements with power distributors to allow the private renewable generators to sell directly to consumers, and
 - introduction of interruptible agreement between distribution companies and consumers;
- 2) Rationalization of franchise arrangements to allow neighboring RECs to merge or expand into unserved areas;
- 3) Introduction of “wheeling” to allow a power producer to use the grid to wheel the power to consumers by paying a transmission fee, and “banking” to allow a power producer-user such as sugar factory and rice mill to supply excess power to the grid during the high season and receive free power back during the low season;
- 4) Restructuring of RECs, through the transition from membership cooperatives to stock cooperatives, for transparency of the management and expanded operation including power generation based on local renewable energy; and
- 5) Packaging of investment incentives to encourage the private sector in exploring, developing and selling energy to the grid.

5.4.3. Water resources

(1) Constraints

The DIDP Area is characterized by relatively ample water resource endowments on the one hand, and modest provision of facilities for various water uses and water-related disaster prevention on the other. Despite the endowments, water availability is not high in penninsular or coastal areas, while lowland areas suffer from flooding. Water-related constraints facing the people in the DIDP Area have been identified through data analysis, site surveys and discussions, consisting of fundamental constraints and those specific to sub-sectors.

Water policy, institutions and plans

There is no established policy nor a comprehensive plan for development and management of water resources in the DIDP Area. The National Water Master Plan, prepared by the JICA technical cooperation, covered four major river basins in the DIDP Area, accounting only for smaller than 50% of the entire DIDP land area. The Bisayas-Mindanao Water Supply, Sewerage and Sanitation Master Plan also by JICA covers only the former Davao Province and Davao del Sur. An idea to establish an authority to oversee all the water-related activities in the Davao Gulf area seems logical as proposed, but none exists.

Water resources and flood control

1) Water resources development

Water resources in the DIDP Area are generally under-developed. This is represented by low irrigation coverage of potentially irrigable area at 39% as of 1996. No sizeable dam exists even in the major river basins except small schemes under the Small Water Impoundment Management (SWIM) Project.

2) Watershed management

Watershed areas in the DIDP Area have been degrading rapidly. Woodland area decreased from 8,630 km² in early 1980's to 5,012 km² in 1994. Various initiatives have been taken to increase the area under forests such as CBFM or IPMA, but no program covers the entire basin of any river. Degrading watershed increases sediment loads which affect downstream and coastal areas.

3) Flood control

Habitual flooding affects productive agricultural land and urban areas along the mid- to lower reaches of major rivers. A number of flood mitigation measures have been taken in the Upper Agusan, the Tagum – Libuganon, the Davao and the Padada rivers, but plain areas in these river basins still suffer from periodic flooding. Almost all areas along any rivers are affected by flash floods due to narrow water basins, steep slopes, devastation of forest land, and inadequate agricultural land use and management in highland/hillyland area.

4) Urban drainage

Urban areas are expanding as population increases, and urban drainage is left under substandard conditions. This causes serious inundation even with relatively small rainfalls.

Water supply and sanitation

1) Water supply

The main thrust of water supply is the service coverage expansion by establishment of Level III systems (individual house connection) in urban areas and Level I (point source) in rural areas. Including Level II systems (communal faucet), the Government has set targets for population-based water service coverage at 95% in urban areas and 93% in rural areas by the year 2000. In the DIDP Area, the present service coverage is still remaining between 47% and 86% for different systems. Existing water supply sources are becoming inadequate in some urban areas due to limited quantity or degrading quality of groundwater sources. Development of surface water sources of the Davao river is contemplated for water supply in Davao City. Mati is also looking into surface water sources, as the groundwater is affected by salt water intrusion.

2) Rural sanitation

Sanitation constitutes an important part of the minimum basic needs. This is not adequately satisfied in many rural communities deprived of safe drinking water, including indigenous cultural communities.

Water pollution

Increasing concern in the DIDP Area is water pollution caused by improper land use and management, inappropriate mining activities, discharge of industrial and domestic wastewater, and dumping of solid wastes. The surface water in the Area is still suitable for both agricultural and domestic uses, except high TSS (total suspended solids) contents due to severe erosion.

Groundwater in some coastal areas suffer from salt water intrusion caused by over-exploitation. Groundwater in Davao City and Davao del Norte is increasingly contaminated by agro-chemicals and leachate from solid waste dumping sites.

Sewerage

There exist no sewerage facilities with a treatment plant in the DIDP Area. Existing systems consist of quite limited extent of piped sewers or open ditches for storm water discharges. Domestic wastewater goes to septic tanks or directly to storm drains, canals, rivers and other natural disposal areas without treatment.

(2) Objections for DIDP water resources development and management

Proper water resources development and management constitute an essential condition for the DIDP Area development due to its topography, soil conditions, and water endowment characteristics. Covering economic, social and environmental aspects, objectives for this sector may be established as follows:

- 1) to expand and stabilize water supply for rapidly increasing urban population,
- 2) to improve rural water supply and sanitation as important part of minimum basic needs, and
- 3) to optimize the use of water and related land resources as a basis for sustainable socioeconomic activities.

(3) DIDP strategy in water resources sector

The Internal Integration strategy calls for maximum and sustainable use of indigenous resources, for which the restoration/enhancement of watershed is a prerequisite. Given the degrading conditions of the watershed, various measures need to be combined by the integrated river basin approach to improve the upper watershed, reduce soil erosion and sedimentation, control floods, and enhance use of water resources for various purposes.

Multi-purpose dams on major rivers, if carefully located and sized, would contribute to all of these, by storing flood water for use during lean seasons and providing opportunities to improve the upper watershed. Community-based participatory approach should be initiated in Phase I to plan for multi-purpose dams. The approach is to ensure social and environmental concerns are reflected in the planning and the local communities are motivated to take charge of watershed improvement and effective use of water resources.

Assurance of access to potable water and sanitary toilets constitutes important part of the minimum basic needs, which is a priority in Phase I under the Internal Integration strategy. Given the mountainous and penninsular topography dominant in the DIDP Area and many small river basins, small water

impoundments present viable options for water supply and other purposes in many rural areas.

Much increased and reliable water sources will support the expansion of water supply for larger urban centers that are expected to develop rapidly in Phase 2 under the Globalization Drive strategy. Improved urban drainage as well as flood control would also support the Globalization Drive. Another important aspect under the strategy is water pollution control. Increased water supply implies increased wastewater discharges. Treatment of domestic sewage and industrial wastewater will become increasingly an important part of the Globalization Drive strategy. As more surface water is utilized by multi-purpose dams, the groundwater regime may be improved in both quality and quantity. To avoid unexpected contamination of groundwater, however, systematic monitoring will be conducted on the quality of groundwater as well as surface water as part of the Globalization Drive.

Water demand in a few large urban centers may grow high enough by Phase 3 and further increase under the High Tech – High Services strategy. This may justify more recycling particularly of industrial water in the face of escalating water costs. Some higher-order services may be quite demanding in terms not much of quantity but of quality and reliability of water to be supplied. Some innovative schemes may be introduced to suppress the overall demand for quality water such as use of treated sewage for irrigating greenery and flushing of toilets in coastal resorts and communities using seawater.

Sewerage systems should be improved in steps under the Globalization Drive and the High Tech - High Services strategy. Initial priorities will be given to larger urban centers and international tourism areas. Some of them will be upgraded later to accommodate the recycling of treated sewage as mentioned, while sewerage systems are expanded to other urban centers and resorts.

(4) Water resources sector strategies

Specific strategies for the water resources sector are presented, consisting of common strategies and those specific to different subsectors.

Common strategies

1) Integrated river basin approach

Almost all water basins in the DIDP Area suffer from denudation of forest land and consequent soil erosion and silting, etc. to varying degrees. The integrated river basin management is most effective and efficient in the long-term, encompassing all water resources sub-sectors: water resources development, flood control and drainage, and water supply. Both structural and non-structural measures will be taken under this strategy. Given the degrading conditions of watersheds in the DIDP Area, afforestation and reforestation are crucial. It is also important that proper land use regulation is applied to respective river basins.

2) Community-based participatory approach

Active and continuous community participation is essential for effective and efficient implementation of projects/programs and enhancement of demand-side awareness in all the water resources sub-sectors. Local communities shall play

an important role in any stage of planning, implementation, monitoring, etc. for reforestation works in watershed management, water supply, small water impounding management (SWIM), flood forecasting and warning and so on. Naturally, close coordination between local communities together with NGO's and government agencies would become more essential.

Water resources and flood control

1) Flood control

A number of flood mitigation measures have been undertaken in major water basins: the Upper Agusan, the Tagum – Libuganon, the Davao and the Padada rivers. Despite such long-term endeavors, plain lands in major water basins still suffer from periodical flooding, to greater or lesser degrees. The plain lands of these basins largely coincide with the most active and indispensable areas for socioeconomic activities in the DIDP Area. Accordingly, it is essential for the entire DIDP Area that these areas are free from flood damages. Aside from some urgent mitigation applying conventional structural measures to be undertaken in the short-term, comprehensive flood protection schemes should be undertaken more intensively on the long-term basis, properly associated with land use, agriculture and urban development in respective areas.

Almost all areas located along large rivers in the DIDP Area are affected by flash floods due to narrow water basins, steep slope, devastation of forest land, etc. In the short-term, urgent alleviation using structural measures should be undertaken primarily to protect built-up areas, arterial roads and main bridges. Besides, the restoration of water retarding capacity in water basins by reforestation and other suitable measures is crucial in the long-run.

2) Urban drainage

While large urban centers in the DIDP Area have expanded their urban areas with population increase, it is found that urban drainage in these areas has been left under substandard conditions. This is why even small rainfalls may cause serious inundation. A long-term urban drainage development plan should be enacted in line with urban planning and flood control around rivers. Also, in the large urban centers, especially in Davao City and other provincial capitals, urban drainage systems need a series of immediate rehabilitation and reinforcement in the short-term.

3) Water resources assessment and monitoring system

Improvement and reinforcement of a water resources assessment and monitoring system is necessary to evaluate surface water and groundwater in terms of both quantity and quality. Necessary and proper means, depending on subject areas, should be expanded and upgraded based on the short-term and long-term plans. The system to be introduced will include: a) meteorological measurement (rainfall, temperature, sunshine, etc.), b) river water gauging (runoff, water stage, etc.), c) groundwater assessment equipment employing monitoring wells, d) water quality analysis, and e) data processing instrument. Observed results would contribute to proper and multi-dimensional management of water resources.

4) SWIM schemes

In areas located in relatively small watersheds without available groundwater sources and often suffering from flash floods, SWIM schemes shall be more extensively applied for flood-proof provision. A SWIM scheme would become more effective and feasible in the form of small-scale integrated watershed management program providing water for irrigation, domestic use and also mini-hydro power generation, aquaculture and recreation if applicable. Community participation would play an important role in SWIM projects/programs through planning, implementation and operation.

Water supply

In water supply for domestic use, the most important consideration is to expand service coverage by safe water, which is at some 60% at present on the population base. In both urban and rural areas, much more efforts and investments for water supply sector are required to keep pace with the DIDP socioeconomic development. Considering a variety of service coverage targets at the national level and the regional level in Southern Mindanao, the target of service coverage in 2016 to be pursued are determined to be 98% coverage for the Area as a whole, or 95% for rural population and 100% for urban population, as shown in Table 5.18.

The present domestic water consumption rate (per capita daily consumption) are reported to range from 100 to 130 lit/day/cap in urban areas and 30 to 50 lit/day/cap in rural areas. The water consumption rate is foreseen to increase, and 150 lit/day/cap and 60 lit/day/cap of water consumption in the target year of 2016 are proposed for urban and rural water supply, respectively, as shown Table 5.19.

Table 5.18 Service Coverage Target of Water Supply

Items	Service Coverage (population number base)		
	Urban Population	Rural Population	Overall Area
DIDP Target in 2016	100 %	95 %	98 %
(Proposed)	8 % by Level-II	47.5 % by Level-I	20 % by Level-I
	92 % by Level-III	47.5 % by Level-II	25 % by Level-II
		(including negligible part of Level-III)	53 % by Level-III
National Target in 2000	95 %	93 %	94 %
Target of Southern Mindanao Region in 1998	Not specified	Not specified	98 %

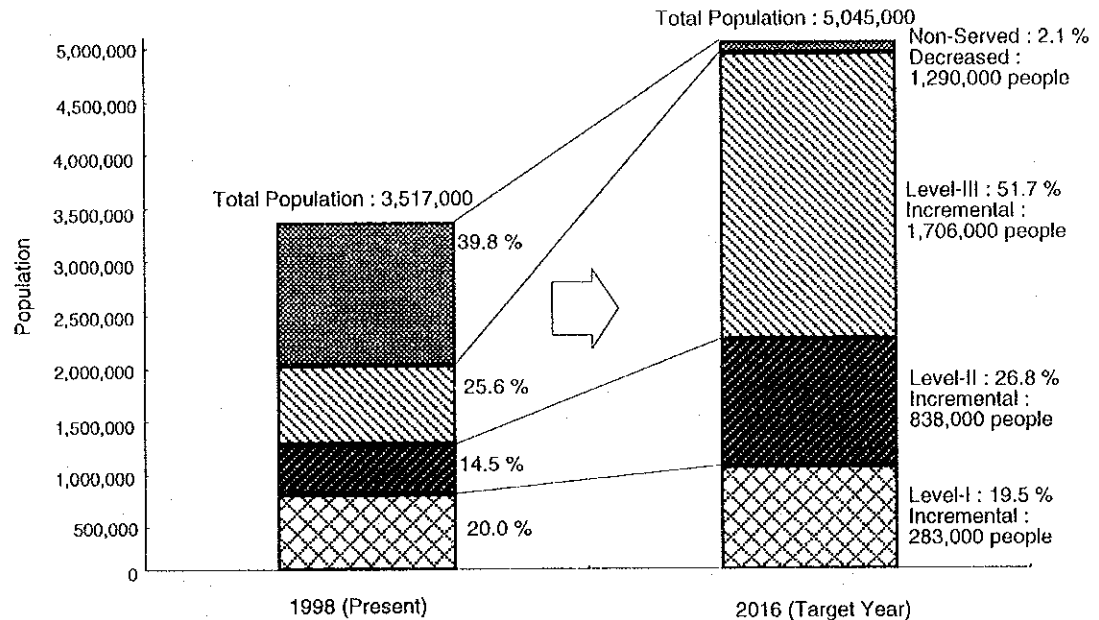
Table 5.19 Water Consumption Rate

Water Supply Categories	Present	2016
	(lit/day/cap)	(lit/day/cap)
Urban Water Supply (Level-III or Level-II)	100 to 130	150
Rural Water Supply (Level-II or Level-I, including negligible part of Level-III)	30 to 50	60

In order to attain these targets, Level-I, Level-II and Level-III systems need the additional facilities for some 283,000 people, 838,000 people and 1,706,000 people up to 2016, respectively, as shown in Figure 5.3 and Table 5.20. The corresponding construction cost up to 2016 is roughly estimated at some P 8,000 million. Water

supply expansion toward 2016, therefore, should be proceeded in accordance with proper priority order in line with the DIDP Master Plan.

Figure 5.3 Transition of Domestic Water Supply Coverage



1) Urban water supply

- All urban centers shall be served by pipe-born water supply system. Such pipe-born systems shall be developed as Level-III in principle to meet the requirement of service level, except for sparsely populated urban areas to be served by existing Level-II systems.
- Pipe-born water supply shall be expanded in the industrial zones newly constructed in PAICs areas and tourism centers to be created along with tourism development plans.
- Cost effectiveness as well as service coverage expansion shall be pursued in urban water supply. Therefore, along with construction of new facilities, improvement and rehabilitation of existing water supply facilities are essential, since old facilities in water intake and distribution are found to contribute to higher water costs due to high water leakage in urban areas.
- In the long-term, surface water utilization may be introduced in large urban centers, like Davao City, with huge water demand to secure stable water availability and to avoid excess extraction of groundwater. In some areas, the introduction of surface water would be inevitable to overcome possible salt-water intrusion into groundwater.
- Active and continuous community involvement should be emphasized for effective and efficient implementation of projects/programs and enhancement of demand-side awareness in water use. Community participation for Level-III shall be promoted through public hearings and briefings, dissemination of information, supervision and feedback on construction progress, on-time payment of water bills and reporting of water leaks and illegal connections.

Table 5.20 Incremental Service Coverage with Water Supply Development

Province/City	Population (1000 people) in 1998	Population (1000 people) in 2016	Incremental Pop to be Developed (1000 people) 1998 to 2016
1. Davao Oriental			
Population	445	673	
Pop Served by Level-I	108	176	68
Pop Served by Level-II	22	200	178
Pop Served by Level-III	36	279	243
Total Served Pop	166	655	489
Unserved Population	279	18	
2. Davao Province			
Population	1,255	1,800	
Pop Served by Level-I	359	489	130
Pop Served by Level-II	116	551	435
Pop Served by Level-III	106	708	602
Total Served Pop	581	1,748	1,167
Unserved Population	674	52	
3. Davao City			
Population	1,099	1,535	
Pop Served by Level-I	30	18	0
Pop Served by Level-II	318	265	0
Pop Served by Level-III	644	1,243	599
Total Served Pop	992	1,526	534
Unserved Population	107	9	
4. Davao del Sur			
Population	717	1,048	
Pop Served by Level-I	204	301	97
Pop Served by Level-II	57	334	277
Pop Served by Level-III	119	381	262
Total Served Pop	380	1,016	636
Unserved Population	337	32	
5. Total DIDP Area			
Population	3,516	5,056	
Pop Served by Level-I	701	984	283
Pop Served by Level-II	513	1,350	837
Pop Served by Level-III	908	2,611	1,706
Total Served Pop	2,119	4,945	2,826
Unserved Population	1,397	111	

Notes: Development conditions are tentatively set as follows:

- Population growth : 2.1 % annually
- Urbanization ratio : 57 % in 2016

Source : JICA Study Team

2) Rural water supply

- Consistent efforts should be made to develop and expand rural water supply for currently deprived areas. Extensive and immediate provision, mainly by Level-I or Level-II systems, are crucial to meet the minimum basic need in rural areas. Given the limited financial resources, priority for rural water supply needs to be set by the established method based on a) the per capita municipal income (PCMI) and the internal revenue allotment (IRA) as a parameter representing financial status, and b) the incidence of water-borne diseases and the unserved household ratio as a parameter representing sanitation conditions.

-
- Like urban water supply, community involvement shall play an important role for effective and efficient implementation of projects/programs. It is a distinctive feature in community participation for Level-I and Level-II that local communities are expected to participate in construction works such as well drilling, material transportation, installation of equipment and pipes, etc. as labor forces, as well as common participatory activities.

Sewerage

1) Domestic wastewater

Sewerage systems equipped with domestic wastewater treatment should be introduced in steps to preserve sanitary living environs and amenity in urban centers. In the short-term, the highest priority shall be accorded to core urban centers accommodating densely populated areas in Davao City and other provincial capitals. Tourism centers to be developed may also be placed at the high priority, because amenity itself is one of indispensable components of tourism in such areas.

The planning for sewerage development should be conducted for other urban centers. For sludge to be generated in sewage treatment, proper disposal systems shall be initiated along with sewerage development such as dehydration, composting, incineration, and/or sanitary landfilling. Besides, the reclamation and reuse of treated sewage should be introduced in the long term to save water resources and enhance water users' awareness for water saving.

2) Industrial wastewater

Comprehensive countermeasures for all kinds of polluted industrial wastewater are needed to meet relevant regulatory standards. Also, monitoring activities against the industrial wastewater treatment and discharge should be reinforced. The reclamation and reuse of treated industrial wastewater should be progressively introduced to save water resources and reduce the pollution loads to be discharged into the environment.

5.4.4. Urban and spatial system

(1) Constraints

The existing urban and spatial system in the DIDP Area may be characterized by the following:

- 1) High primacy of Davao City with the urban population of 771,844 in 1995 accounting for 57% of the total DIDP urban population,
- 2) Lack of sizeable urban centers other than Davao City nor any urban cluster,
- 3) Presence of isolated/remote settlements with poor access from anywhere due to penninsular/island and mountainous topography and self-contained rural economies,
- 4) Limited access of good conditions from neighboring regions,
- 5) Under-utilized sea lanes despite the presence of many public and private ports, and

-
- 6) Existence of two airports – one (Davao Alternate International) close to its capacity and the other (Mati) largely unused.

These conditions may work as constraints to integrated socioeconomic development of the DIDP Area. On the other hand, alliances of neighboring municipalities are being strengthened by the PAIC initiative. This may be instrumental in the formation of urban clusters, and also encourage the integration of rural communities.

Larger urban centers in the DIDP Area, Davao City and a few others having more or less 100 thousand population, face the following common problems:

- 1) rapid population growth,
- 2) proliferation of squatters,
- 3) inadequate road networks and traffic control,
- 4) poor drainage conditions,
- 5) improper solid waste management systems,
- 6) no sewerage system of the liquid wastes,
- 7) insufficient telecommunication systems,
- 8) encroachment of urban areas on agricultural land and a mixed land use,
- 9) lack of open space and shortages of the urban amenity, and
- 10) issuance of development permits through arbitrary reclassification of areas already classified under the zoning ordinances.

Common development problems facing municipal centers in the DIDP Area are identified as follows:

- 1) inadequate urban planning and administration,
- 2) unordered urbanization patterns without effective urban land use plans and zoning ordinances,
- 3) insufficient urban infrastructure such as water supply, electricity, drainage facilities, telecommunications and urban roads,
- 4) degrading urban environment due to squatters, water pollution and solid wastes dumping/littering, and
- 5) social problems associated with rural immigrants, squatters and environmental degradation.

(2) Objectives for DIDP urban and spatial development

Urban and spatial development in the DIDP Area should aim at spatially more balanced distribution of population, while effectively utilizing the primacy of Davao City within a broader context of island wide development of Mindanao and the BIMP-EAGA. Accordingly, objectives for urban and spatial development in the DIDP Area are defined as follows:

- 1) to promote more orderly urban development patterns of Davao City to make it function as a *de facto* capital of the BIMP-EAGA,
- 2) to decongest Davao City through strengthening and clustering secondary urban centers using the PAIC initiative,

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- 3) to promote rational land use for higher productivity in rural areas and insensive land use in urban areas, and
 - 4) to pursue complementary development at urban centers for cost effective delivery of social services to the entire populace.

(3) DIDP strategy in urban and spatial system

Phase 1 for the Internal Integration places emphasis on improving links between different parts of the DIDP Area. For this, farm-to-market roads should be improved and/or alternative transport means established, and small towns should be equipped with basic facilities for marketing of agro-products and simple agro-processing as well as basic social services.

As the links between different parts of the DIDP Area are improved, the resource base will expand to support processing and marketing activities in some secondary urban centers such as core urban centers of PAICs. In Phase 2 for the Globalization Drive, these urban centers will be inter-linked, and linkages with neighboring regions and BIMP-EAGA strengthened. Such inter-regional and international linkages should inevitably center on Davao City, but other secondary urban centers should be connected to the network.

In Phase 3, population and economic activities will further concentrate in Davao City and a few larger urban centers in its influence area, while all the settlements are integrated by the multi-modal transport network serving even the remotest communities. Various urban infrastructure needs to be much improved to support the High Tech – High Services development, and international linkages centering on Davao City will go beyond BIMP-EAGA. For the latter, port and airport facilities and services need to be much upgraded.

(4) Urban and spatial development strategies

Specific strategies for urban and spatial development in the DIDP Area are established to support the DIDP strategy.

1) Improving farm-to-market access

As the first step toward integrating isolated rural economies, farm-to-market access should be improved. For some remote communities in coastal areas, sea routes may provide alternative means of transportation. At the same time, service urban centers at the fourth tier of urban hierarchy should be equipped with basic facilities to serve rural communities in respective hinterlands, including those for simple agro-processing, distribution of agro-products and daily needs, and agricultural/ rural credit.

2) Developing clusters of secondary urban centers, using the PAIC initiative, in line with the Dispersed Concentric Strategy for Region XI

Urban functions in different urban centers in a cluster should be strengthened in a mutually complementary manner to support as a whole prospective socioeconomic activities in a corresponding PAIC. Improvement of links with rural hinterland would be an important part of this.

3) Improvement of urban environment

Integrated solid waste management and flood control projects shall be implemented in the near future to improve urban environment of Davao City, and extended subsequently to other major urban centers. Composting and sanitary landfill are essential components of the former.

The urban drainage and flood control project, in the short term, shall upgrade and rehabilitate the existing drainage structure and construct identified drainage mains and sub-mains in major urban centers. In the long term, it aims to formulate a program of implementation which could serve as a continuation of initial efforts.

4) Strengthening Davao City with clarification of its urban functions in line with the Bipolar Strategy for Region XI with General Santos City

The Davao City will increase its population by half a million within the next 20 years. The City as an international gateway of the Southern Philippine and a regional center of Region XI and the DIDP Area shall be converted into a modernized city through decentralization to Bunawan, Toril, Tugbok and Calinan in the City.

Population pressure of Davao City shall be absorbed in the outside of the City as well, according to the PAIC strategy, to the Tagum-Panabo area in Davao del Norte, Sta. Cruz-Digos area in Davao del Sur, and to some extent in Lupon and Mati of Davao Oriental. Decentralization of urban functions shall be accelerated to Lupon and Mati as well introducing rapid sea transport (super fast craft) from the City to Lupon in the short to medium term.

5) Establishment of an integrated transport system for the Davao Metropolitan Area

A more efficient road network shall be formulated in the urbanization area of Davao City, constructing the circumferential and radial roads to disperse the traffic movement and to prevent the through traffic from the CBD area. In order to alleviate the severe traffic congestion existing in Davao City, an integrated traffic management system shall be immediately implemented, including signalization and road channeling. A Light Railway Transit (LRT) may be introduced between Sta. Cruz and Tagum, starting from the Panacan section in Davao City in the medium to the long term.

Creating the parking space in the CBD of the major urban centers will contribute to alleviating the traffic congestion. The construction of a new bus terminal is crucial to reduce the traffic in the urban center. A new bus terminal together with a relocation of public market and/or commercial and institutional facilities would provide an opportunity to improve the physical structure of the CBD through urban renewal.

6) Creation of urban amenity in major urban centers and tourism areas

Creation of the urban amenity (e.g. shopping center, water front, amusement facility, museum, park, modernized avenue etc.) is crucial to attract both domestic and foreign tourists and investors for industrial development and to establish the comfortable living conditions for the local populace in the DIDP Area.

Intensified land use development will be required for urban areas in the major towns of Davao City, Tagum City, Panabo, Sta. Cruz, Mati, Lupon etc. through the area redevelopment and an enforcement of zoning ordinances with the high total floor area to land area ratio. New zoning ordinances shall be adopted for new urban area development.

A new modernized urban area will be created near Sta. Ana Wharf including a waterfront development of fisherman's wharf, marina, commercial and business area development, a container terminal development and tollway development in the medium to long terms. New town development to absorb the residential demand in terms of the quantity and the quality and to create modernized residential area could be realized in the Davao City and/or its vicinities in the long term.

In this regard, a Davao Metropolitan Area Urban Development Plan shall be immediately formulated providing an urban structure, land use plan, multi-modal transport system and infrastructure in the area including Samal Island. Areas for the tourism development are the Eden-Bayabas eco-tourism area of Davao City and Samal Island in the short term, and the coastal areas between Malita and Jose Abad Santos and the Sarangani municipality in Davao del Sur, and the coastal area from Lupon to Boston via Mati in Davao Oriental in the medium to long terms.

7) Development of subcenters in Davao City with characteristic functions

To avoid excessive concentration in the City proper, subcenters should be developed respectively having characteristic functions and facilities. The Bunawan subcenter will lead the industrial development with technological innovations, capitalizing on its strategic location along the artery road, close to the international airport and the sea port. The Taril subcenter will be a major commercial center with good access to the City proper, beach resorts, Mt. Apo and newly urbanizing areas in Davao del Sur.

The Tugbok R & D center may develop through active interactions between industries, academic institutes and government agencies. The Calinan subcenter will be strengthened as an agro-processing and agricultural support center surrounded by productive areas. The Three Ridge eco-tourism center will become a mountain resort for Mindanao, comparable to Baguio for Luzon, and form a tourism circuit with Samal Island.