- improve the poor state of existing information systems,
- generate a commitment to use the improved information to incorporate considerations of recurrent costs into planning and budgeting,
- develop a sound methodology for identifying and measuring recurrent cost requirements,
- promote a more rational use of scare resources through the use of evaluation techniques (i.e. cost analysis and economic evaluation),
- improve revenue (tax) collection efficiency, and
- mobilize additional resources via user charges, local financing for development projects, etc.

5.1.4 POLICY CONSIDERATIONS

Since success in national development is often measured in terms of project completion rather than long-term sustainability, politicians, civil servants, and development planners tend to attempt to maximize the number and size of investments and accept all investment support irrespective of its recurrent cost burdens. In order to combat this failure to choose priorities, greater use needs to be made of techniques of economic evaluation to determine the "sustainability" of projects.

The sustainability of development activities is determined by a range of factors - including economic soundness and project design corresponding to the managerial, technical and financial capacity of the host country. When these factors are inadequate, it is likely to produce minimal benefits (development effects) in the short run and not to be sustainable in the long run.

5.2 REVENUE GENERATION: IMPEDIMENT TO TAX EFFORTS

Land and Tax Reforms cannot necessarily be conditions to receiving new grants and concessional loans, but definitely conditions to sustainable development.

5.2.1 ISSUES OF NATIONAL TAX

Tax collection in the Philippines is hampered both by problems in the law (tax design) and in law enforcement as well as the persistent lack of political will. As a World Bank study[2] argued, about one-half of potential revenue, from corporate and personal income taxes, as well as for the value-added tax (VAT) is lost, either due to avoidance or evasion. Furthermore, tax equity in the Philippines has been badly disregarded or minimized. This must contributes to eroding the attitude toward tax compliance. An ADB report[3] maintains that one particularly contentious issue stems from the manner in which the legal structure treats income from wages and salary

[2] World Bank, "The Philippines, Country Report; Public Sector Resource Mobilization and Expenditure Management," 1992

[3] Asian Development Bank, " Philippines, Economic Review and Bank Operations" 1993

earners in contrast to income accruing to owners of small businesses and professionals. The tax design has allowed those businesses and professions to make an inordinately generous self-assessment for deductible expenses. The World Bank's Study suggested that salaried workers face average tax rates that were several times higher than the average tax rates borne by professionals, who were often the wealthier individuals.

However, the value-added tax is far more problematic, because professional services are allowed to escape taxation almost completely. Value-added taxes are often introduced mainly government's inability to tax income or wealth to the degree thought desirable. VATs are basically a flat-rate tax on national income, therefore it cannot easily be adjusted to make the collection progressive.

Moreover, there have been problems in tax collection since the introduction of the VAT in 1988. The collection performance is estimated to have been less than the half of the potential level (the World Bank [4] noted that more conservative estimates place the undercollection of 29% in 1990).

The enforcement effort in the Philippines can be safely said to be too weak to encourage voluntary compliance with the law. However, some administrative efforts have been made under the Ramos Administration. A number of recent tax measures have concentrated on increasing collections from potentially large tax payers, including the creation of a special administrative unit within the Bureau of Internal Revenue and requiring more frequent filling by large tax payers[5] . Other legislative actions included have increased tax penalties for taxpayers and also in the event of malfeasance by Government tax officials.

TABLE 5.2.1 POTENTIAL REVENUE FROM THE INDIVIDUAL TAX AND THE LEVEL OF TAX EVASION

Year	Collection Rate (%)	Potential Revenue (PM)	Actual Revenue (PM)	Difference (PM)	Evasion Rate (%)
1985	26.9	21,949.60	5,912.0	16,037.00	73.1
1986	38.3	15,504.74	5,940.0	9,564.74	61.7
1988	28.5	27,887.30	7,,947.0	19,940.30	71.5
1990	35.1	46,200.30	16206.0	29,994.30	64.9
1991	34.0	61,112.10	20,744.6	40,367.50	66.0

Source : Potential Revenue, estimates by Dr. Rosario Manasan of PIDS Actual Revenue, Bureau of internal Revenue (BIR).

5.2.2 GENERATION OF LOCAL GOVERNMENT REVENUE

(1) Revenue Source

To strengthen the absorptive and institutional capacity for national development under the decentralized structure, it is crucial to raise revenue through local taxes. These may be either property taxes or other local taxes, such as those on industry,

[4] *ibid.*

[5] Dr. Rosario G. Manasan, " Breaking Away from the Fiscal Bind, Reforming the Fiscal System" in PIDS Review and Outlook of the Philippines Economy 1993-1994, PHDS, 1993

commerce, and practice of a profession. The property tax has several particular advantages as a local revenue source:[6]

1. All municipalities and cities have some taxable real estate within their boundaries. The property tax can produce revenue in small outlying local governments as well as in large cities.

2. Within the province, the property tax base is broad; thus, the burden of such a tax can be distributed across a larger segment of the eligible population, and significant revenue can be raised at low tax rates.

3. Property taxation based on accurate property valuation can recover the cost of services directly from the beneficiaries.

4. Relatively little of the property tax will be shifted from property owners to others, while the tax on commercial property can be shifted to consumers.

Real Property Tax (RPT) – a mechanism of national development – must be properly imposed for various reasons. One reason given for taxing lands is to promote a rational landuse policy. Land being a scare resource, government should feel compelled to use taxation as a tool to promote the optimal use of land.

Another reason for taxing lands is to raise revenue. The beneficiaries of this land revenue are the local government units which are given the authority to collect the real property tax.

RPTs are also resorted to in support of certain economic and development goals. Based on the Government's development plan, land taxation is used as a mechanism to achieve certain desired development objectives.

(2) The Limited Revenue Effort of LGUs

The enactment of the Local Government Code (LGC) of 1991 determines the drastic transfer, from the national government to the local government units (LGUs), of the primary responsibility for the provision and delivery of basic services and the performance of certain regulatory functions. Under this massive transfers, LGUs are obliged to generate an increasing portion of their income from local sources. Relative independence of financial position for LGUs is to be strengthened, but the revenue performance of LGUs still remains to be improved. Some LGUs are expected to receive a net increase in funds from the central government through the IRA. This could act as a disincentive to resource mobilization.

A particular focus of the Code is on property tax. Real property taxes provided 15.3% of total local government revenues in 1990. But the share of these taxes to total government tax collection has dropped from 3.4% at the beginning of the 1980s to 1.5% in 1990. Also, it is estimated that LGUs collected nation-wide less than 60% of the potential real property tax revenues[7]

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[6] The proportion of property tax versus total tax revenue is noticeably low compared to other Asian countries; the rate for Singapore stands at above 25%, most of the countries nearly 10% on average.

[7] Dr. Rosario G. Manasan, " Breaking Away from the Fiscal Bind, Reforming the Fiscal System" in PIDS Review and Outlook of the Philippines Economy 1993-1994, PHDS, 1993

(3) Recent Collection Efforts of the Province of Cebu

In spite of the nation-wide revenue performance being low, the Province of Cebu has made a noticeable effort in recent years. At seen in the Table below, the collection performance has been increasing and even fulfilled. This effort is indeed commendable, however, despite these gains made, the real property tax has yet to be tapped to its full potential. There is still much room for improvement because of the following reasons:

1. the target is practically a collectable level, not identical to, and even deviated from the real potential RPT revenue; and

2. property valuation is notoriously understated, and in certain LGUs the assessment rate is much lower than those of other LGUs.

TABLE 5.2.2 REAL PROPERTY TAX COLLECTION, 1988 - 1994

Year	Target	Actual Collection	Collection Efficiency
1988		2,670.0	
1989	3,949	3,777.9	95.67%
1990	4,517	4,311.6	95.45%
1991	4,800	4,851.6	101.07%
1992	5,000	5,355.2	106.70%
1993	5,360	5,683.7	106.04%
1994	5,897		

Source: Bureau of Local Government Finance

(4) Constraints to the Tax Administration

In common with other administrative functions in the Philippines, the tax administration cannot be insulated from political influences. The following constraints have been cited as stumbling blocks towards full utilization of real property to its highest and best use:

1. Inadequate logistical support in terms of manpower, motor vehicles, field and official equipment

2. Political interference/ lack of political will to enforce tax measures

3. lack of technical know-how of local councils

   The local councils (Sangunians) under the LGUs are entrusted with the responsibility of determining the correctness of financial measures that would otherwise have been best left to the technocrats This causes frequent delays in the approval of the schedules of value assessments.

4. Statutory constraints: pre-determined ceilings for assessment levels and tax rates:

   - for each type of property, maximum percentages are set as assessment level ceilings, whilst no minimum percentages are fixed

   - tax rate of real property tax is pegged at a maximum of 2%

TABLE 5.2.3 REVENUE STRUCTURE OF LOCAL GOVERNMENTS, 1980-1991

	1980-85 Average	1986-91 Average	1986	1987	1988	1989	1990	1991
	Nominal Levels (in million pesos)							
A. LOCAL SOURCES	3380	7243	4616	4887	5499	8655	9288	10533
I. Tax Revenues	2378	4851	3288	3418	3851	5557	6010	6980
1. Real Property Tax	1460	2872	2080	2123	2276	2733	3728	4293
2. Others	918	1978	1208	1295	1575	2824	2282	2687
II. Operating & Misc. Revenues	993	2202	1323	1461	1634	2444	3039	3310
III. Capital	9	191	5	9	14	653	219	243
B. EXTERNAL SOURCES	2980	7621	4045	4036	7860	6626	9794	13366
1. Shares from National Taxes	2335	5234	3249	3359	4202	4097	6995	9504
2. Grants and Aids	496	2253	734	633	3604	2457	2693	3396
3. Inter-Local Govt. Trans.	16	19	12	30	20	24	10	17
4. Borrowings	133	115	50	13	33	48	97	448
TOTAL INCOME & EXTRA ORDINARY RECEIPTS & BORROWINGS (A+B)	6361	14864	8661	8923	13359	15281	19062	23899
	Ratio to GNP in %							
A. REVENUES	0.90	0.82	0.77	0.73	0.69	0.95	0.86	0.83
I. Tax Revenues	0.63	0.55	0.55	0.51	0.48	0.61	0.56	0.55
1.Real Property Tax	0.39	0.32	0.35	0.32	0.29	0.30	0.35	0.34
2. Others	0.24	0.22	0.20	0.19	0.20	0.31	0.21	0.21
II. Operating and Misc. Revenues	0.26	0.25	0.22	0.22	0.21	0.27	0.28	0.26
III. Capital	0.00	0.02	0.00	0.00	0.00	0.07	0.02	0.02
B. EXTERNAL SOURCES	0.79	0.86	0.68	0.60	0.99	0.73	0.91	1.06
1. Shares from National Taxes	0.62	0.59	0.54	0.50	0.53	0.45	0.65	0.75
2. Grants and Aids	0.13	0.25	0.12	0.09	0.45	0.27	0.25	0.27
3. Inter-Local Govt. Trans.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Borrowings	0.04	0.01	0.01	0.00	0.00	0.01	0.01	0.04
TOTAL INCOME & EXTRAORDINARY RECEIPTS & BORROWINGS (A+B)	1.68	1.68	1.45	1.33	1.68	1.67	1.77	1.89
A. LOCAL SOURCES	53.14	48.73	53.29	54.77	41.17	56.64	48.62	44.07
I. Tax Revenues	37.39	32.63	37.96	38.30	28.82	36.37	31.53	29.21
1. Real Property Tax	22.95	19.32	24.02	23.79	17.04	17.89	19.56	17.96
2. Others	14.43	13.31	13.95	14.51	11.79	18.48	11.97	11.24
II. Operating & Misc. Revenues	15.61	14.81	15.27	16.37	12.23	16.00	15.94	13.85
III. Capital	0.15	1.28	0.06	0.10	0.11	4.28	1.15	1.02
B. EXTERNAL SOURCES	46.86	51.27	46.71	45.23	58.83	43.36	51.38	55.93
1. Shares from National Taxes	36.71	35.21	37.52	37.65	31.46	26.81	36.69	39.77
2. Grants and Aids	7.80	15.16	8.48	7.09	26.98	16.08	14.12	14.21
3. Inter-Local Govt. Trans.	0.25	0.13	0.14	0.34	0.15	0.16	0.05	0.07
4. Borrowings	2.10	0.77	0.57	0.15	0.25	0.31	0.51	1.88
TOTAL INCOME & EXTRAORDINARY RECEIPTS & BORROWINGS	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Dr. Rosario Manson,"Breaking Away from the Fiscal Bind, Reforming the Fiscal System", PIDS Review and Outlook of the Philippines Economy 1993-1994, PIDS, 1993

- residential buildings with market values of P175,000 or less are now exempted from real property tax

- Section 270 of RA 7160 provides that no action for the collection of real property tax, whether administrative or judicial shall be instituted after the expiration of the five year period from the date the tax becomes due, subject to certain conditions

  This provision can give a premium to delinquent tax payers and discourages prompt payment of the real property tax

5. A local assessor is appointed by a major or ranking elected official and should be a resident in the concerned locality (LGC Section 472)

   This makes difficult assessment work to be insulated or to adequately objective. Usual assessment methods heavily depend upon the negotiation between a property owner and an assessor, which is naturally subject to personal or political influence in his or her locality.

6. No tax mapping formulated

   This allows the case-to-case method of valuation, which makes it difficult for LGUs to achieve a consistent and accurate valuation. The method is believed to be prone to corruption, since each property owner is given the opportunity to negotiate with the assessor on the valuation.

TABLE 5.2.4 BLGF* ADMINISTRATIVE RPTA PROJECTS (LGU COVERAGE)**

Region	Completed As of 12/31/93	On-Going As of 1/31/94	Total
CAR	6	12	18
I	11	28	39
II	16	12	28
III	12	49	61
IV	5	31	36
V	56	57	113
VI	131		131
VII	**10**	**93**	**103**
VIII	1	121	122
IX	4	12	16
X	7		7
XI	4	28	32
XII	4	22	26
NCR	2	11	13
TOTAL	269 LGUs	476 LGUs	745 LGUs

Notes: * BLGF- Bureau of Local Government Finance
**RPTA-Real Property Tax Administration

To improve tax collection efficiency, the Philippines has obtained fund assistance from the World Bank and USAID. This project contains the installation of the RPTA, e.g. tax mapping, records management and the like. This project is expected to enrich

inventory of real property units in a designated locality and vitalize the activities of the units.

(5) Disparity in Assessment Levels: The Case of the City of Cebu

LGC regulates the assessment levels for the different types of properties as indicated below. The City of Cebu poses a unique stance for keeping the assessment levels much lower. This deviation must be worthwhile discussing more publicly.

	Under the Local Gov't Code
Residential	maximum of 20%
Commercial	50%
Industrial	50%
Agricultural	40%
Timberland	20%

	The Assessment Levels for the City of Cebu
Residential	4%
Commercial	10%
Industrial	10%
Agricultural	8.5%
Timberland	10%

It is believed that most economists will conclude as follows; this great disparity in values between the City of Cebu and the neighboring cities and municipalities leading to the inequitable distribution of tax burden. Since uniformity and equity are basic principles in the appraisal/assessment of real property, such low assessment levels could function adversely against facilitating land utilization and transfers so that land economy may be maximized and the land market optimized.

It can also be discussed that the present assessment levels for buildings and other structures have also been watered down.

Although the market values in the Cebu City's Schedule of Values have been upgraded to somehow reflect actual trends, it is reported that certain defects, inconsistencies have been spotted:

1. a tax payer enjoys higher loan grants due to high appraised values of properties in Cebu

2. taxes imposed are at very low levels, practically "absolving" the taxpayers of his share of the tax liability

(6) The Progressive Land Tax (PLT)

While various countries in Asia and Latin American have executed 'the progressive land tax,' land taxation system in the Philippines is uniform regardless of the size, location, value or productivity of the land.

In line with the constitutional mandate calling for the adoption of a system of taxation that is progressive, the progressive land tax should be seriously considered.

This system promotes land distribution (discourage land speculation) and optimal land utilization. By imposing a heavier proportional taxation on the landowners, such tax obligation would lead to voluntary reduction of excessive large land holdings.

For instance, PLT can be designed within the context of the present real tax system. An annual land value tax with rates with some range of the capital value depending on the amount of increase in land value from one appraisal period to the next.

(7) Computerizing Tax Administrations

Automated Data Processing (ADP) Systems have the following advantages:

1. ADP can serve to process forms, streamline tax procedures, compile statistics, process returns and payments , and assist in enforcement operations

2. Computers can address forms and payment vouchers, check the accuracy and consistency Of data reported, calculate taxes, identify computation errors, maintain taxpayers' records and general accounting controls and records, and prepare refund, assessment, and penalty notices.

3. In enforcement, computerized systems can identify defaulters, prepare notices, develop mathematical formulas and statistical programs to select returns for audit, and verify data and identify tax evaders through cross-checking with external sources.

(8) Recommendations

1. Tax Mapping

   Tax mapping can give a good comparative picture of sites and allow for a more accurate drawing of boundaries for the different property categories.

2. Provision of adequate logistical support to maximize tax assessment and collection efforts

3. Intensified revenue generation campaign to include 'Information and Education' campaigns by way of informal barangays assemblies

4. Minimum of political interference

   - return of authority to approve 'Schedule of Market Values, Local Tax Code, to the Department of Finance (DOF).
   - return of authority to appoint assessors to the Secretary of Finance
   - restoration of the ranking system for assessors in the DOF

5. Fixing of assessment levels at reasonable uniform percentages

6. Modification of Section 270 "Periods Within Which to Collect Real Property Taxes" of the Local Government Code

7. Tax rate of real property, which is pegged at a maximum of 2%, should be considered.

8. Necessity of improving the quality of public services in order that taxpayers may be convinced of tax compliance.

   A considerable increase in collection will be expected on account of increases of assesses values due to:

   - undeclared/undervalued parcels of land,
   - increase in land area, and
   - revised rates in the respective Schedule of Values in taxing jurisdictions in consonance with the General Revision of assessments

5.3 INSTITUTIONAL CAPACITY

5.3.1 OVERVIEW

Institutional issues in the government sectors are not only confined to professional manpower and financial constraints, but also to organizational and functional structures under the new circumstances created by LGC. There are fundamental inconsistencies and/or limited coordination between budgeting, planning, reviewing, monitoring and staffing. More precisely, existing resources and manpower capacities make it difficult for LGUs to produce landuse, and local development plans and investment programs. This circumstances for inter-offices coordination can be worsened by the absence of cohesive and relevant planning, which is applicable to the pressing local needs.[8]

Financial constraints have caused widespread problems and difficulties. In particular, the costs of devolved functions and responsibilities cannot be adequately budgeted by LGUs. The devolution has resulted in increases in expenses for personnel salaries and wages, allowances, benefits and the like. A large number of LGUs, particularly lower class municipalities, will fall into deficit positions if they budget, in full accordance to the devolution programs, for expenses of personnel services, capital outlays and statutory obligations.[9]

East Asia has a remarkable record of high and sustained growth. The World Bank concludes that most of this achievement is attributable to eight dynamic economies: Japan; the "Four Tigers"-Hong Kong, the Republic of Korea, Singapore, and Taiwan; and three newly industrializing economies (NIEs) of Southeast Asia, Indonesia, Malaysia, and Thailand. The Philippines is not included in these eight economies. Needless to say, one of the major determinants for the success of these countries is efficient and powerful technocratic bureaucracies, shielded from political pressure, devise and implement well-honed.

Under the technocratic insulation, most of those countries were able to achieve 'shared growth', which also contributed to creating high labor incentives.

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[8] USAID," Third-Rapid Appraisal of Decentralization-The Local Perspective"

[9] Dr. Rosario G. Manasan," Breaking Away from the Fiscal Bind: Reforming the Fiscal System", in 'PIDS Review and Outlook of the Philippine Economy 1993-1994'

In contrast, the Philippines public administration has been weak, which can easily permit vested interests to shape key economic policies. Policy and law enforcement have not been well implemented. Taking as an example of the land reform processing, although the ownership ceiling is set to be three hectares, there are plenty of loopholes in the practice and the imposition of penalties for noncompliance.

Institutional capacity is another element of absorptive capacity. Progress towards sustained development is critically dependent on the strength and quality of a country's institutional and organizational system. Competent civil services and public management are essential elements to developments.

Effective institution-building requires long-term commitments. Human resources development is a prerequisite for institution-building. Administrative and functional linkages need to be well designed. However, external support cannot be regarded as successful unless it has contributed to strengthening on a permanent basis the local institutions through which and for which it works.

Strong public administrative capability and relative independence of technocrats' decision-making, as in the developed countries and Asian neighboring countries, are basic instruments for efficient development management.

5.3.2 CONSTRAINTS TO INSTITUTION BUILDING

As discussed above, there remain various constraints which hamper the efficient public administration.

(1) Administrative/Organizational Problems

- It remains to be seen reorganizing administrative systems to accommodate new functions and responsibilities.
- Not all local government are similarly situated in terms of resource endowments or management skills.
- Some inconsistent or vague provisions in LGCs contribute to both overlapping responsibilities and authorities, and lack of functional coordination.
- Horizontal and vertical relationships among and between units are not clearly spelled out.
- There are wide variations in the type, quality and coherence of plans as well as fundamental inconsistencies between budgets, comprehensive plans and staffing patterns.
- LGUs do not have adequate time and resources and sufficient experience to shift planning process in accordance to the new circumstances created by LGC, a circumstance which is exacerbated by absence of cohesive, relative planning manuals which are applicable to their needs.
- The information system of LGUs still largely rely on manual works, which make it difficult to handle the voluminous transaction, records, and data. The information system still is in a manual based environment.
- Public administration is not designed to be reasonably insulated from political pressures.

(2) Manpower, Staffing and Professionalism

- Insufficient level of technical and managerial competence of LGU executives and staff, especially at the municipal/barangay level
- Local senior managers are too limited in terms of the professional freedom as technocrats that they can wield to deal with local problems. The need for greater flexibility and relative autonomy in dealing with local problems is commonly seen as a necessary condition for improving the quality of the managerial process for national development.
- The Attrition Law has prevented the adequate staffing of government offices.(This is particularly true to the Bureau of Local Government Finance)
- Financial support for human resources has not been adequate.
- The absence of a career development system can be an underlying constraint over the long-term.[10] This makes it difficult to recruit and keep quality personnel.

(3) Financial Constraints

Since financial constraints have naturally affected various aspects of public services, we confine our comments to some selected points.

- Budgetary constraints have delayed the transfers to the regional offices (line agencies) of additional functions and responsibilities.
- Regional and field operations and mobility of personnel are often hampered by lack of sufficient fund allocation
- Development of information system has been hampered by increasingly massive amounts of works.
- Insufficient remuneration for qualified personnel in the government sector is a key problem contributing to civil services inefficiency in the Philippines.

5.3.3 INFORMATION SYSTEM DEVELOPMENT

It is presently an enormous problem to process, keep and maintain relevant data without sacrificing the accuracy, completeness and timeliness. Due to the tedious manual system of operation, the infinite problems now affect its daily operations.

The activities of most of the offices of the Cebu Provincial Governments are affected by (1) inadequate statistical information from different provincial offices, (2) difficulty in monitoring the status of incoming and outgoing communications from/to the Office of the Governor as basis for strategic planning and decision making, and (3) lack of technical capacities in consolidating information from the different departments and the dissemination of same to the public.

Due to the underdevelopment of information system, the major constraints can be summarized as follows:

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[10] USAID, *Ibid.*

1. Inadequate statistical information,
2. Unmanageable volume of data, and
3. Lack of technical capacities

have caused these problems:

1. Difficulty in file maintenance/consolidation of up-to-date information,
2. Doubtful data integrity and accuracy,
3. Loose data security, and
4. Difficulty in monitoring.

5.3.4 THE CASES OF SYSTEM CONSTRAINTS: THREE MAJOR PROVINCIAL OFFICES[11]

These are examples of the system constraints due to underdeveloped information system which three provincial offices confront: Budget, Planning and Development, and Treasurer's Office. It is apparent how pressing it is to reduce the constraints and build institutional capacity for sustainable development.

(1) Provincial Planning and Development Office

- Lack of forms to facilitate the monitoring of projects
- Inability in handling volume of data
- No proper coordination among the major division of the Office
- Frequently made 'over- or under-estimation' of budgetary requirements
- No proper recording of resolutions from barangays and municipalities about proposed projects

(2) Budget Office

- Difficulty in consolidating budget estimates of the different offices of the provincial government
- Difficulty in preparing budget for the provincial government
- Inadequate review of the budget of municipalities, since a lot of relevant data is not available.
- Insufficient reporting to compare the budget against actual income/expenditure figures

[11] "Information System Plan for Cebu Provincial Government', prepared by DBP Data Center Inc.

(3) Treasurer's Office

The following constraints in the Treasurer's Office have resulted in the lack of statistical reports which could, otherwise, help the Provincial Government of Cebu to attain a level of efficiency in funds control:

- Difficulty in monitoring the cash collection and disbursement of the provincial government due to the growing activities and lack of personnel of the Provincial Treasure's Office
- The above disadvantage affects the audit and examinations of account of the 48 municipalities composing Cebu.
- Lack of personnel to assess application forms for the different taxes, fees and charges accruing to the province
- Posting of transaction is often delayed due to the large volume of transactions. There are also voluminous reports prepared by the Treasury which, in most cases, delay closing of the books of accounts.
- The existing Treasury function is merely relegated to the service of factual reporting requirement. Reports has not really reached that stage whereby statistical analysis is undertaken to given relevance to management reporting.

5.3.5 RECOMMENDATIONS

As discussed above, there are various issues involved in connection with operational and structural reforms. In practice, a number of recommendations have already been proposed by some relevant studies[12] and well read in the concerned quarters. These covers "devolution and local reorganization," "provision of the Code," "local government career system," "fiscal administration" and so forth. Therefore, the JICA Study Team confines its recommendation to mainly training, development planning, computerization, and taxation.

(1) Training

The Study Team recommends well-tailored training to be given to the staff of LGUs. For example, the Local Government Academy provides a good "Integrated Capacity Building Program," which includes a special program targeted at senior executives and elected officials. However, it should be noted that the training components contains not only generic program, e.g. budgeting, planning, but also training on specific topics relevant to the pressing needs of LGUs.

(2) Development Planning

Weak linkage between planning and budgeting does hamper basic system for development activities. It is recommended that planning guidelines must reflect a resource allocation mechanism that is appropriate to the level of financial, logistic and personnel base within LGU's control.

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[12] Department of Finance, "Essential Actions for LGU Revenue Mobilization' 1992, USAID, *Ibid.*

(3) Computerization

As discussed in the Information System, it does not need many words to argue the need of establishing 'computerization' to make the administrative system more efficient and effective. Regarding the necessity of computerization for taxation, the previous section discussed it extensively.

It is noted that 'computerization' needs well organized administration, if it is superimposed on poorly organized administration, the computerized system could not effectively function. It is a prerequisite for an appropriate administrative policy to coordinate the needs of the departments who use it.

(4) Taxation

Refer to "Recommendation" in Section 5.2 Revenue Generation.

APPENDIX 5.1 MUNICIPAL INTEGRATION AND RDC

Multi-Municipal Integration for Sub-regional Development

The municipal projects as well as social development projects have to be pursued in the economies of scale. LGUs tend to solve investment problems individually. This is often difficult, because of lacks of the economy of scale and the investment efficiency.

The Study Team realized that although each city/municipality has its own history of human settlement formation, its jurisdiction is so small that some municipal projects requiring sizable investment and continuous recurrent expenditures can hardly be feasible.

Instead of the individually separate approach, a collective and integrated approach can be applied, involving all the efforts of neighboring municipalities. This will make municipal projects more feasible, thereby leading to facilitating the implementation. The projects/programs to be pursued under this scheme are: 1) garbage collection and treatment; 2) water resource development; 3) fire-fighting system; 4) medical emergency system; 5) port and port supporting facilities; 6) public market with a multi-function, and 6) roads improvement and maintenance.

This concept is addressed and recognized as "Clustering" in the 1993-1998 Medium-Term Regional Development Plan (MTRDP). To make it more functional, the Study Team proposes to institutionally organize a cooperative type of "municipal consolidation" with partial administrative power devolved by the municipalities concerned. This will be formed, based on a hierarchical center and human settlement system from a regional planning point of view, as well as a consensus on the sharing system of financial responsibilities and profits among the municipalities concerned.

Regional Development Authority

The RDC functions as a coordinating and decision-making body for regional development, and supervises regional projects supported by international institutions such as CVRP (Phase I was terminated in 1992), MCDP (on-going) and CVWSP on an ad-hoc basis. Knowledge, experiences, personnel and all the learning accumulated from these projects should be locally organized for the next projects/programs. In a sense, the Study Team proposes "Central Visayas Regional Development Authority (CVRDA)" to be organized on a non ad-hoc basis to assume major responsibility for the implementation of the regional projects, attached to RDC Region VII. Needless to say, coordination and demarcations with provincial governments as well as line-agencies of the national government should be deliberately pursued.

APPENDIX 5.2 NEW METHODS OF CAPITAL LEVERAGE

To overcome the existing budget constraints, substantial institutional arrangement should be explored, such as resorting to 'Municipal Development Fund' and establishing "Third Sector Scheme"... However, it is noted that these methods aim to collect funds for capital outlays, therefore it remains critical that sufficient public revenue for recurrent costs does hamper the development of infrastructure. Moreover, inadequate coordination between Budget and Finance Offices has affected the prompt repayment of LGU loan atomization, which will make credibility of LGU borrowing lowered.

Municipal Development Fund

The MDF is the existing fund assistance facility which provides initial funds (loans) for municipal projects/programs under Department of Finance. The Philippine Government amended the Municipal Development Fund (MDF) Act to make it more functional. This includes access to MDF by semi-governmental and private financial institutions for a wide variety of municipal projects. However, the weakening budget position has resulted in the ceiling of the availability of MDF. The Fund has confronted the financial constraints.

MDF is a supportive facility for LGUs to embark on a cost-recovery type of projects which directly benefit the local people, such as the development of public market, municipal port, water supply system; public housing; parking lots and so on. However, the Study Team found out that municipal leaders do not know this scheme;[13] LGUs can launch a loan-funded projects which requires a thoughtful plan and preparation to implement, instead of waiting for budget allocation and/or grants from the central government and other external resources.

Should MDF prove to be more functional to municipal development in the medium term, MDF could be possibly financially and institutionally strengthened by inviting external funds from both bilateral and multilateral resources.

The Third Sector Scheme

Privatization is often thought of as the only solution for project implementation which requires sizable capital investment. In this regard, the government has developed some schemes to seek private sector participation such as BOT, BOO or some other reductive methods. Although full participation of the private sector is crucial for most projects, this is not true to all cases. The public sector's initiatives are important for projects which have high public benefits, such as reclamation projects and public utility system development.

In order to implement and manage these projects, the Study Team proposes to apply the concept of "Third Sector", which is regarded as a joint venture with the public and private sectors, or a "public initiative associated with private participation" system.[14]

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[13] Because of the three-years term of mayor's service, no mayor is willing to make a record of debt on its municipal account during his/her term. Instead of this challenging attempt, he/she make efforts to obtain the share of special allocation from the congressional development budget. This seems to be a main reason behind the less-use of MDF.

[14] The Third Sector System is popular in Japan especially for large-scale social capital investment such as projects of international airports, large-scale new towns, expressways, reclamation, subways and so on. The Third Sector enterprises are organized as the implementation body, the body responsible for operation and maintenance of the facilities and/or the body for both.

The third sector is inherently a juridical enterprise with a certain share of equity held by the public sector. The private sector may take part in this enterprise for financial and technical interests. A key concept of this system is that the public sector can assume its primary role, using the private sector resources.

CHAPTER 6

LAND USE AND RESOURCES MANAGEMENT

CHAPTER 6
LAND USE AND RESOURCES MANAGEMENT

6.1 INTRODUCTION

In formulating the integrated regional development master plan for the target year of 2010, it is very important from the long term perspectives to promote the effective use and the recovery of the natural resources. Proper use and management of the natural resources in the study area is the main subject for future land use planning.

In order to solve this, and to clarify the land use potentials constraints of the study area, Geographic Information System (GIS) techniques are being applied in this study. GIS has been developed mainly in U.S.A. as early as in 1980s. GIS is an information system which can handle both geographical data represented by map and geo-referenced attribute data totally. Basic tools for spatial analysis such as overlay of the maps, buffer zone creation, network and TIN (Triangulated Irregular Network) for topographical analysis are installed in the GIS. GIS has a wide range of applications such as urban/regional development planning, natural resources management, environmental management, urban utility management, tax assessment and so on. In the case of regional development planning, it is important to know the spatial distribution of the constraints/opportunities for the development in the study area.

Analysis of spatial structure in the study area, development potentials and constraints can be conducted effectively by the application of GIS technique. In this study, GIS in water resource center of the University of San Carlos, GIS in DENR, Region VII and GIS in PCI are used. Data maps related to the existing conditions of the resources in Cebu Island have been collected, digitized and analyzed based on the GIS. The output of the data analysis can provide basic information for land use planning and resource management.

6.2 METHODOLOGY AND PROCEDURES OF THE ANALYSIS

6.2.1 DATA COLLECTION

Existing maps and statistical data, reports, satellite image of SPOT, etc. are collected. These data are reviewed and re-interpreted by field survey and SPOT images.

The following data are collected:

• Topographic Map	(1:50,000)
• Geology	(1:50,000)
• Slope	(1:250,000)
• Existing Land Use	(1:50,000)
• Erosion Map	(1:250,000)
• Road Network	(1:250,000)
• Land Classification	(1:250,000)
• Environmental Constraints	(1:250,000)
• Barangay Distribution	(1:250,000)
• Municipal Boundary	(1:250,000)
• Watershed	(1:250,000)
• Soil	(1:250,000)

6.2.2 DATA AUTOMATION AND CREATION OF GIS DATA BASE

All data maps collected are digitized and inputted into the computer by manual digitizer or scanner so as to enable the computer to handle and manipulate these data maps. Some of the data such as land classification and slope map were provided by DENR from their existing computer file. After the completion of digitization, the input data are checked and corrected, and finally stored into the computer as a clean file. The accumulation of the clean file data forms the geographic data base. In the table of contents of GIS, Data Base for this study are shown in Table 6.2.1.

6.2.3 PRIMARY DATA ANALYSIS

Primary data analysis is conducted in order to know the quantitative and qualitative relationship among the geographic data by overlaying several maps on one other. The result of the overlay analysis is shown in the map and in table format. The following primary data analysis has been conducted (refer to Figure 6.2.1).

6.2.4 SECONDARY DATA ANALYSIS

Two suitability modeling analysis is conducted in the study. One is General Land Use Suitability Analysis; the other is the Conservation Suitability Analysis. In General Land Use Suitability Analysis, the factors such as Erosion Map, Existing Land Use Map, Slope Map Environmental Constraints Map and Soil Map are overlaid. After the completion of analysis, the municipal boundary file will be overlaid again in this result and the area distribution of general land use suitability by municipality will be calculated.

TABLE 6.2.1 CONTENTS OF GIS DATA BASE

1. Elevation
1) 0 - 100 m
2) 100 - 300 m
3) 300 - 500 m
4) 500 - 1,000 m
5) Over 1,000m

2. Slope
1) 0 - 8%
2) 8 - 18%
3) 18 - 35%
4) 35 - 50%
5) Over 50%

3. Geology
1) Quaternary Alluvium
2) Carcar Formation
3) Mainggit Formation
4) Toledo Formation
5) Uling Formation
6) Malubog Formation
7) Cebu Formation
8) Mananga Group
9) Tunlob Schist
10) Bulacao Andesite
11) Talamban Diorite
12) Lutopan Diorite
13) Fault Line

4. Existing Land Use
1) Paddy Ride Irrigated
2) Fishponds
3) Nipa/Mangroves
4) Vegetables
5) Forest/Shrubs/Banana
6) Shrubs/Grassland/Banana/Coconut
7) Corn/Coconut/Shurubs/Cassava
8) Coconut/Banana/Grassland/Corn
9) Paddy Rice (Non-itti.)/Corn/Cassava/Grassland/Coconut
10) Pasture land/Shrubs
11) Sugar Cane/Corn
12) Fruit Trees/Corn/banana/Grassland
13) Cassava/Coconut/Corn
14) Mine Pit
15) Built-up Area

5. Erosion Map
1) No apparent erosion
2) Slight Erosion
3) Moderate Erosion
4) Severe Erosion

6. Road Network
1) National Road
2) Provincial Road

7. Land Classification
1) Forest Land
2) National Park
3) Alienable & Disposable
4) Reservation

8. Municipal Boundary
1) Municipal Boundary
2) Barangay Boundary

9. Barangay Distribution
1) Location of Barangay

10. Environmental Constraints
1) Protection & Conservation Area
2) Flood Prone Area
3) Mineral Resource Area
4) Terrain Constraints
5) Built-up Area
6) Prime Lands

11. Watershed
1) Watershed Boundary of Major Rivers

12. Soil
1) Hydosol
2) Beach Sand
3) Faraon Clay
4) Bolinao Clay, Steeep Phase
5) Faraon Clay, Steep Phase
6) Lugo Clay
7) Mandaue Clay Loam
8) Mandaue Silt Loam
9) Medellin Clay
10) Mantalongon Clay Loam
11) Baguio Clay Loam

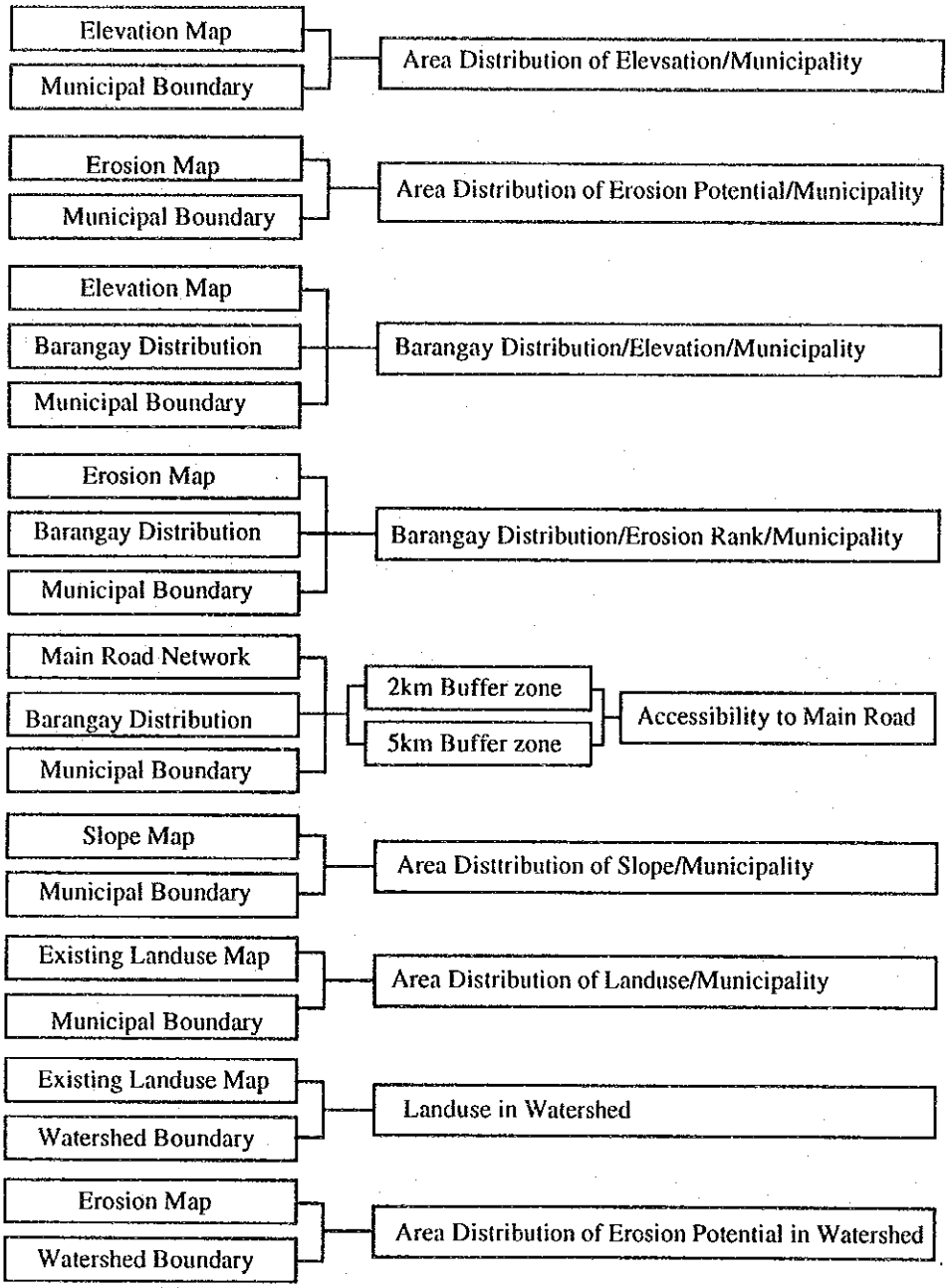


FIGURE 6.2.1 CONTENTS OF PRIMARY DATA ANALYSIS

Conservation suitability analysis combines those data, such as Erosion Map, Existing Land Use Map, Environmental Constraints Map, Land Classification Map and Geological Map. In this map, environmentally sensitive area for development will be discussed and mapped.

In the secondary data analysis, each data factors are classified and weighted according to its importance to model construction.

6.2.5 LAND USE ZONING

The results of the primary and secondary data analysis will be finally integrated into the compilation of Land Use Zoning Map. Land Use Zoning Map shows the suitable area for land use or conservation from the macro point of view. Zoning criteria will be set at the following five items:

- Urban Area
- Agricultural Area
- Forest Area
- Natural Park Area
- Natural Conservation Area

6.3 EXISTING CONDITIONS OF RESOURCE POTENTIALS AND CONSTRAINTS

The outline of the existing conditions of resource potentials and constraints is described in this section, based on the collected data and GIS Data Base.

Total area of Cebu Province is calculated at 482,777 ha (Elevation), 48,275 ha (Erosion), 482,627 ha (Slope by DENR), 470,767 ha (General Land Use Suitability). These figures are derived from digitalization and area calculation by GIS of study team and DENR. Authorized area data of Cebu Province is 508,840 ha (5,088 km^2) by NSO (1980 Census).

However, NSO data on municipal area in Cebu Province is not updated yet. According to the recent municipal boundary map provided by the University of San Carlos Water Resource Center, it is clear that there are large difference between map and statistics. Municipal area for Naga seems almost double for Talisay or Minglanilla. Municipal area of Talisay is calculated at 4,181 ha, Minglanilla as 4,768 ha, 9,724 ha for Naga by study team. But in the case of NSO, the area of Talisay is showing 8,640 ha, 6,560 ha for Minglanilla, and 7,990 ha for Naga.

Therefore, area data (hectare) is shown in tables without adjustment as a reference.

6.3.1 TOPOGRAPHICAL CHARACTERISTICS

(1) Elevation

The study area is mainly composed of hilly upland and mountains. Distribution of flat land is quite limited. To analyze such topographical conditions, elevation map and municipal boundary are overlaid and the area of distribution of elevation by municipality is calculated.

The results of this analysis is shown in Figure 6.3.1 and Table 6.3.1.

According to the analysis, about 200,000 ha of the study area are less than 100 m representing 41% of the entire study area. Area of 500 m - 1000 + (including more than 1000 m) is about 58,000 ha (12%). About 82% of the area in District 4 and 99% of the area in district 6 are less than 100 m in elevation.

(2) Slope

The slope of the land is one of the major constraints for land use. Steep slope of the land usually causes serious environmental problems such as erosion of surface soil or even a land slide. Housing, industrial development and infrastructure development, etc. are also controlled costly by the slope gradient.

Basic data of Slope Map is provided by the DENR Region VII. This map was originally compiled by DENR based on 1:50,000 topographic map (refer to Figure 6.3.2).

Classification categories of the slope map are the following:

1) 0 - 8%
2) 8 - 18%
3) 18 - 35%
4) 35 - 50%
5) 50% or over

Area distribution of the slope of each municipality is calculated by overlaying slope map and municipal boundary map. The result of the calculation is shown in Table 6.3.2.

In the entire Cebu Province, 0 ~ 8% slope area covered is 86,095 ha (18% of total area), 8 ~ 18% slope is 59,804 ha (12%), 18 ~ 35% slope is 230,205 ha (48%), 35 ~ 50% slope is 99,916 ha (21%) and slope of more than 50% area is 6,608 ha (1%), respectively. Total area of more than 18% slope is showing 336,729 ha (70% of Cebu Province).

Slope of less than 8% where the higher land use suitability can be found is distributed mainly in the alluvial lowland areas along the coastal line.

District wise, the area distribution of slope of less than 8% is as follows:

1)	District 4	27,145 ha	(42% of total District)
2)	District 6	11,672 ha	(78% of total District)
3)	District 5	18,295 ha	(21% of total District)
4)	District 1	6,704 ha	(14% of total District)
5)	District 3	11,119 ha	(9% of total District)
6)	District 2	8,526 ha	(7% of total District)
7)	Cebu City	2,628 ha	(9% of total District)

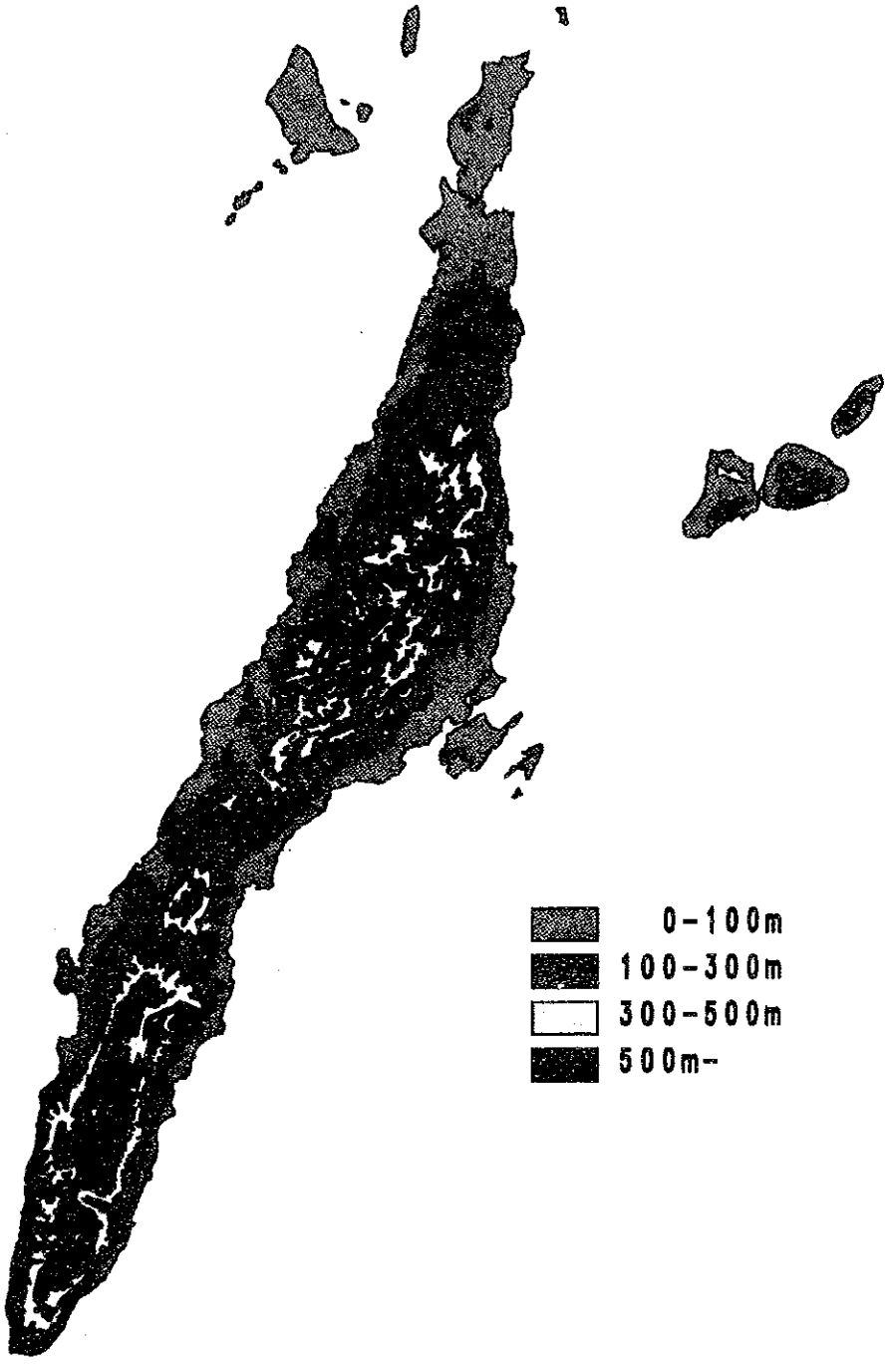


FIGURE 6.3.1 ELEVATION MAP

TABLE 6.3.1 AREA DISTRIBUTION OF ELEVATION (HA)/MUNICIPALICY

(unit: ha)

CODE	MUNICIPALITY	0 - 100m		100 - 300m		300 - 500m		500 - 1000m +		TOTAL
	PROVINCE	195,200	(41%)	161,280	(33%)	68,084	(14%)	58,213	(12%)	482,777
100	DISTRICT 1	18,414	(40%)	20,721	(45%)	5,339	(12%)	1,487	(3%)	45,961
101	Talisay	2,591		1,114		338		139		4,181
102	Minglanilla	1,996		1,580		652		539		4,748
103	Naga	3,296		4,545		1,870		13		9,724
104	San Fernando	2,271		4,229		647		0		7,147
105	Carcar	4,748		4,770		336		15		9,868
106	Sibonga	3,513		4,483		1,495		782		10,273
200	DISTRICT 2	26,714	(21%)	37,103	(29%)	27,465	(22%)	35,853	(28%)	127,134
201	Argao	4,480		7,167		5,108		2,595		19,349
202	Dalaguete	2,434		3,390		2,860		5,942		14,626
203	Alcoy	1,072		914		1,174		2,044		5,204
204	Boljoon	1,183		2,916		2,338		2,368		8,804
205	Oslob	2,247		2,370		2,971		4,210		11,798
206	Santander	997		1,254		463		27		2,742
207	Samboan	458		1,888		1,958		1,420		5,724
208	Ginatilan	456		1,151		1,432		2,301		5,340
209	Malabuyoc	499		2,163		2,952		3,344		8,958
210	Alegria	434		1,759		2,611		5,553		10,357
211	Badian	2,343		2,381		1,490		4,061		10,276
212	Moalboal	3,501		1,679		903		1,646		7,728
213	Alcantara	776		918		356		316		2,365
214	Ronda	1,726		2,525		613		24		4,889
215	Dumanjug	4,108		4,629		238		0		8,975
300	DISTRICT 3	43,320	(35%)	52,977	(42%)	18,937	(15%)	10,414	(8%)	125,648
301	Barili	3,849		6,462		1,534		954		12,798
302	Aloguinsan	2,468		3,474		3		0		5,944
303	Pinamungahan	7,119		3,944		764		0		11,827
304	Toledo City	7,774		7,246		4,930		2,039		21,988
305	Balamban	5,706		8,102		5,066		4,904		23,778
306	Asturias	7,574		10,617		4,925		2,519		25,634
307	Tuburan	8,831		13,132		1,716		0		23,678
400	DISTRICT 4	54,162	(82%)	11,515	(18%)	0	(0%)	0	(0%)	65,677
401	Tabuelan	4,504		4,856		0		0		9,360
402	San Remigio	7,748		1,557		0		0		9,305
403	Daanbantayan	9,193		159		0		0		9,352
404	Medellin	7,019		106		0		0		7,125
405	Bogo	9,314		295		0		0		9,610
406	Tabogon	4,167		4,543		0		0		8,710
407	Santa Fe	1,892		0		0		0		1,892
408	Bantayan	7,681		0		0		0		7,681
409	Madridejos	2,644		0		0		0		2,644
500	DISTRICT 5	34,611	(45%)	30,140	(39%)	8,214	(11%)	4,372	(5%)	77,337
501	Borbon	2,268		6,039		0		0		8,306
502	Sogod	1,516		5,760		937		0		8,214
503	Catmon	1,730		3,543		2,946		1,255		9,474
504	Carmen	1,713		1,363		1,144		1,395		5,615
505	Danao City	3,961		3,981		1,772		1,398		11,111
506	Compostela	2,678		2,394		1,209		325		6,606
507	Liloan	3,442		1,089		0		0		4,530
508	San Francisco	8,379		1,340		0		0		9,720
509	Poro	4,415		2,289		191		0		6,894
510	Tudela	1,871		1,442		15		0		3,329
511	Pilar	2,638		900		0		0		3,538
600	DISTRICT 6	12,030	(93%)	879	(7%)	9	(0%)	0	(0%)	12,918
601	Consolacion	3,176		879		9		0		4,064
602	Mandaue City	2,823		0		0		0		2,823
603	Lapu-Lapu City	5,231		0		0		0		5,231
604	Cordova	800		0		0		0		800
700	Cebu City	5,949	(21%)	7,945	(28%)	8,120	(29%)	6,087	(22%)	28,101

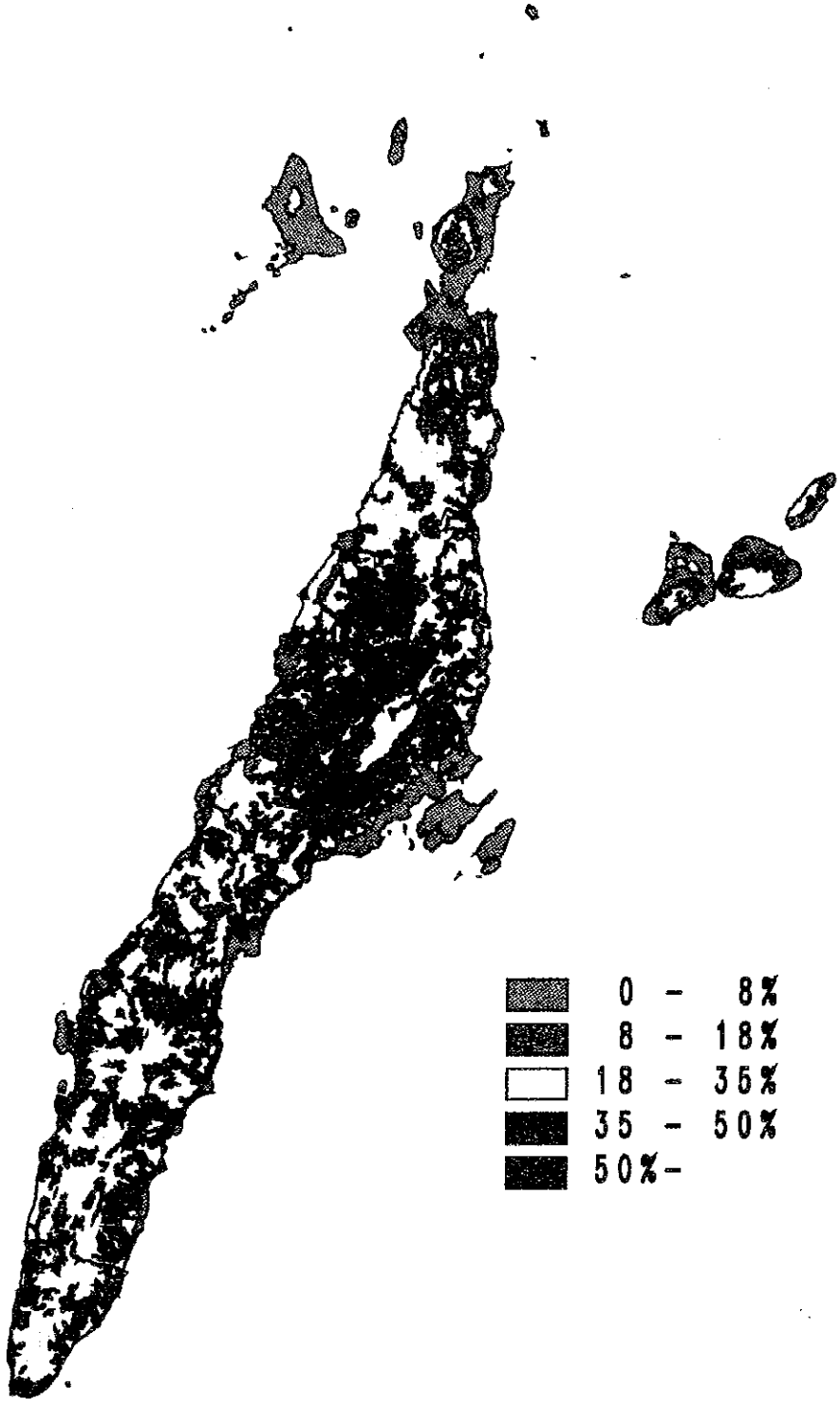


FIGURE 6.3.2 SLOPE MAP

TABLE 6.3.2 AREA DISTRIBUTION OF SLOPE (HA)/MUNICIPALITY

	0 - 8%		8 - 18%		18 - 35%		35 - 50%		50%		TOTAL
PROVINCE	86,095	(18%)	59,804	(12%)	230,205	(48%)	99,916	(21%)	6,608	(1%)	482,627
DISTRICT 1	6,704	(14%)	7,417	(15%)	21,908	(46%)	11,540	(24%)	391	(1%)	47,960
Talisay	1,597		73		991		1,407		158		4,227
Minglanilla	643		83		1,238		3,006		53		4,776
Naga	539				6,033		3,410		55		5,241
San Fernando	595		402		3,720		2,028		64		9,122
Carcar	2,547		2,571		5,276		870				9,707
Sibonga	783		4,288		4,651		819		62		10,603
DISTRICT 2	8,526	(7%)	15,048	(12%)	79,219	(63%)	20,184	(16%)	2,703	(2%)	125,681
Argao	944		2,098		12,511		2,382		528		18,463
Dalaguete	561		651		8,262		3,003		775		13,252
Alcoy	765				1,752		2,957				5,473
Boljoon	352		479		6,252		1,903		306		9,293
Oslob	318		308		8,655		2,833		695		12,808
Santander	367		812		1,787						2,966
Samboan	163		963		4,345		77		33		5,580
Ginatilan	168		428		4,029		1,162		286		6,073
Malabuyoc	220		246		4,999		1,574		80		7,118
Alegria	95		706		6,857		1,534				9,192
Badian	607		1,486		6,024		1,877				9,993
Moalboal	1,878		1,074		4,233		546				7,732
Alcantara	406		1,092		1,065		66				2,629
Ronda	575		1,614		3,815		17				6,021
Dumanjug	1,108		3,092		4,635		253				9,088
DISTRICT 3	11,119	(9%)	8,206	(7%)	56,492	(48%)	40,736	(35%)	550	(0%)	117,103
Barili	527		2,617		7,060		1,392				11,596
Aloguinsan	325		643		4,499		364				5,831
Pinamungahan	1,699		1,349		7,282		1,705				12,036
Toledo City	3,103		521		9,846		7,796				21,266
Balamban	2,291		372		5,903		13,868		195		22,631
Asturias	1,588		514		8,127		8,053		215		18,497
Tuburan	1,586		2,190		13,774		7,557		140		25,247
DISTRICT 4	27,145	(42%)	16,186	(25%)	21,314	(33%)	420	(1%)	143	(0%)	65,208
Tabuelan	103		1,628		8,157		34				9,921
San Remigio	3,233		2,629		2,867		100				8,830
Daanbantayan	5,833		1,455		1,805						9,092
Medellin	3,644		2,212		1,218						7,075
Bogo	2,893		4,408		2,138		46				9,485
Tabogon	775		3,854		4,280		241		143		9,293
Santa Fe	1,807										1,807
Bantayan	5,650				410						6,060
Madridejos	3,206				439						3,645
DISTRICT 5	18,295	(22%)	12,243	(15%)	38,853	(47%)	12,782	(15%)	1,106	(1%)	83,279
Borbon	991		2,700		4,826				113		8,630
Sogod	736		2,061		6,668		473				9,938
Catmon	219		938		7,683		1,716		154		10,711
Carmen	882		1,022		3,822		1,543				7,269
Danao City	1,335		164		6,641		5,668		551		14,358
Compostela	426		43		2,029		886		283		3,667
Liloan	1,905		269		1,024		2,496		6		5,699
San Francisco	6,615		1,465		1,578						9,658
Poro	1,941		2,147		2,532						6,620
Tudela	1,666		938		732						3,336
Pilar	1,580		496		1,317						3,393
DISTRICT 6	11,677	(78%)	30	(0%)	1,053	(7%)	2,179	(15%)	86	(1%)	15,025
Consolacion	1,216		30		808		2,154		86		4,293
Mandaue City	2,414				245		26				2,685
Lapu-Lapu City	7,237										7,237
Cordova	810										810
Cebu City	2,629	(9%)	673	(2%)	11,367	(40%)	12,074	(43%)	1,628	(6%)	28,371

Slope distribution of 0 ~ 8% and 8 ~ 18% by municipality is summarized as follows:

TABLE 6.3.3. SLOPE DISTRIBUTION

Municipality	0 ~ 8% (ha)	%	8 ~ 18% (ha)	Total (ha)	%
Lapulapu	7,236	(100%)	0	7,236	(100%)
San Francisco	6,614	(68%)	1,465	8,079	(84%)
DaanBantayn	5,832	(64%)	1,454	7,286	(80%)
Bantayan	5,650	(93%)	0	5,650	(93%)
Medellin	3,644	(51%)	2,211	5,855	(83%)
San Remegio	3,233	(36%)	2,628	5,861	(66%)
Madridejos	3,205	(88%)	0	3,205	(88%)
Toledo	3,102	(15%)	520	3,622	(17%)
Bogo	2,893	(30%)	4,408	7,301	(77%)
Cebu City	2,628	(9%)	673	3,301	(12%)
Carcar	2,546	(23%)	2,570	5,116	(45%)
Mandaue	2,414	(90%)	0	2,414	(90%)

These municipalities have relatively wider area of flat land. Lapulapu City, San Francisco, and Bantayan are islands and formed by lowlying quaternary limestone.

In the following municipalities, distribution of flat land area is relatively limited and summarized as follows:

Municipality	0 ~ 8% slope (ha)	%
Alegria	95	1
Oslob	318	2
Samboan	163	3
Ginatilan	168	3
Tabuelan	103	1
Catmon	219	2
Dalaguete	561	4
Boljoon	352	4
Malabuyoc	220	3
Badian	607	6
Barili	527	5
Aloguinsan	325	6
Tabogon	775	8
Sogod	736	7
Naga	539	5
Argao	944	5
Sibonga	783	7
Ronda	575	9

Contrary to the above list, wider area in the following municipalities are occupied mainly by hilly to mountainous topography. High Area distribution of more than 35% slope by municipality is summarized as follows:

Municipality	Slope more than 35%	%
Minglanilla	(3,059 ha)	61%
Naga	(3,465 ha)	35%
Dalaguete	(3,778 ha)	29%
Alcoy	(2,957 ha)	54%
Malabuyoc	(1,654 ha)	23%
Toledo City	(7,796 ha)	37%

Balamban	(14,063 ha)	62%
Asturias	(8,268 ha)	45%
Tuburan	(7,697 ha)	31%
Consolacion	(2,240 ha)	59%
Cebu City	(13,702 ha)	48%

6.3.2 GEOLOGICAL CONDITION

Geological map in the study area is compiled based on 1:50,000 scale geological map as published by the Bureau of Mines. Geology in the study area is classified into the following thirteen formations (rock types) and one fault line, and is shown in the Geological Map (refer to Figure 6.3.3).

1) Quaternary Alluvium
2) Carcar Formation
3) Barili Formation
4) Mainggit Formation
5) Toledo Formation
6) Uling Formation
7) Malubog Formation
8) Cebu Formation
9) Mananga Group
10) Tunlog Schist
11) Bulacao Andesite
12) Talamban Diorite
13) Lutopan Diorite
14) Fault Line

Main geology in the study area is sedimentary rocks which were formed in the cretaceous period in Mesozoic Era (Mananga Group), Tertiary (Cebu Formation, Malubog Formation, Uling Limestone, Toledo Formation, Mainggit Formation and Barili Formation) and Quaternary Period (Carcar Formation and Quaternary Alluvium) in Cenozoic Era. Mesozoic formation like cretaceous sand stones, conglomerate and lower tertiary sandstone, etc. formed the backbone of the Cebu island. These stones are mainly distributed in the central part of the island.

Tertiary rocks are widely distributed in the Cebu island and the main rock types are limestone, sandstone and conglomerate. Quaternary limestone is also distributed widely in the fringe area of older sedimentary rocks. Carcar formation (CaF) is a typical quaternary limestone which is extensively distributed in the northern and southern part of the Cebu island.

Alluvium has developed near the mouths of rivers and coastal lowland. The development of the alluvial lowland which is suitable for agriculture, urban development, industry development and so on is quite limited due to the small catchment area of the rivers.

Metamorphic rocks and igneous rocks such as diorite are distributed along the contact zone between Mesozoic or Tertiary sedimentary rocks and intrusive rocks the metallic resources are deposited at this time.

There are no apparent volcanic activities and topography in Cebu island.

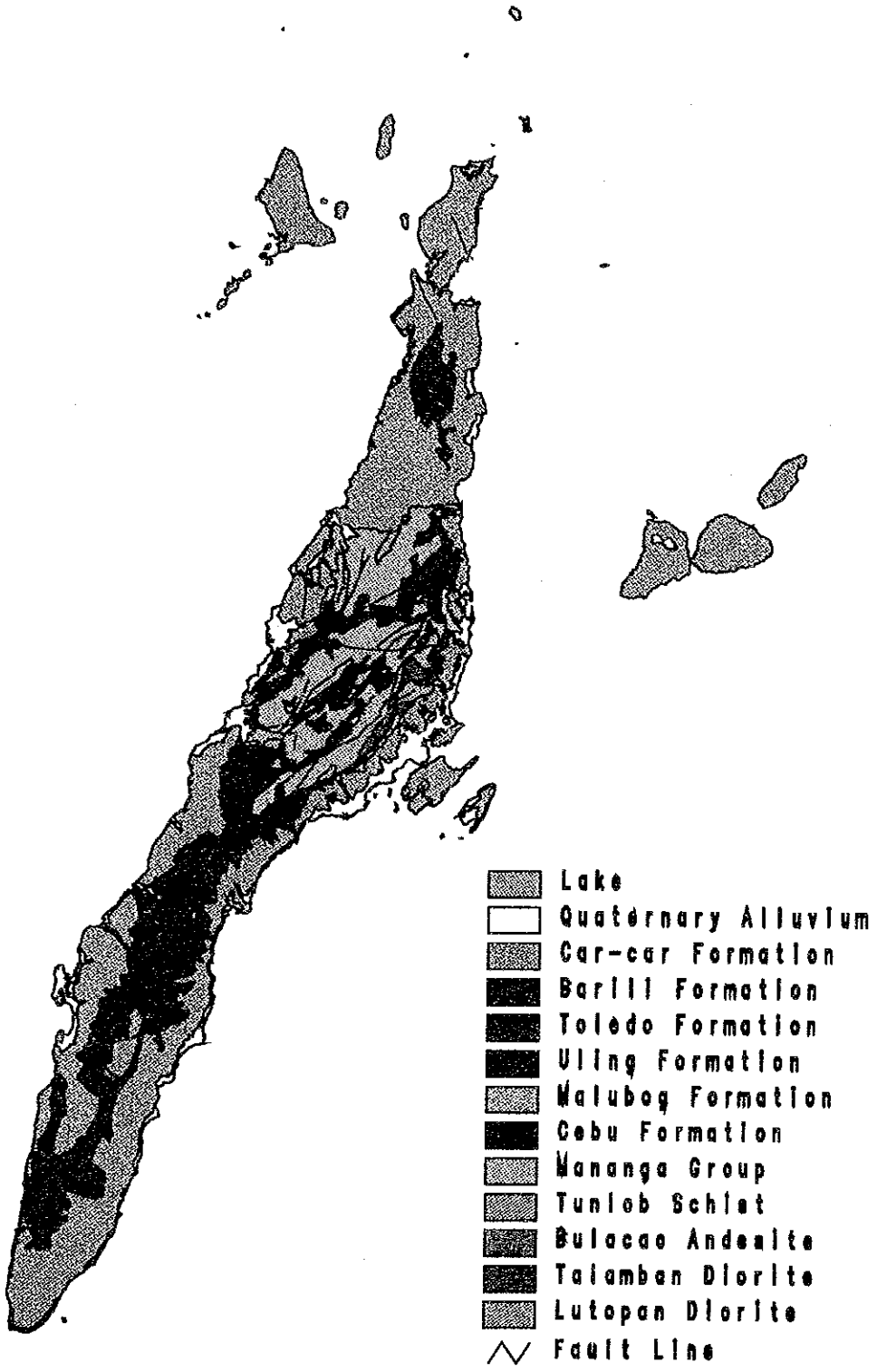


FIGURE 6.3.3 GEOLOGICAL CONDITION

Main fault lines are running parallel to the island axis of the Cebu island and minor fault lines are formed at cross direction to the main fault line. Main fault lines will be a constraint for large scale road and dam construction.

6.3.3 EXISTING LAND USE

Concerning the existing Land use, DA executed general Land use survey covering the whole country in the middle of 1980s. This survey was conducted by interpretation of aerial photography and field check based on 1:50,000 scale topographic map.

Many agencies related to regional planning have been using this map as the basic data and this study also depends on it. The contents of this map still reflect the general Land use pattern of the study area except urbanized area of Metro Cebu.

Existing Land Use of the Cebu island is classified into the following fifteen categories:

(1) Paddy Rice Irrigated
(2) Fishponds
(3) Nipa/Mangroves
(4) Vegetables
(5) Forest/Shrubs/Banana
(6) Shrubs/Grassland/Banana/Coconut
(7) Corn/Coconut/Shrubs/Cassava
(8) Coconut/Banana/Grassland/Corn
(9) Paddy Rice (Non-irri.)/Corn/Cassava/Grassland/Coconut
(10) Pasture land/Shrubs
(11) Sugar Cane/Corn
(12) Fruit Trees/Corn/Banana/Grassland
(13) Cassava/Coconut/Corn
(14) Mine Pit
(15) Built-up Area

Because of the higher population pressure to the flat land, the land of the study area where agricultural activity is possible is totally cultivated already. Even a steep slope area of the mountains with shallow soils are farmed as a corn fields. Corn is the main crop in this region and paddy rice field is relatively limited because of the lack of suitable land for paddy field and irrigation systems. Gently sloped hilly upland areas are extensively used to grow corn, cassava, banana, fruit trees, and for pasture. Coconut is mainly planted in coastal lowland and upland area. Sugarcane is cultivated in northern part of the Cebu island where the terrain is relatively flat. Forest land can be seen only in the southern central highland and national park area in central Cebu. Large scale mining site is developed in the central area of the Cebu island. Built up area is the urbanized area of Metro Cebu and part of Lapu-lapu City.

Figure 6.3.4 shows Existing Land Use in Cebu Province.

6.3.4 EROSION POTENTIAL

Erosion potential of surface soil is one of major constraints for land use.

Erosion Map was compiled manually by the data combination of slope, type of soil and vegetation map in 1980s by DA. Input data of this study is provided by NEDA VII. This map is showing the severeness and the potentiality of the soil erosion whose erosion rank is classified into the following four categories (Figure 6.3.5):

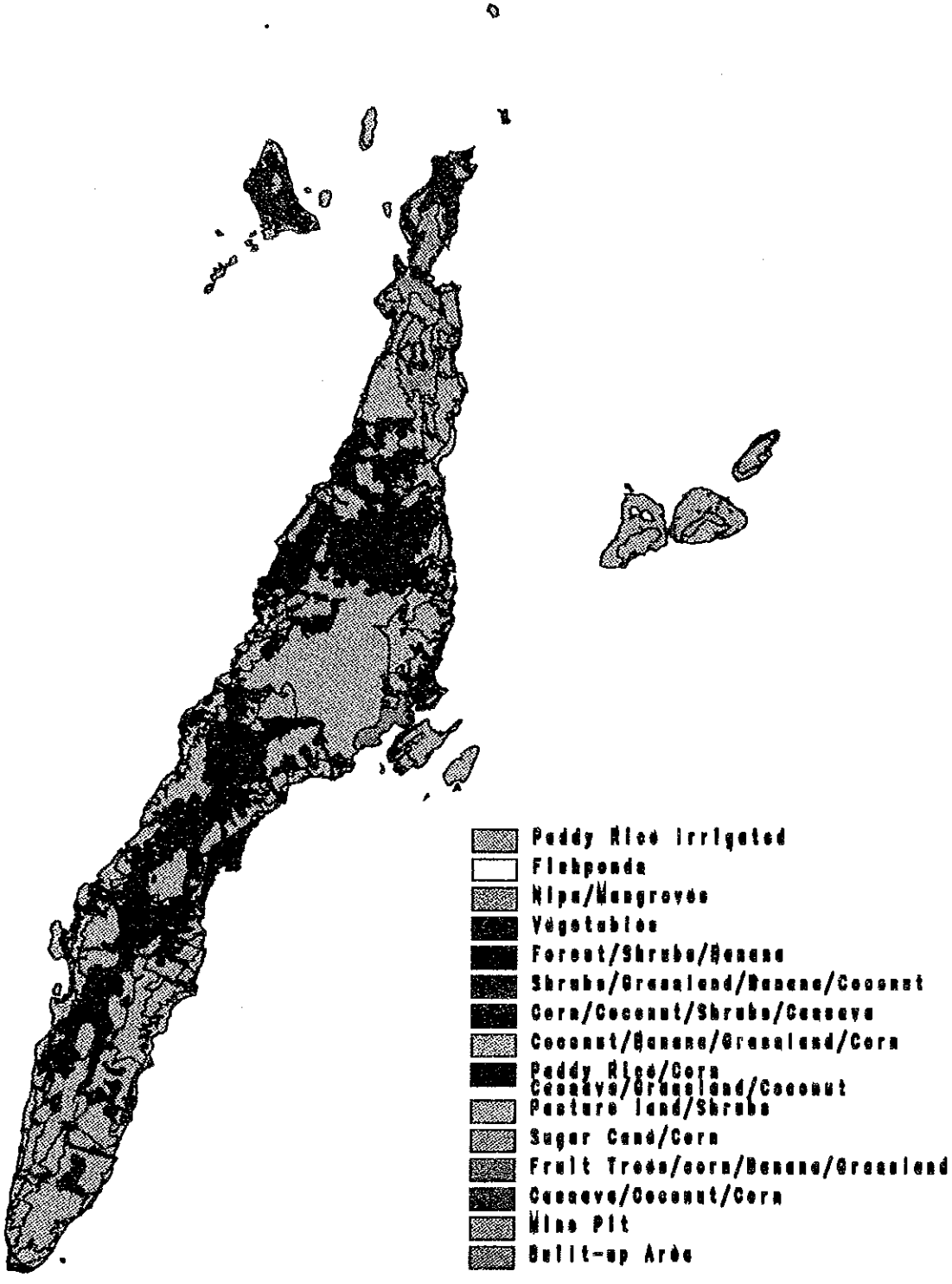


FIGURE 6.3.4 EXISTING LAND USE

E0 : No Apparent Erosion
E1 : Slight Erosion
E2 : Moderate Erosion
E3 : Severe Erosion

Table 6.3.5 shows the area distribution of the soil erosion potential by municipality in hectare (ha) and percentage of the erosion rank by municipality .

4% of the Cebu Island is characterized by Moderate (E2) to Severe Erosion (E3) which is approximately 360,000 ha. Almost all of the mountainous areas are included in these erosion categories. Land use in these area should basically be conservative or protective such as reforestation and contour farming, etc.

No apparent erosion (E0) area is found 86,800 ha (18%) in the whole study area, while the rest of the area has 34,472 ha (7%) of slight erosion (E1) and 4,668 ha (1%) of miscellaneous area, such as lakes, fishpond, etc.

Areas with no apparent erosion (E0) are considered highly suitable for urbanization, road location, industry location and agriculture if the soil condition is favorable.

Table 6.3.4 shows high and low erosion potential areas (E0 + E1) by (E2 + E3) by district.

TABLE 6.3.4 DISTRICT-WISE HIGH EROSION (E2 + E3) AND LOW EROSION (E0+E1) POTENTIAL AREA

District	High Erosion Potential				Low Erosion Potential			
	E2 (ha)	E3 (ha)	Total (ha) E2+E3	% to Total District Area	E0 (ha)	E1 (ha)	Total (ha) E0+E1	% to Total District Area
1	12,182	23,290	35,472	78%	9,340	1,069	10,409	22%
2	69,121	38,463	107,584	84%	8,027	11,030	19,057	15%
3	42,004	60,104	102,108	81%	16,729	4,449	21,208	17%
4	30,756	2,742	33,498	51%	24,974	6,690	31,664	48%
5	38,040	13,722	51,762	67%	14,708	10,453	25,161	33%
6	2,514	558	3,072	24%	8,792	235	9,027	70%
Cebu City	7,320	16,003	23,323	83%	4,,230	546	4,776	17%

Total high erosion potential area in District 2 is showing 107,584 ha and 84% of the district. District 3 is showing that 81% of district area is covered by this category and 23,323 ha of Cebu City (83% of City area) also fall in this category. Extensive areas of District 1 is covered by high erosion potential area and in this District 78% (35,472 ha) of the district falls in this category. Districts 6 and 4 are showing relatively small areas of high erosion potential. Percentage of this category in these District are 24% and 51%, respectively.

Low erosion potential area (E0 + E1) covers 70% (9,027 ha) of the area of District 6 and 48% (31,664 ha) of District 4. District 5 also has a sizable area (25,161 ha) of low erosion potential.

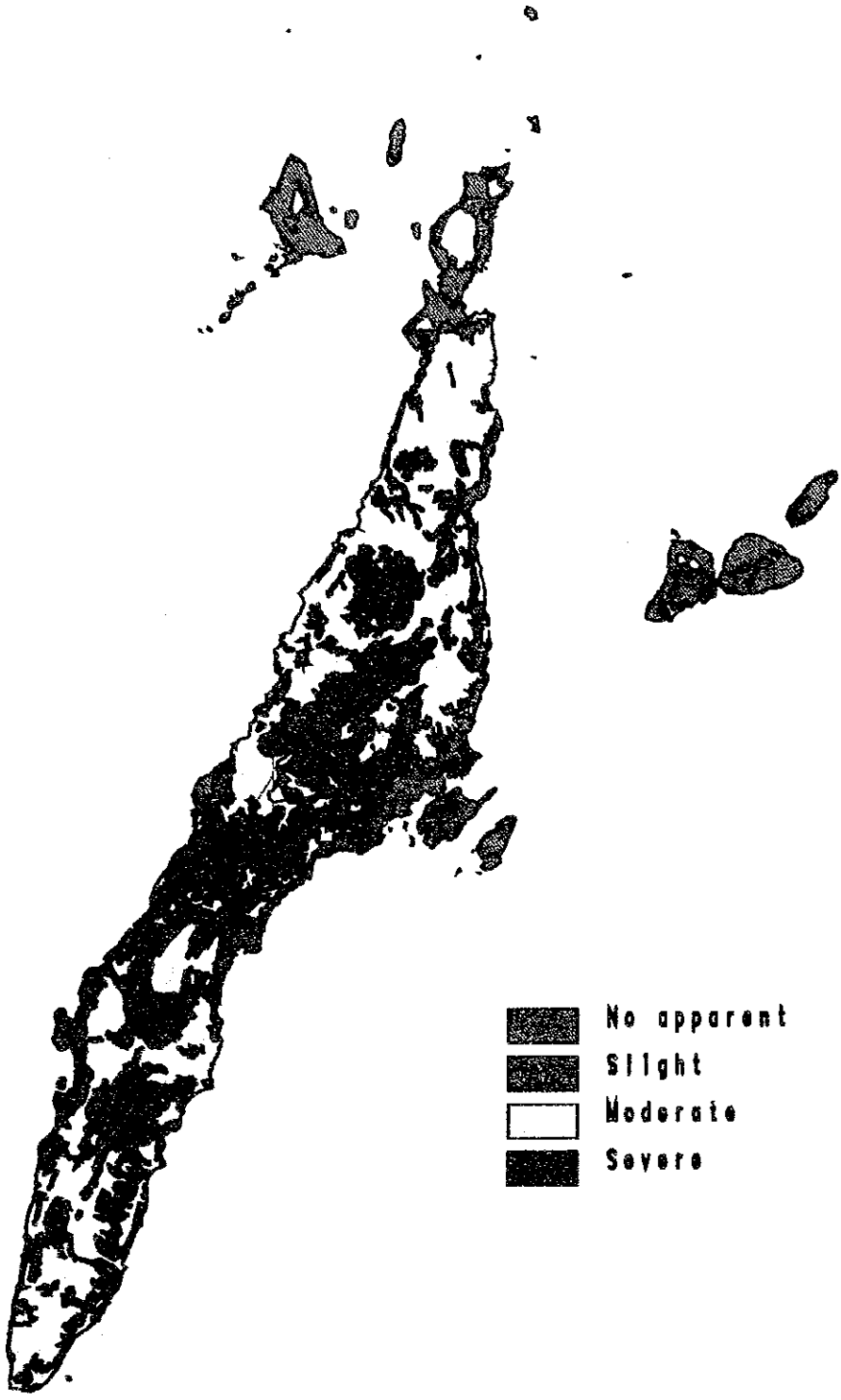


FIGURE 6.3.5 EROSION MAP

TABLE 6.3.5 AREA DISTRIBUTION OF EROSION POTENRIAL (HA)/MUNICIPALITY

	No Apparent E0		Slight E1		Moderate E2		Severe E3		Miscel. Area Ms		TOTAL
PROVINCE	86,800	(18%)	34,472	(7%)	201,937	(42%)	154,882	(32%)	4,668	(1%)	482,759
DISTRICT 1	9,340	(20%)	1,069	(2%)	12,182	(27%)	23,290	(51%)	77	(0%)	45,958
Talisay	1,877		0		580		1,724		0		4,181
Minglanilla	890		0		1,447		2,431		0		4,768
Naga	843		0		1,722		7,158		0		9,723
San Fernando	1,067		0		1,372		4,630		77		7,146
Carcar	3,325		745		1,542		4,256		0		9,868
Sibonga	1,338		324		5,520		3,090		0		10,272
DISTRICT 2	8,027	(6%)	11,030	(9%)	69,121	(54%)	38,463	(30%)	492	(0%)	127,133
Argao	367		651		10,560		7,772		0		19,349
Dalaguete	319		2,482		4,831		6,993		0		14,625
Alcoy	403		233		2,900		1,668		0		5,204
Boljoon	352		0		5,237		3,138		77		8,803
Oslob	17		0		8,295		3,273		212		11,797
Santander	287		419		1,557		478		0		2,742
Samboan	110		0		5,129		421		65		5,724
Ginatilan	109		0		4,268		963		0		5,339
Malabuyoc	26		580		5,169		3,182		0		8,958
Alegria	7		1,058		6,782		2,510		0		10,357
Badian	1,594		3,134		3,972		1,568		9		10,276
Moalboal	2,666		180		3,516		1,264		101		7,728
Alcantara	140		491		1,140		595		0		2,367
Ronda	91		904		2,628		1,237		29		4,888
Dumanjug	1,538		897		3,138		3,403		0		8,976
DISTRICT 3	16,729	(13%)	4,449	(4%)	42,004	(33%)	60,104	(48%)	2,362	(2%)	125,648
Barili	483		5		4,595		7307		408		12,799
Aloguinsan	302		0		769		4,874		0		5,945
Pinamungahan	2,288		1,146		1,156		7,183		54		11,827
Toledo City	3,862		303		7,890		7,424		1,507		20,986
Balamban	1,843		1,212		6,723		13,886		116		23,780
Asturias	3,264		1,451		9,046		11,598		276		25,634
Tuburan	4,689		332		11,825		6,830		0		23,677
DISTRICT 4	24,974	(38%)	6,690	(10%)	30,756	(47%)	2,742	(4%)	512	(1%)	65,675
Tabuelan	921		53		6,408		1,977		0		9,359
San Remigio	3,573		891		4,357		425		59		9,305
Daanbantayan	3,670		2,330		3,268		0		86		9,354
Medellin	4,107		532		2,451		0		32		7,122
Bogo	2,173		1,911		5,449		28		49		9,610
Tabogon	188		74		8,094		312		41		8,709
Santa Fe	1,794		0		0		0		98		1,891
Bantayan	6,198		750		648		0		86		7,682
Madridejos	2,351		148		82		0		62		2,643
DISTRICT 5	14,708	(19%)	10,453	(14%)	38,040	(49%)	13,722	(18%)	406	(1%)	77,329
Borbon	306		370		6,183		1,447		0		8,306
Sogod	4		1,092		4,908		2,202		6		8,213
Catmon	69		210		5,852		3,343		0		9,474
Carmen	816		0		4,407		391		0		5,615
Danao City	1,857		463		6,212		2,579		0		11,111
Compostela	994		440		3,437		1,736		0		6,607
Liloan	1,901		501		2,082		32		13		4,529
San Francisco	5,254		2,119		1,696		513		138		9,719
Poro	1,483		2,891		1,654		782		79		6,891
Tudela	609		1,595		377		696		51		3,328
Pilar	1,414		772		1,232		0		118		3,536
DISTRICT 6	8,792	(68%)	235	(2%)	2,514	(19%)	558	(4%)	818	(6%)	12,918
Consolacion	1,345		228		1,933		558		0		4,064
Mandaue City	2,234		7		581		0		0		2,822
Lapu-Lapu City	4,456		0		0		0		775		5,231
Cordova	757		0		0		0		44		801
Cebu City	4,230	(15%)	546	(2%)	7,320	(26%)	16,003	(57%)	0	(0%)	28,099

Table 6.3.6 illustrates high erosion potential municipalities. Naga, Argao, Boljoon, Oslob, Samboan, Ginatilan, Malabuyoc, Alegria, Barili, Aloguinsan, Tabuelan, Borbon and Catmon more than 90% of total area of those 13 municipalities are covered by high erosion potential area.

Municipalies of low erosion potential are listed in Table 6.3.7. Wider areas of Bantayan, San Francisco, Lapulapu, Medellin, Daan Bantayan, Mandaue, Cordova and San Remegio, Carcar are covered by low erosion category.

TABLE 6.3.6 LIST OF MUNICIPALITY OF HIGH EROSION POTENTIAL (E2 +E3)

Municipality	E2 (ha)	E3 (ha)	Total (ha)	% to totalMun. Area
Minglanilla	1,447	2,431	3,878	81%
Naga	1,722	7,158	8,880	91%
San Fernando	1,372	4,620	6,002	84%
Sibonga	5,520	3,090	8,610	84%
Argao	10,560	7,772	18,332	95%
Dalaguete	4,831	6,993	11,824	81%
Alcoy	2,900	1,668	4,568	88%
Boljoon	5,237	3,138	8,375	95%
Oslob	8,295	3,273	11,568	98%
Samboan	5,129	42	5,550	97%
Ginatilan	4,268	963	5,231	98%
Malabuyoc	5,169	3,182	8,351	93%
Alegria	6,782	2,510	9,292	90%
Barili	4,595	7,307	11,902	93%
Aloguinsan	769	4,874	5,643	95%
Balamban	6,723	13,886	20,609	87%
Asturias	9,046	11,598	20,644	81%
Tabuelan	6,408	1,977	8,385	90%
Tabogon	8,904	312	8,406	97%
Borbon	6,183	1,447	7,630	92%
Sogod	4,908	2,202	7,110	87%
Catmon	5,852	3,343	9,195	97%
Carmen	4,407	391	4,798	85%
Cebu City	7,320	16,003	23,323	83%

TABLE 6.3.7 LIST OF MUNICIPALITY OF LOW EROSION POTENTIAL (E0 + E1)

Municipality	E0 (ha)	E1 (ha)	Total (ha)	% to total Mun. Area
Bantayan	6,198	750	6,948	90%
San Francisco	5,254	2,119	7,373	76%
Lapulapu	4,456	0	4,456	85%
Medellin	4,107	532	4,639	65%
Daan Bantayan	3,670	2,330	6,000	64%
San Remegio	3,573	891	4,464	48%
Carcar	3,325	745	4,070	41%
Mandaue	2,234	7	2,241	79%
Cordova	757	0	757	95%

6.3.5 BARANGAY DISTRIBUTION AND ANALYSIS

In Cebu province, people have been inhabited not only in the more productive lowland area but also in the hilly upland area to have their lively bases. Hilly upland areas of more than 18% slope is classified as forest area (Timberland) and settlement development is legally prohibited except for some particular alienable and disposable area in the Philippines. The distribution pattern of the barangays are far beyond this legal restriction and people are widely inhabited in mountainous area with having very limited social services and poor production bases.

In order to know one of the social services level and the environmental conditions of the barangay in upland area, relationships between barangay distribution and elevation, accessibility to main road network, and barangay distribution and erosion potential are analyzed and tabulated. The location of the barangay is digitized by auto scanner. The head point coordinates of the barangay name which is shown in Barangay Distribution Map as provided by NEDA is digitized as the location of each barangay. In this map, approximately eight hundred (800) barangays are identified except the barangays in the urban areas. The total number of barangays is smaller than the existing number, but the data show the general tendency of barangay distribution in the rural area.

(1) Barangay Distribution and Elevation

Data file on elevation is overlaid on the Barangay Distribution file and Municipal Boundary file together in order to indicate the vertical distribution of barangay by municipality as shown in Figure 6.3.6 and Table 6.3.8.

About 45% of the counted barangays are found to have 100m elevation and another 35% are distributed between 100 - 300m in the study area. All in all, 80% of the total barangays have elevation of less than 300m while 20% barangays have more than 300m elevation.

In District 2, 26% of the barangays have elevation of less than 100m, 33% of the barangays have elevation between 100 - 300m. This adds up 53% of the barangays having less than 300 m in elevation. But another 41% of the barangays are located between 300 m - 1,000m, 20% are in 300 - 500m and 21% in 500 - 1,000m respectively. In District 3, 84% of the barangays have elevation less than 300m, but 16% of the barangays have more than 300m elevation. In District 5, most of the barangay (91%) have elevation of less than 300m and 11% of the barangays have more than 300m in elevation.

(2) Accessibility to Main Road Network

Barangay distribution file, municipal boundary file and Main Road Network maps are overlaid to analyze the barangay accessibility to the main road, not including barangay roads. Two (2) km and five (5) km buffer zones from the main road are created and the number of barangays within and beyond these buffer zones are counted and listed in Table 6.3.9. Figures 6.3.7 and 6.3.8 show the overlay map of Accessibility.

In general, 55% of the barangays are located within 2km from the main road and 87% of the barangays are included within 5km buffer zone. On the contrary, 13% of the barangays are still located beyond the 5km buffer zone area from the main road. In District 4, 99% of the barangays are located within 5km buffer zone, and in District 5, 86% of the barangays are also located within 5km buffer zone. In District 3, 26% of the barangays are still located beyond the 5km buffer zone from the main road. In District 2, 16% of the barangays are also located beyond the 5km buffer zone.

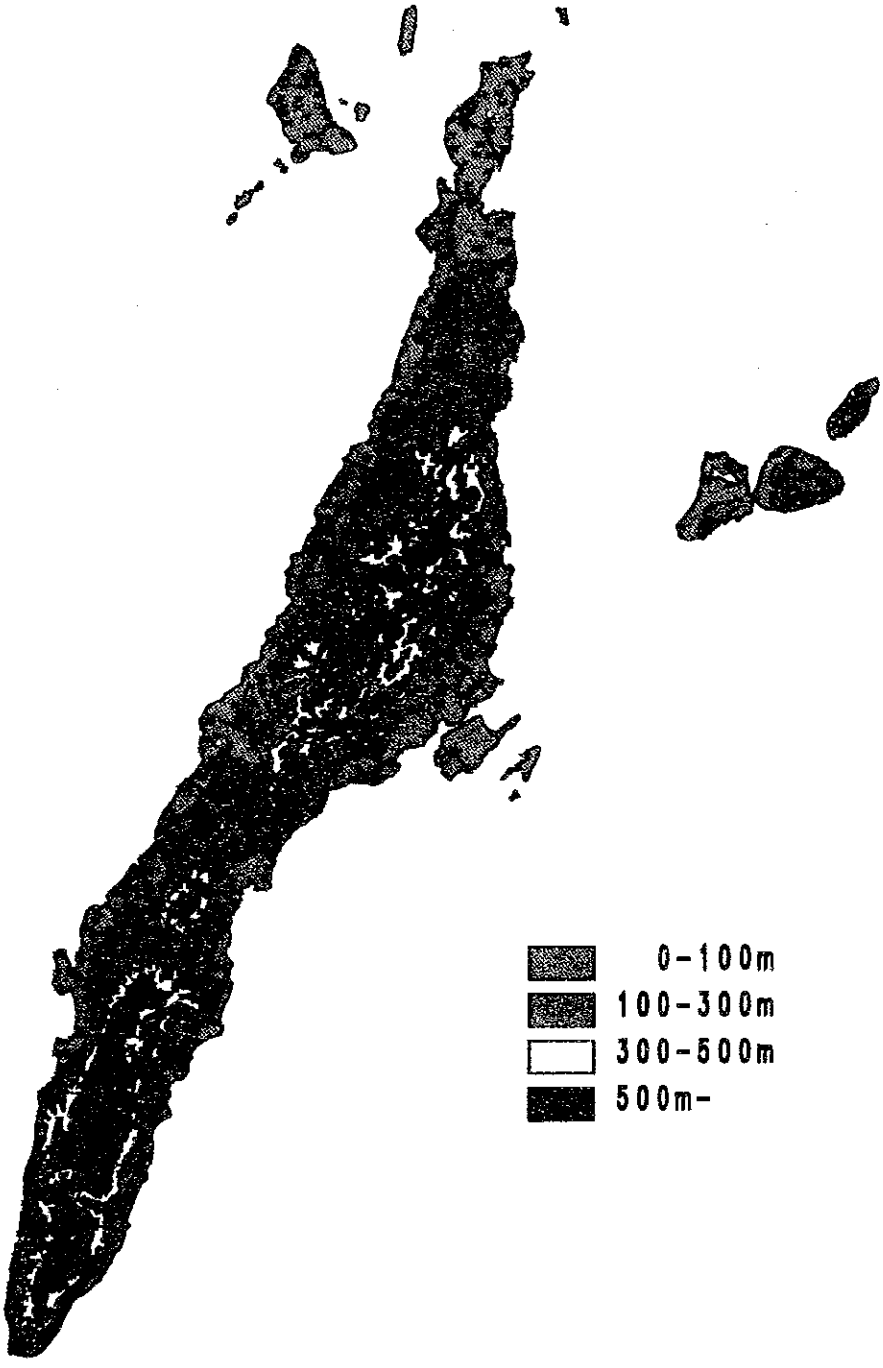


FIGURE 6.3.6 BARANGAY DISTRIBUTION BY ELEVATION AND MUNICIPALITY

TABLE 6.3.8 BARANGAY DISTRIBUTION BY ELEVATION AND BY MUNICIPALITY

CODE	MUNICIPALITY	0 - 100m		100 - 300m		300 - 500m		500 - 1000m	
	PROVINCE	359	(45%)	278	(35%)	87	(11%)	67	(9%)
100	DISTRICT 1	39	(48%)	31	(38%)	10	(13%)	1	(1%)
101	Talisay	9		2		0		0	
102	Minglanilla	1		1		1		1	
103	Naga	8		8		4		0	
104	San Fernando	6		8		1		0	
105	Carcar	6		6		0		0	
106	Sibonga	9		6		4		0	
200	DISTRICT 2	62	(26%)	77	(33%)	48	(20%)	48	(21%)
201	Argao	12		18		12		4	
202	Dalaguete	4		6		9		11	
203	Alcoy	3		1		0		1	
204	Boljoon	1		5		1		1	
205	Oslob	3		10		3		4	
206	Santander	3		4		2		0	
207	Samboan	2		4		7		2	
208	Ginatilan	2		2		1		6	
209	Malabuyoc	1		5		4		2	
210	Alegria	1		2		2		4	
211	Badian	8		3		4		9	
212	Moalboal	7		2		1		3	
213	Alcantara	2		2		0		1	
214	Ronda	4		3		2		0	
215	Dumanjug	9		10		0		0	
300	DISTRICT 3	70	(38%)	86	(46%)	20	(11%)	9	(5%)
301	Barili	13		17		3		2	
302	Aloguinsan	3		8		0		0	
303	Pinamungahan	14		5		3		0	
304	Toledo City	7		5		2		1	
305	Balamban	7		6		3		4	
306	Asturias	9		15		5		2	
307	Tuburan	17		30		4		0	
400	DISTRICT 4	106	(88%)	15	(12%)	0	(0%)	0	(0%)
401	Tabuelan	3		7		0		0	
402	San Remigio	18		2		0		0	
403	Daanbantayan	18		0		0		0	
404	Medellin	10		0		0		0	
405	Bogo	15		1		0		0	
406	Tabogon	11		5		0		0	
407	Santa Fe	3		0		0		0	
408	Bantayan	17		0		0		0	
409	Madridejos	11		0		0		0	
500	DISTRICT 5	68	(49%)	59	(42%)	5	(3%)	8	(6%)
501	Borbon	5		13		0		0	
502	Sogod	3		10		0		0	
503	Catmon	4		7		1		3	
504	Carmen	2		1		1		2	
505	Danao City	6		10		1		2	
506	Compostela	6		5		1		1	
507	Liloan	6		2		0		0	
508	San Francisco	11		2		0		0	
509	Poro	7		6		1		0	
510	Tudela	9		2		0		0	
511	Pilar	9		1		0		0	
600	DISTRICT 6	10	(100%)	0	(0%)	0	(0%)	0	(0%)
601	Consolacion	7		0		0		0	
602	Mandaue City	3		0		0		0	
603	Lapu-Lapu City	0		0		0		0	
604	Cordova	0		0		0		0	
700	Cebu City	4	(21%)	10	(53%)	4	(21%)	1	(5%)

TABLE 6.3.9 ACCESSIBILITY TO MAIN ROAD (NUMBER OF BARANGAYS)

CODE		Within 2kms		Within 5kms		Over 2kms		Over 5kms	
	PROVINCE	437	(28%)	687	(43%)	354	(22%)	104	(7%)
100	DISTRICT 1	67	(41%)	81	(50%)	14	(9%)	0	(0%)
101	Talisay	10		11		1		0	
102	Minglanilla	3		4		1		0	
103	Naga	18		20		2		0	
104	San Fernando	11		15		4		0	
105	Carcar	12		12		0		0	
106	Sibonga	13		19		6		0	
200	DISTRICT 2	106	(23%)	206	(44%)	129	(27%)	29	(6%)
201	Argao	17		39		29		7	
202	Dalaguete	13		29		17		1	
203	Alcoy	4		4		1		1	
204	Boljoon	3		6		5		2	
205	Oslob	15		18		5		2	
206	Santander	6		9		3		0	
207	Samboan	6		14		9		1	
208	Ginatilan	2		8		9		3	
209	Malabuyoc	4		9		8		3	
210	Alegria	3		8		6		1	
211	Badian	13		24		11		0	
212	Moalboal	1		11		12		2	
213	Alcantara	2		3		3		2	
214	Ronda	3		5		6		4	
215	Dumanjug	14		19		5		0	
300	DISTRICT 3	70	(19%)	136	(37%)	115	(31%)	49	(13%)
301	Barili	18		35		17		0	
302	Aloguinsan	6		11		5		0	
303	Pinamungahan	8		21		14		1	
304	Toledo City	10		13		5		2	
305	Balamban	6		8		14		12	
306	Asturias	9		17		22		14	
307	Tuburan	13		31		38		20	
400	DISTRICT 4	96	(40%)	120	(50%)	25	(10%)	1	(0%)
401	Tabuelan	4		9		6		1	
402	San Remigio	16		20		4		0	
403	Daanbantayan	16		18		2		0	
404	Medellin	10		10		0		0	
405	Bogo	14		16		2		0	
406	Tabogon	14		16		2		0	
407	Santa Fe	3		3		0		0	
408	Bantayan	11		17		6		0	
409	Madridejos	8		11		3		0	
500	DISTRICT 5	83	(30%)	120	(43%)	57	(20%)	20	(7%)
501	Borbon	12		18		6		0	
502	Sogod	12		12		1		1	
503	Catmon	7		13		8		2	
504	Carmen	4		6		2		0	
505	Danao City	11		19		8		0	
506	Compostela	4		7		9		6	
507	Liloan	2		7		6		1	
508	San Francisco	9		13		4		0	
509	Poro	11		14		3		0	
510	Tudela	11		11		0		0	
511	Pilar	0		0		10		10	
600	DISTRICT 6	8	(40%)	10	(50%)	2	(10%)	0	(0%)
601	Consolacion	5		7		2		0	
602	Mandaue City	3		3		0		0	
603	Lapu-Lapu City	0		0		0		0	
604	Cordova	0		0		0		0	
700	Cebu City	7	(18%)	14	(37%)	12	(32%)	5	(13%)

FIGURE 6.3.7 ACCECIBILITY OF BARANGAYS TO MAIN ROADS (2KMS)

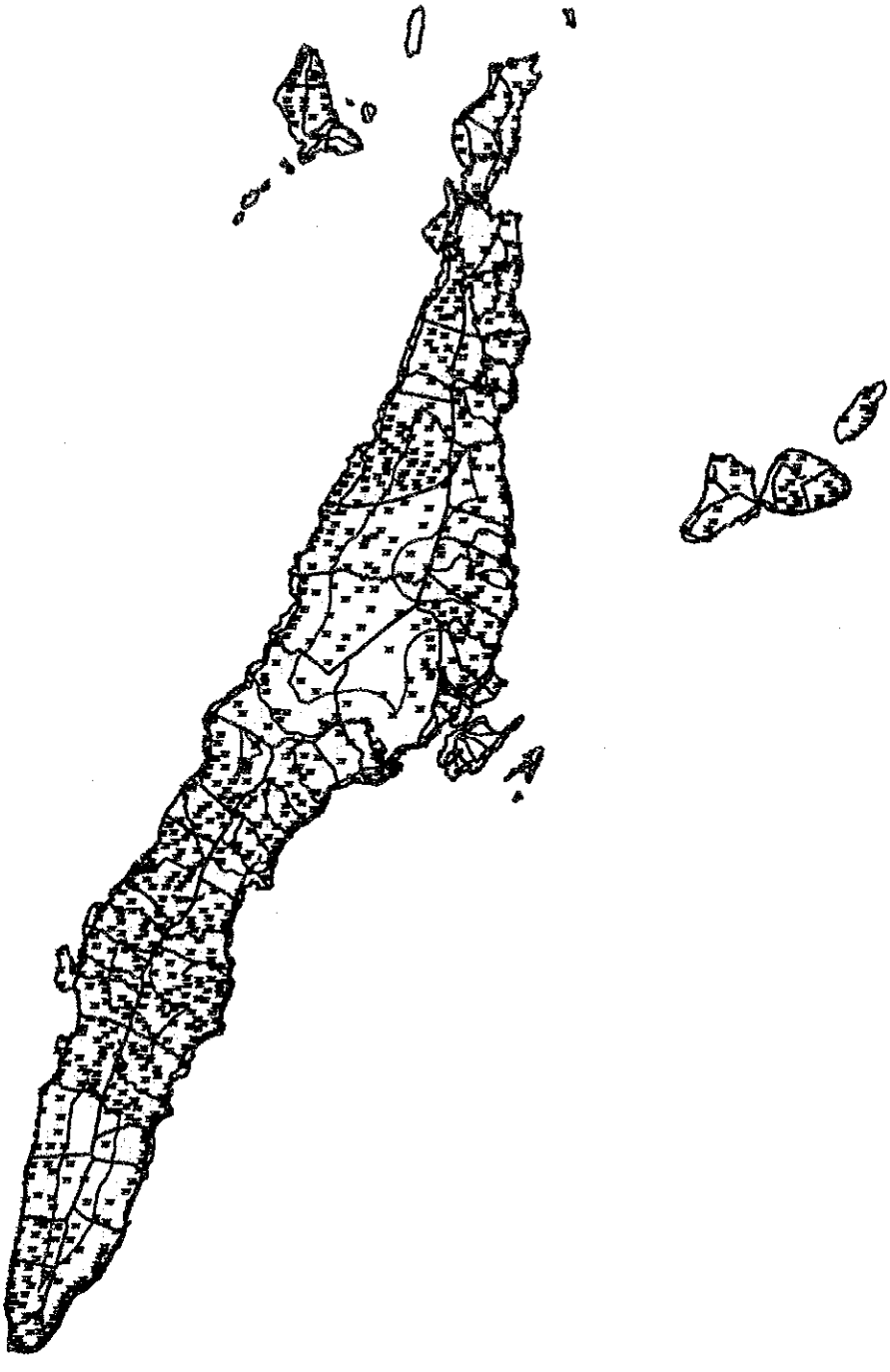


FIGURE 6.3.8 ACCECIBILITY OF BARANGAYS TO MAIN ROADS (5KMS)

(3) Barangay Distribution and Erosion Potential

Barangay distribution file and municipal boundary file are overlaid on erosion map to know the relationship between barangay location and erosion potential by municipality. Figure 6.3.9 and Table 6.3.10 show the results of the analysis.

42% of barangays are located in moderate erosion (E2) area while 29% are located in severe erosion (E3) area. This means that two-thirds of the total barangays in the study area belong to the moderate or severe erosion categories. Only 19% of the barangays are located in areas of no apparent erosion (E0). In District 2, a high 83% of the barangays are located in areas of moderate (E2) to severe (E3) erosion while only 6% of the barangays are located in the no apparent erosion (E0) area. In District 3, 82% of the barangays are seen in the area of E2 + E3 and 12% are located in the E0 rank. In District 5, 61% of the barangays are seen in the area of E2 + E3 and 25% are located in the area of E0. In District 4 and 6, barangay distribution in E0 rank is 41% and 60% respectively. Barangays in Lapulapu City and Cordova are also located in low erosion areas.

6.3.6 WATERSHED, EROSION POTENTIAL AND EXISTING LAND USE

Watershed is one of the key units as a closed system not only for the drainage of waters but also for the discharge of eroded soils, polluting materials and so on. Destination of watershed here is the whole areas that drains into particular river or lake (by DENR). In this study, 25 main watersheds are selected with the type of existing land Use and erosion potential, and are then calculated and tabulated to know the existing environmental conditions within these watershed.

The five largest rivers in the study area flow into the western side of Cebu. Balamban river has the largest watershed area at 22,392 ha (224 km). Sapangdaku river has the second largest watershed at 16,590 ha and Guinabasan river, the third largest at 12,062 ha. Langyon and Baluang rivers have more than 10,000 ha of watershed.

Watershed development in Cebu Province is quite limited due to the narrow and mountainous topography of the island. For example, Mananga watershed, where the water resource development is being planned has 8,732 ha. Kotkot river has 7,990 ha of watershed.

The location of 25 main watersheds is shown in Figure 6.3.10. Tables 6.3.11 and 6.3.12 are the results of calculation. Results of overlay analysis of watershed and erosion potential are briefly described below.

In any watershed area, forest covers are extremely scarce and shrubs or grassland type of vegetation distributes extensively. In most watersheds, percentage of high erosion potential area is averaging more than 80% of total watershed area. Rehabilitation activity such as reforestation should be planned, accelerated and enhanced in upland areas of these watershed like Mananga, Kotkot, Balamban, Sapangdaku and Mandaue, etc.

Watershed	Description
Balamban	12,726 ha (57%) of total watershed is severe erosion (E3) area and 9,007 ha (40%) is covered by moderate erosion (E2) area. Total area of these two erosion categories is estimated at 21,733 ha (94%) of the watershed. Land use in this watershed is mainly pasture and shrubs (18,210 ha) and shrub/grassland/banana/coconut and so on. Forest vegetation is not seen in this watershed.
Sapangdaku	A total 11,059 ha (91%) of this watershed is covered by high erosion potential areas (E2 + E3). Main land use type is pasture and shrubs (9,628 ha) and corn/coconut/shrub/cassava. In this watershed, 1,175 ha of forest/shrub/banana type land use is developed.
Guinabasan	In this watershed, severe erosion area (E3) occupies 3,820 ha (32%). Moderate erosion area (E2) is 4,969 ha (41%) and total hectares of E3 + E2 is 8,798 ha (73%) of the watershed. Main land use type is 7,179 ha of shrub/grassland/banana/coconut and 4,028 ha of pasture land/shrubs. There is no forest coverage in this watershed.
Baluang	About 10,317 ha (95%) of this watershed is covered by E3((1,078 ha) + E2 (9,239 ha) erosion area. Main land use type is 7,220 ha of pasture/shrubs and 3,095 ha of shrub/grassland/banana/coconut.
Languyon	In this watershed, E3 erosion area occupies 8,305 ha (82%) and E2 area is 1,266 ha (12% of total watershed. Areas of E3 + E2 account to 9,571 ha (94%) of this watershed. Main land use type is 7,530 ha of shrub/grassland/banana/coconut and 1,883 ha of pasture/shrubs.
Mananga	7,613 ha (87%) of the total watershed area is covered by E3 + E2. Main land use type is 7,128 ha of pasture/shrubs and 430 ha of forest/shrub/banana and others.
Kotkot	is covered by 7,060 ha (89%) of E3 + E2 area and its main land use is 4,921 ha of pasture/shrubs and 2,464 ha of coconut/banana/grassland/corn, etc.
Argao	E3 (4,258 ha) + E2 (3,229 ha) area covers 91% of this watershed and main land use type is 6,091 ha of pasture/shrubs and 794 ha of forest/shrub/banana.

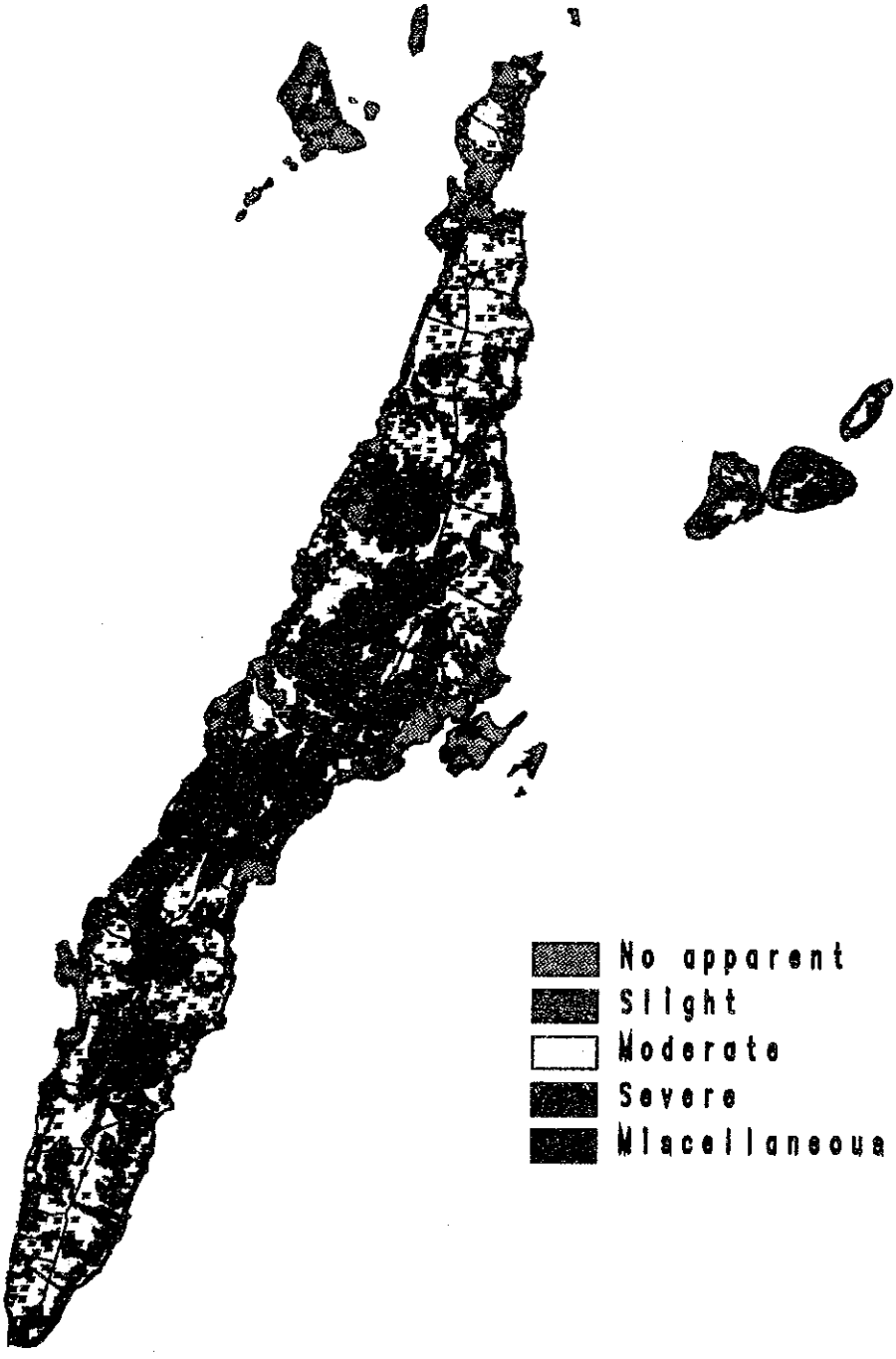


FIGURE 6.3.9 BARANGAY DISTRIBUTION AND EROSION RANK

TABLE 6.3.10 BARANGAY DISTRIBUTION BY EROSION RANK AND MUNICIPALITY

CODE		E0		E1		E2		E3		Ms	
	PROVINCE	151	(19%)	71	(9%)	333	(42%)	232	(29%)	4	(1%)
100	DISTRICT 1	21	(19%)	4	(19%)	(19%)	(19%)	36	(19%)	0	(19%)
101	Talisay	6		0		0		5		0	
102	Minglanilla	1		0		3		0		0	
103	Naga	4		0		3		13		0	
104	San Fernando	3		0		4		8		0	
105	Carcar	5		1		1		5		0	
106	Sibonga	2		3		9		5		0	
200	DISTRICT 2	14	(6%)	25	(11%)	124	(53%)	72	(31%)	0	(0%)
201	Argao	1		2		25		18		0	
202	Dalaguete	0		4		10		16		0	
203	Alcoy	0		0		4		1		0	
204	Boljoon	0		0		6		2		0	
205	Oslob	0		0		11		9		0	
206	Santander	0		3		4		2		0	
207	Samboan	0		0		14		1		0	
208	Ginatilan	0		0		9		2		0	
209	Malabuyoc	0		2		6		4		0	
210	Alegria	0		1		6		2		0	
211	Badian	4		7		10		3		0	
212	Moalboal	4		3		6		3		0	
213	Alcantara	1		1		1		2		0	
214	Ronda	0		3		4		2		0	
215	Dumanjug	4		2		8		5		0	
300	DISTRICT 3	23	(12%)	7	(4%)	71	(38%)	81	(44%)	3	(2%)
301	Barili	0		0		12		20		3	
302	Aloguinsan	1		0		3		7		0	
303	Pinamungahan	8		1		0		13		0	
304	Toledo City	2		0		8		10		0	
305	Balamban	3		2		5		11		0	
306	Asturias	3		4		13		15		0	
307	Tuburan	6		0		30		5		0	
400	DISTRICT 4	49	(41%)	15	(13%)	51	(43%)	4	(3%)	1	(1%)
401	Tabuelan	0		0		6		1		0	
402	San Remigio	6		3		9		0		1	
403	Daanbantayan	9		3		6		0		0	
404	Medellin	5		2		3		0		0	
405	Bogo	2		4		10		0		0	
406	Tabogon	1		0		15		0		0	
407	Santa Fe	3		0		0		0		0	
408	Bantayan	13		2		2		0		0	
409	Madridejos	10		1		0		0		0	
500	DISTRICT 5	35	(25%)	20	(14%)	58	(41%)	27	(19%)	0	(0%)
501	Borbon	1		3		10		4		0	
502	Sogod	0		3		6		4		0	
503	Catmon	0		0		7		8		0	
504	Carmen	1		0		5		0		0	
505	Danao City	4		0		13		2		0	
506	Compostela	5		0		4		4		0	
507	Liloan	0		4		4		0		0	
508	San Francisco	8		0		3		2		0	
509	Poro	4		3		5		2		0	
510	Tudela	6		4		0		1		0	
511	Pilar	6		3		1		0		0	
600	DISTRICT 6	6	(60%)	0	(0%)	4	(40%)	0	(0%)	0	(0%)
601	Consolacion	5		0		2		0		0	
602	Mandaue City	1		0		2		0		0	
603	Lapu-Lapu City	0		0		0		0		0	
604	Cordova	0		0		0		0		0	
700	Cebu City	3	(16%)	0	(0%)	5	(26%)	11	(58%)	0	(0%)

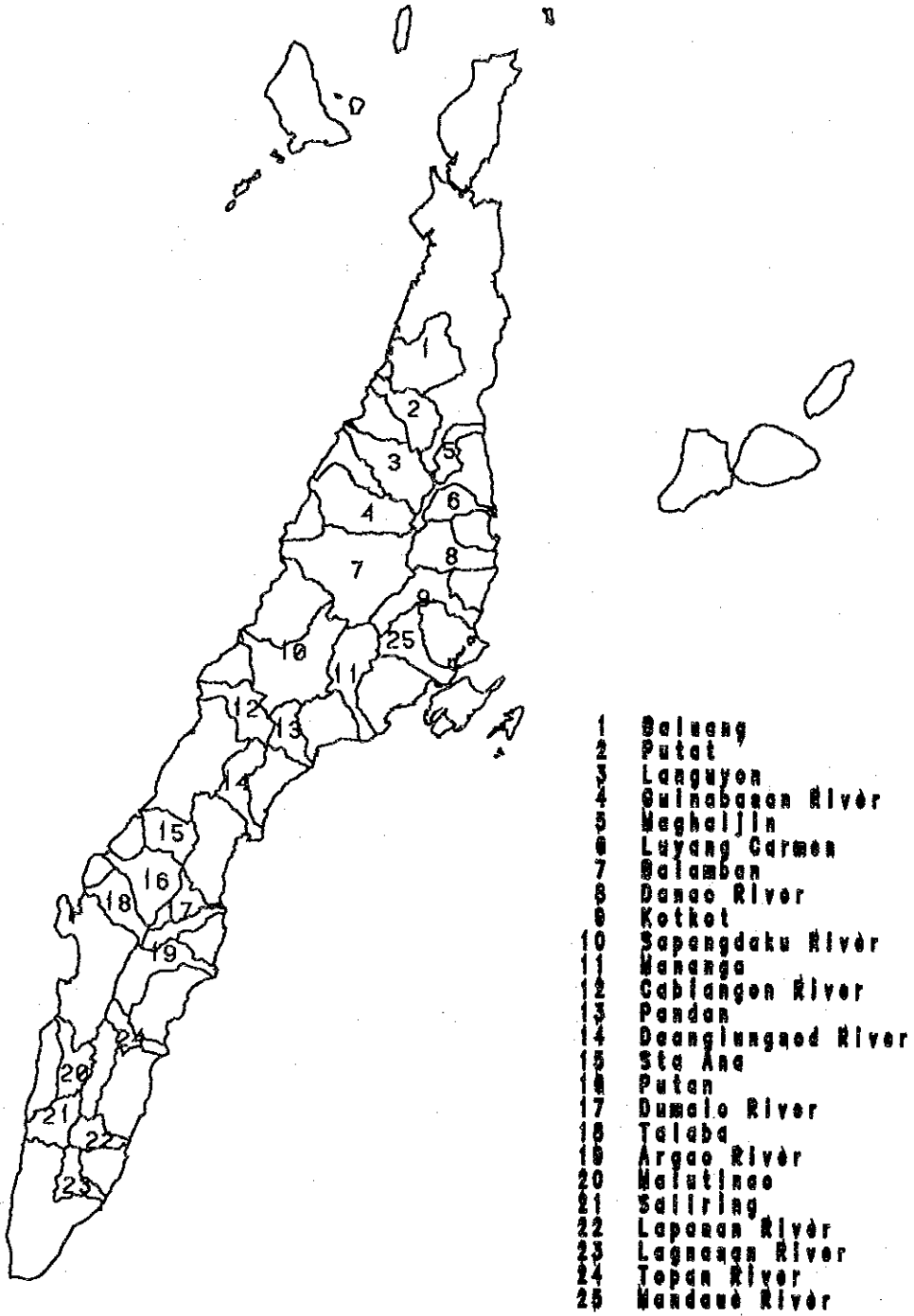


FIGURE 6.3.10 MAIN WATERSHEDS

TABLE 6.3.11 AREA DISTRIBUTION OF EROSION POTENTIAL BY MAIN WATERSHED

	Watershed	Severe	Moderate	Slight	No Apparent	Total	No of Barangays
1	Baluang	1,078	9,239	156	393	10,866	13
2	Putat	1,293	5,098	0	353	6,744	16
3	Languyon	8,305	1,266	0	607	10,178	18
4	Guinabasan River	3,820	4,969	446	2,827	12,062	14
5	Maghaljin	1,453	1,919	0	59	3,431	3
6	Luyang Carmen	299	3,481	0	171	3,951	4
7	Balamban	12,726	9,007	363	296	22,392	18
8	Danao River	2,999	4,481	151	453	8,084	10
9	Kotkot	1,103	5,957	242	688	7,990	12
10	Sapangdaku River	9,493	5,566	0	1,531	16,590	12
11	Mananga	1,817	5,796	109	1,010	8,732	7
12	Cabiangon River	2,296	2,799	211	1,459	6,765	8
13	Pandan	3,878	570	0	183	4,631	11
14	Daanglungsod River	1,932	334	106	4,014	6,386	10
15	Sta. Ana	2,472	63	0	3,270	5,805	14
16	Putan	5,449	434	0	2,972	8,855	18
17	Damalo River	2,396	524	703	364	3,987	4
18	Talaba	1,171	4,035	364	100	5,670	11
19	Argao River	4,258	3,229	384	358	8,229	17
20	Malutinao	515	4,116	430	0	5,061	4
21	Sallring	2,334	2,582	318	2	5,236	7
22	Lapasan River	878	2,715	0	59	3,652	2
23	Lagnasan River	924	2,797	0	22	3,743	6
24	Topan River	1,241	949	1,001	263	3,454	4
25	Mandue River	0	4,341	487	1,934	6,762	8

6.3.7 SOIL

Soil map in the study area is provided by DA in scale of 1/250,000, which was compiled in very old time (Figure 6.1.11). According to this map, soil types of the Cebu province are classified into twelve items and each soil characteristics is summarized as follows:

Soil Type	Description
Cebu Hydrosol	Poorly drained lowland area. Soils are accumulations or deposits of fine silt, clay and sand forming a low delta, mainly covered by mangrove type vegetation. Good places for breeding of crustaceans.
Beach Sand	Well drained areas and calcareous flat lowland. This soil type is an accumulation of wave and current erosion materials from the sea and form beaches.
Bolinao Clay	Well drained areas and calcareous hilly and mountain land. Surface soil is red-colored and heavy clay. Moderately friable when dry, sticky when wet. It has a good coarse blocky structure.

Fara-on Clay	Well drained areas and calcareous hilly and mountain land. The surface soil is black with blocky or granular structure, rich in organic matter and highly calcareous. The sub-soil is yellowish brown to grayish brown, good coarse granular and the sub-stratum is highly weathered limestone, light gray to gray, structureless, wholly made up of carbonates. Bed rock is hard coralline limestone.
Bolinao Clay, Steep Phase	Well drained areas and calcareous and hilly mountain land. The surface soil of this type is more stony and red, moderately friable when dry but slightly plastic when wet.
Faraon Clay, Steep Phase	Well drained areas and calcareous hilly and mountain land. This soil type covers the high, steep limestone hills and was formed from the underlying bedrocks of limestone. The original plant association of this type consist of molave type of forest.
Lugo Clay	Well drained areas and calcareous hilly and mountain land. Lugo clay is residual soil developed from lime shale. It has a characters of black surface soil which is thin. The absence of stones or rock outcrops and the fine granular structure of the surface make plowing easy. It is clayey and the surface soil seldom hardens upon drying, yet friable and is sticky and strongly plastic.
Mandaue Clay Loam	Moderately drained areas, and non-calcareous flat lowland. This soil is made up of alluvium originating from the inner uplands. The surface is free from any salt concentration outcrops or stones.
Mandaue Silt Loam	Moderately drained areas and non-calcareous flat lowland. This soil is developed on the western coastal part of the province forming the low level alluvial plains and fringing from the mountain ranges. The surface soil is free from any boulders or stones, so that deep plowing is possible. Along the river banks and in areas not cultivated, talahib, cogon and bamboo grooves make up the native vegetation. The sub-soil is clay loam and has a clayey is as thin as the surface soil.
Medellin Clay	Moderately drained areas and calcareous flat upland. The surface soil has a characteristic black color and the deep heavy clay is very sticky when wet and hard when dry. There is no stone or rock outcrop on the surface layer.
Mantalongon Clay Loam	Well drained areas and non-calcareous hilly and mountain land. This soil type is found on the south central portion of Cebu, occupying the highly elevated and very rugged mountains, dominantly covered by cogon and is fairly friable and can be easily worked. But due to it steep slopes, only small patches can be cultivated. Only soil type in the province that is slightly acidic.
Baguio Clay Loam	Well drained areas and non-calcareous hilly and mountain land. This soil type is residual formation and dark brown to brown surface with depth from 20~30 cm. Surface soil is rich in organic matter. Stone or rock outcrops are not common and there are only very few patches of arable land on this type.

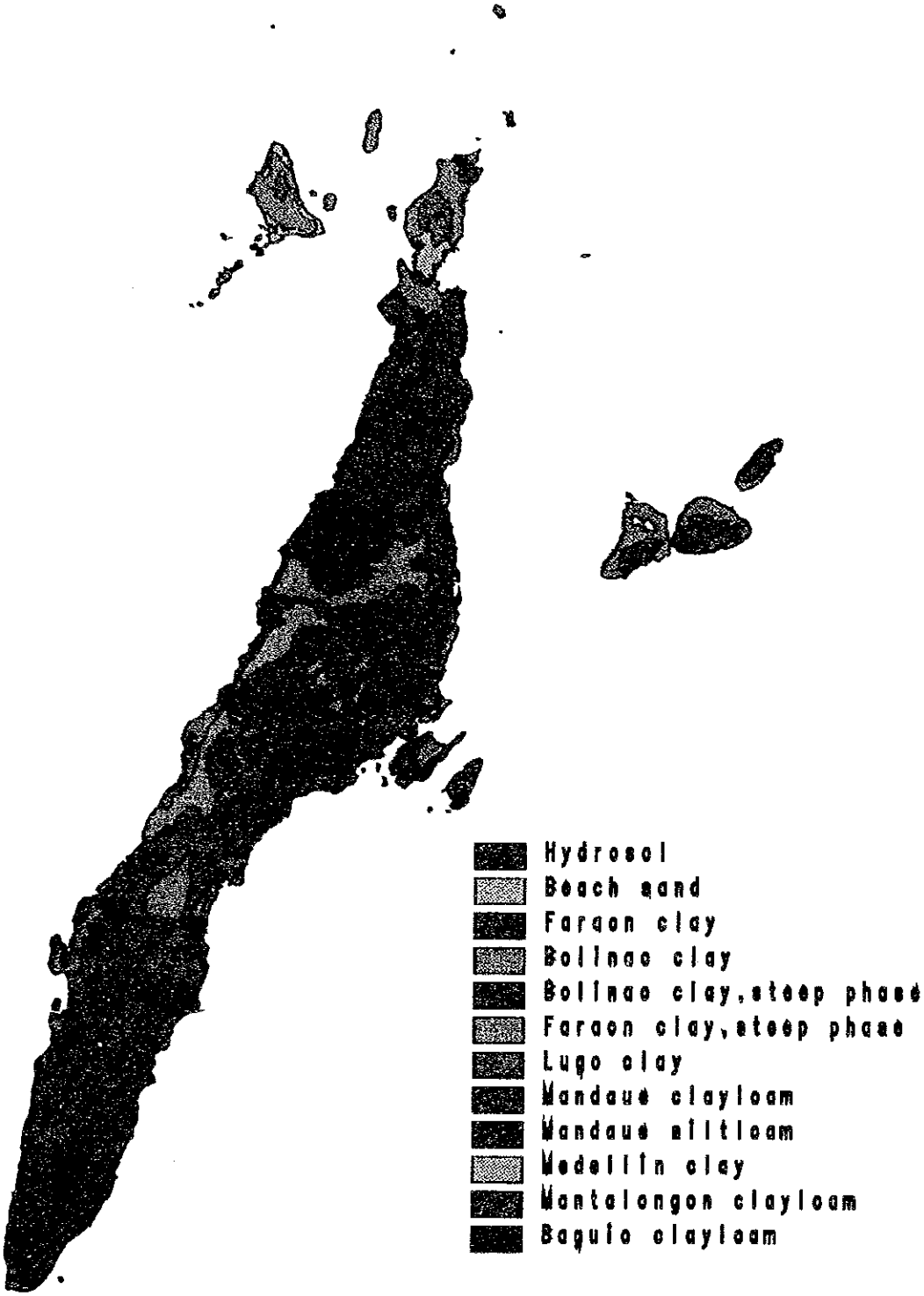


FIGURE 6.3.11 SOIL MAP

6.3.8 ENVIRONMENTAL CONDTIONS

(1) Environmental Constraints

Environmental Constraints Map is compiled by the overlay of the Erosion Map, Existing Land Use Map, Land Limitation Map and Geological Map (Figure 6.3.12). This map shows the distribution of environmental constraints in the study area. Severe Erosion Area is mainly formed in mountainous area with steep slope, shallow soil and few forests. The surface soil of this area will be eroded easily at heavy rain fall, if the existing vegetation (shrubs and grasses) cover is removed by development activities.

This area is also considered as a high risk for land slide, or land that may collapse due to steep slope and severe rock weathering. Flood prone areas found in coastal lowlands, which are easily reached by flood or high tide, however, are relatively limited. Forest reserves and National park are located in very limited areas in the central and southern central parts of the study area.

(2) Summary of Existing Physical Conditions

Based on the data analysis of existing environmental conditions in the study area, physical conditions are briefly summarized in Tables 6.3.13 and 6.3.14.

TABLE 6.3.13 EXISTING PHISICAL AND SOCIAL CONDITION

District	Elaevation	Slope	Geology
1	• Mainly less than 300m • Partly more than 500m	• Less thatn 8% in coastal area • Mainly 18-50% in hilly upland area	• Alluvium • Quaternary limestone
2	• Less thatn 100m in narrow coastal area • More thatn 500m in inland	• Mainly 18-50% partly more than 50% in upland area • Less than 8% in coastal zone	• Quaternary and tertiary limestone • Tertiary sandstone
3	• Less thatn 100m in coastal zone • 300-800m in inland	• Less than 8% in coastal zone • 18-35% in hilly upland • More than 35% in mountainous area	• Alluvium • Quaterry limestone • Cretaceous & tertiary sedimentary rocks
4	• Less than 300m in inland • Mainly less than 100m	• Less than 8% i coastal area of Bantayan island • 8-18% in upland area	• Quaternary & tertiary limestone • Limited area in alluvium
5	• Less thtan 300m in Northern area • Less thatn 100m in coastal area • More than 500m in inland	• Less thatn 8% in coastal zone • Mainly 8-35% in Northen area • More thatn 35% in mountainous area	• Quaternary limestone • Tertiary limestone & sedimentary rocks • Cretaceous rocks
6	• Less than 100m	• Mainly less than 8% • Partly 35-50%	• Alluvium • Quaternary limestone • Cretaceous rocks
7	• Less tan 100m in coastal area • More than 500 in inland	• Mainly 8% in coastal area • Mainly 35-50% or more in mountainous area	• Alluvium • Tertiary & cretaceous sedimentary rocks

TABLE 6.3.13 EXISTING PHYSICAL AND SOCIALCONDITION (CONT'D)

District	Main River	Topography	Existing Land Use	Natural Resources
1	• Managga • Daang-lungsod	• Alluvial fan to deltaic lowland in coastal zone • Hilly upland with medium to steep slope	• Corn/coconut • Cassava /banana • Built-up area (Housing)	• Limestone
2	• Argao Proper • Talaba • Putaw	• Narrow alluvial lowland along the coastal line • Hilly upland with flat top many concave & convex topo in limestone area	• Corn/coconut • Cassava/banana • Shrubs/grasslands • Forest	• Dolomite
3	• Balamban • Sapangdaku	• Deltaic lowland near Toledo and Balamban • Hilly upland with gentle to steep slope	• Corn/coconut • Shrubs/banana • Paddy rice • Irrgated	• Minerales (Copper, gold, limestone)
4	• Somosa	• Low lying coastal terrace • Narrow alluvial lowland • Hilly upland with gentle slope	• Sugar cane/corn • coconut	
5	• Danao • Kotkot	• Narrow alluvial lowland • Hilly upland with gentle to steep slope	• Forest/shrubs • Sugar cane •Coconut/banana	• Limestone • Guano
6	• No big rivers	• Alluvial fan to deltaic lowland & flat coral limestone island (Marctan & Olango)	• Built-up area •Coconut/banana • Fishponds	• Mactan stone
7	• No big rivers	• Hilly upland with steep slope • Alluvial fan to deltaic lowland in coastal zone	• Built-up area •Corn/coconut/ shrubs/forest/vegitables	

TABLE 6.3.14 CONSTRAINTS AND POTENTIALS

Distr-ict	Environ-mental Problems	Erosion Potential	Natural Disaster	Water Resoruce Potential	Lanuse Potential	Accessibility to Main City
1	• Water pollytion by waste water disposal	• Medium to severe in upland area • Lowland level in coastal zone	• Floodin gin coastal lowland	• Ground wwater in coastal lowland	• Higher demand for urbanization in lowland area • Protective land use in upland	• Good accessibility to Metro Cebu
2	• Not particular	• Medium to severe in upland area	• Land collapses or slide in steep slope area	• Ground water • Spring water • Limited surface water potential	• Protective land use such as reforestation, contour farming and conservation	• Relatively good in Eastern coast • Relatively poor in Western area
3	• Sediment-ation in Sapang-daku river by mining activity	• Medium to severe in upland area	• Land collapses or slide in steep slope area • Flooding in lowland area	• High potential in both surface & ground water	• Plenty of flat land in coastal zone suitable for urbanization, agricultue, industry, etc. • Protective land use in upland	• Relatively good accessibility toMetro Cebu
4	• Not particular	• Low level in coastal area	• Flooding in coastal lowland area	• Mainly grond water spring	• Plenty of flat land in coastal zone suitable for urbanization, agricultue, industry, etc.	• Relatively poor accessibility toMetro Cebu
5	• Water pollution in urbanized area	• Medium to severe in upland area • Low level in coastal zone	• Land collapses or slide in steep slope area • Flooding in lowland area	• Ground water use	• Relatively limited flat land • Protective land use in hilly upland area	• Relatively good accessibility toMetro Cebu except for Camote Island
6	• Water pollution by waste water disposal	• Very low	• Flooding in coastal lowland	• Mainly ground water use • Limited potential in Mactan Island	• Plenty of flat land suitable for housing, industry, etc. • Limited suitability of agriculture	• Good accessibility to Metro Cebu
7	• Water pollution by waste water disposal	• Medium to severe in upland area	• Land collapese or slide in steep slope area	• Partly critical condition of ground water use in coastal area by salt water intrusion	• Higher density of urbanization • Protective and conservative land use in upland area	• Vice-versa

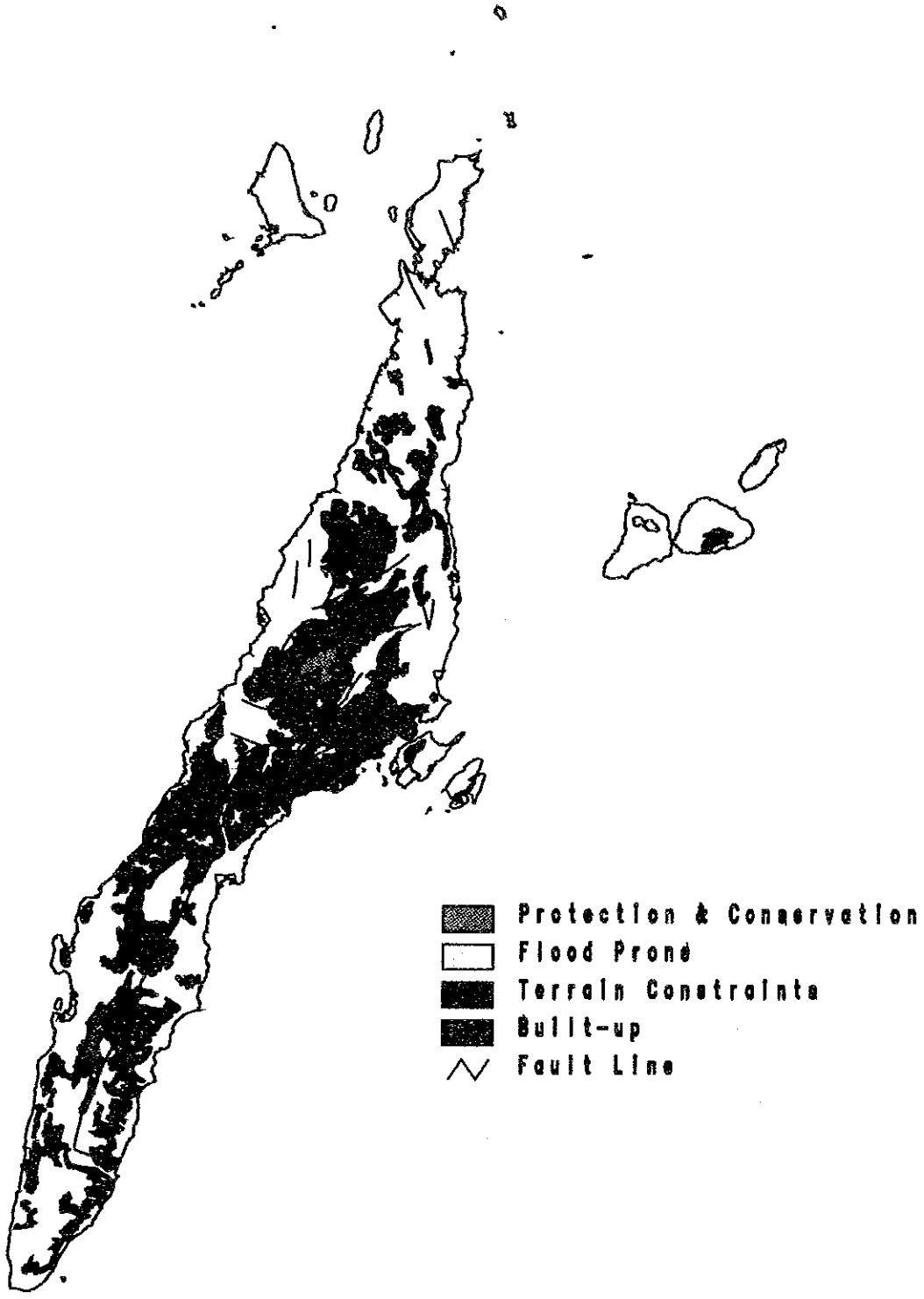


FIGURE 6.3.12 ENVIRONMENTAL CONSTRAINTS MAP

6.4 LAND USE SUITABILITY AND CONSERVATION SUITABILITY ANALYSIS

For this analysis, the basic data and the results of the primary data analysis existing environmental and physical condition in the study area are stored in the computer as an independent files in GIS system for the purpose of following up secondary data analysis such as suitability modeling. In this study, General Land Use Suitability and Conservation Suitability are analyzed by overlaying several environmental factors so as to provide the basic information for spatial framework of this study.

6.4.1 GENERAL LAND USE SUITABILITY FOR DEVELOPMENT

General land use suitability analysis is conducted by overlaying erosion map, existing land use map, slope map, environmental constraints map and soil map (Figure 6.4.2). Each factor is weighted according to the importance for land use. Municipal Boundary Data is also overlaid on the result of this analysis and area distribution of general land use suitability by municipality is calculated in Table 6.4.1. These procedures are shown in Figure 6.4.1.

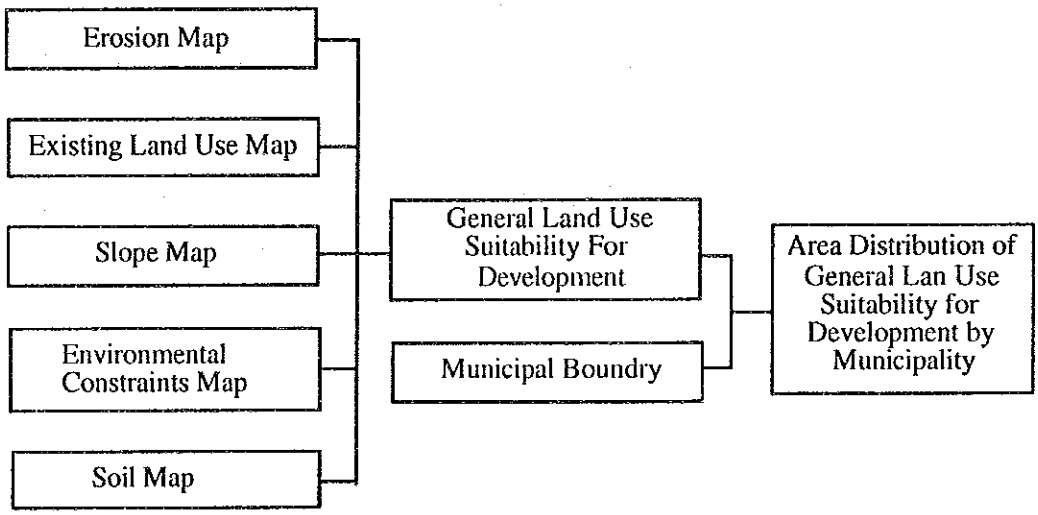


FIGURE 6.4.1 PROCEDURE OF GENERAL LAND USE SUITABILITY ANALYSIS

The general land use suitability is described as follows: most suitable area for land use is 64,580 ha (14%) in the whole Cebu province, moderate suitable area is 22,087 ha (5%), marginal suitable area is 118,483 ha (25%) and not suitable area is 265,617 ha (56%).

Most suitable area is evaluated as the area of low lying, flat land with low erosion potential, no environmental constraints and no legal restrictions and so on. This area is mainly distributed along the coastal lowland and considered as highly suitable either for

agriculture, urban or industrial land use. Yet, urban built up area in Metro Cebu, approximately 13,000 ha, is not included in most suitable area category.

On the other hand, not suitable area is evaluated as the area of steep slope, with severe erosion potential, shallow soil and having legally restricted area and so on. In the study area, 56% of the whole area is evaluated as not suitable for land uses and 25% (118,483 ha) is considered as marginally suitable. Therefore, 81% of the study area is considered not suitable for economical land uses. Land uses in these areas should be basically conservative or protective such as reforestation, contour farming in limited area and so on.

Moderate suitable area is occupying 22,087 ha (5%) of the study area. This area is suitable for agriculture, urban and industrial development with environmental measures such as slope protection of cut and fill.

From the district point of view, District 4 (34%), District 5 (25%) and District 6 (36%) have relatively wider areas of most suitable land. In District 2 (6%) and District 3 (5%), distribution of most suitable land is limited.

The municipalities of Talisay, Naga, Minglanilla, the cities of Mandaue and Cebu have limited most suitable area because of their being in the low land area and is evaluated as urban built up area.

6.4.2 CONSERVATION SUITABILITY

Conservation suitability map is derived by the overlay of erosion map, existing land use map, environmental constraints map and land classification map (Figure 6.4.3).

This map shows the distribution of specific area related to conservation such as forest land, national park, reservation, protection and conservation and so on. Flood prone and terrain constraints areas where the erosion potential is severe are evaluated as suitable area for conservation. Built-up area and alienable and disposal area are also shown in this map as one of the factors of land use decision and zoning.

FIGURE 6.4.2 GENERAL LAND USE SUITABILITY FOR DEVELOPMENT

TABEL 6.4.1 AREA OF GENERAL LAND USE SUITABLITY FOR DEVELOPMENT BY MUNICIPALITY (HA)

	Most Suitable		Moderate		Marginal		Not Suitable		Total
PROVINCE	64,580	(14%)	22,087	(5%)	118,483	(25%)	265,617	(56%)	470,767
DISTRICT 1	5,611	(12%)	2,147	(5%)	3,286	(7%)	33,959	(75%)	45,003
Talisay	71		0		106		3,892		4,069
Minglanilla	0		0		5		4,652		4,657
Naga	418		2		495		8,598		9,513
San Fernando	593		396		673		5,347		7,009
Carcar	2,612		856		389		5,817		9,674
Sibonga	1,917		893		1,618		5,653		10,081
DISTRICT 2	7,263	(6%)	4,992	(4%)	50,361	(40%)	62,017	(50%)	124,633
Argao	604		1,005		6,200		11,185		18,994
Dalaguete	745		697		2,440		10,493		14,375
Alcoy	489		0		1,202		3,426		5,117
Boljoon	205		225		3,465		4,761		8,656
Oslob	42		31		5,995		5,519		11,587
Santander	277		411		1,203		687		2,578
Samboan	13		0		4,747		841		5,601
Ginatilan	170		221		3,156		1,699		5,246
Malabuyoc	228		355		3,371		4,849		8,803
Alegria	219		358		5,400		4,206		10,183
Badian	751		574		3,953		4,818		10,096
Moalboal	1,755		353		3,696		1,639		7,443
Alcantara	390		203		981		750		2,324
Ronda	543		196		2,534		1,533		4,806
Dumanjug	832		363		2,018		5,611		8,824
DISTRICT 3	6,625	(5%)	2,595	(2%)	18,585	(15%)	95,651	(77%)	123,456
Barili	239		309		725		11,301		12,574
Aloguinsan	166		123		115		5,441		5,845
Pinamungahan	1,009		792		707		9,114		11,622
Toledo City	1,956		229		3,427		16,004		21,616
Balamban	1,126		242		242		21,750		23,360
Asturias	1,025		365		2,419		21,392		25,201
Tuburan	1,104		535		10,950		10,649		23,238
DISTRICT 4	21,619	(34%)	7,604	(12%)	23,603	(37%)	10,305	(16%)	63,131
Tabuelan	23		345		5,568		3,232		9,168
San Remigio	2,614		1,566		3,666		1,199		9,045
Daanbantayan	5,377		680		2,515		532		9,104
Medellin	3,479		1,174		1,073		1,014		6,740
Bogo	2,894		1,754		4,634		148		9,430
Tabogon	107		1,888		5,439		1,120		8,554
Santa Fe	865		0		0		741		1,606
Bantayan	4,885		113		614		1,294		6,906
Madridejos	1,375		84		94		1,025		2,578
DISTRICT 5	19,072	(25%)	4,484	(6%)	20,351	(27%)	31,165	(42%)	75,072
Borbon	706		615		4,693		2,152		8,166
Sogod	989		306		3,635		3,121		8,051
Catmon	396		573		3,025		5,319		9,313
Carmen	777		411		1,151		3,098		5,437
Danao City	1,617		285		3,445		5,472		10,819
Compostela	583		84		1,664		4,164		6,495
Liloan	1,597		43		200		2,558		4,398
San Francisco	6,205		917		1,378		917		9,417
Poro	2,825		538		295		2,877		6,535
Tudela	1,719		221		66		1,221		3,227
Pilar	1,658		491		799		266		3,214
DISTRICT 6	4,310	(36%)	80	(1%)	333	(3%)	7,287	(61%)	12,010
Consolacion	775		32		309		2,778		3,894
Mandaue City	0		0		10		2,618		2,628
Lapu-Lapu City	2,992		15		0		1,767		4,774
Cordova	543		33		14		124		714
Cebu City	80	(0%)	185	(1%)	1,964	(7%)	25,233	(92%)	27,462

Note: 13,000ha of urban built-up area in Metro Cebu is not included in most suitable area.

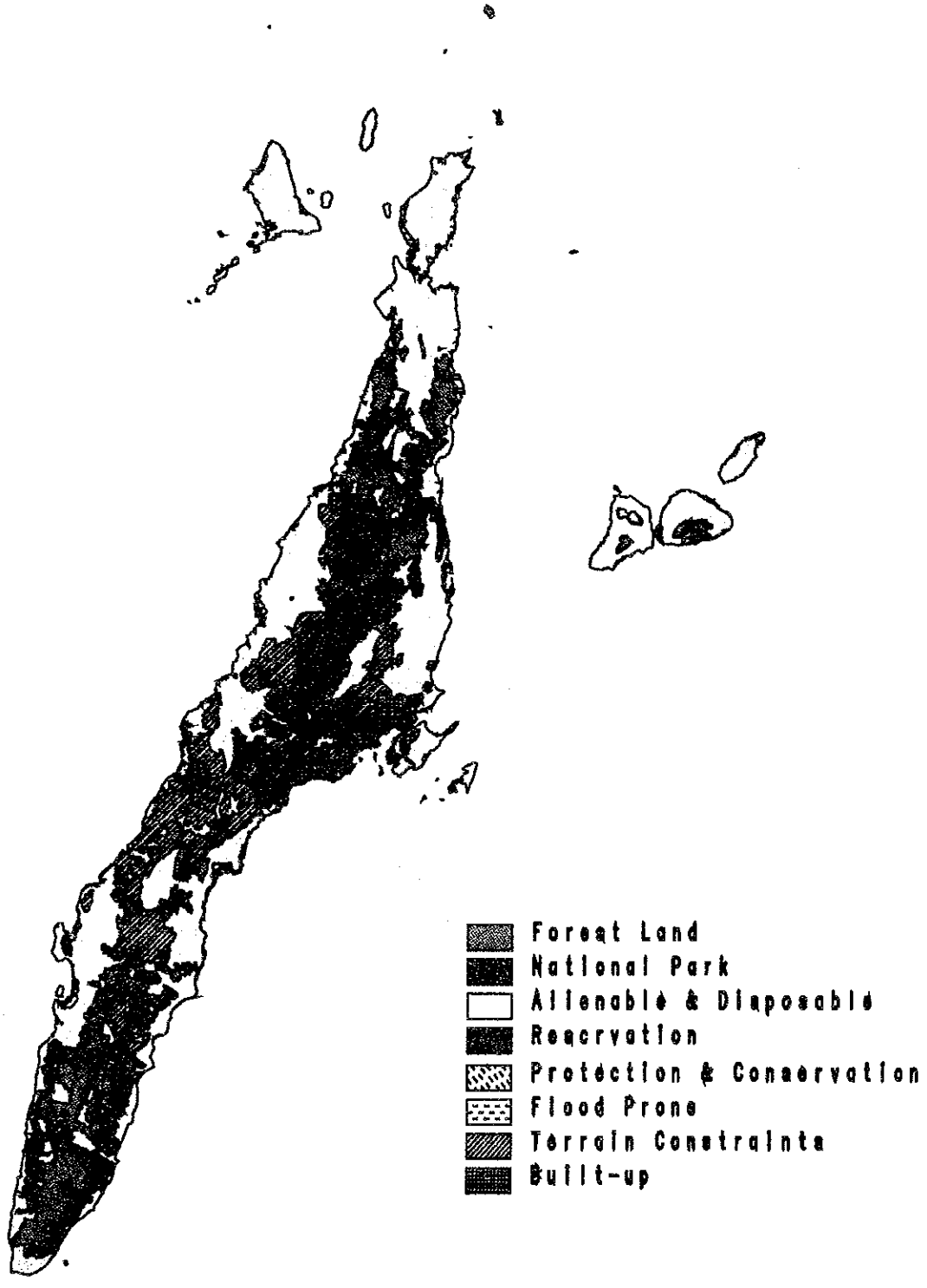


FIGURE 6.4.3 CONSERVATION SUITABILITY

6.5 LAND USE ZONING

Land use zoning map is compiled from the macro point of view by the integration of the outputs of the secondary data analysis to provide a regional index of future land use. Figure 6.5.1 shows the Land Use Zoning.

Land use zoning here is classified into the following five categories and the land use characteristics of Cebu are described as shown in the table below.

TABLE 6.5.1 LAND USE ZONING

Land Use	Description
Primary Agricultural Area	found in lowland areas with flat and low erosion potential. This area is also suitable for housing, industry and infrastructure development in general. Land use plan in this area should be well coordinated and proper demarcation should be prepared.
Protective Land Use Area	located in hilly upland area. In this area, protective land use activities such as contour farming and reforestation should be practiced. Environmental considerations such as soil erosion control, reforestation and watershed protection, etc. are the basic mitigating measures besides upland agriculture in this area.
Natural Conservation Area	s basically conserved and economic activities should be restricted except for the limited use specifically for tourism or academic purposes.
Urban Area	mainly found around the Metro Cebu area. Urbanization in this area will be further continued.
National Parks	located in the central area of Cebu island. These areas are designated as natural park area in land use zoning.

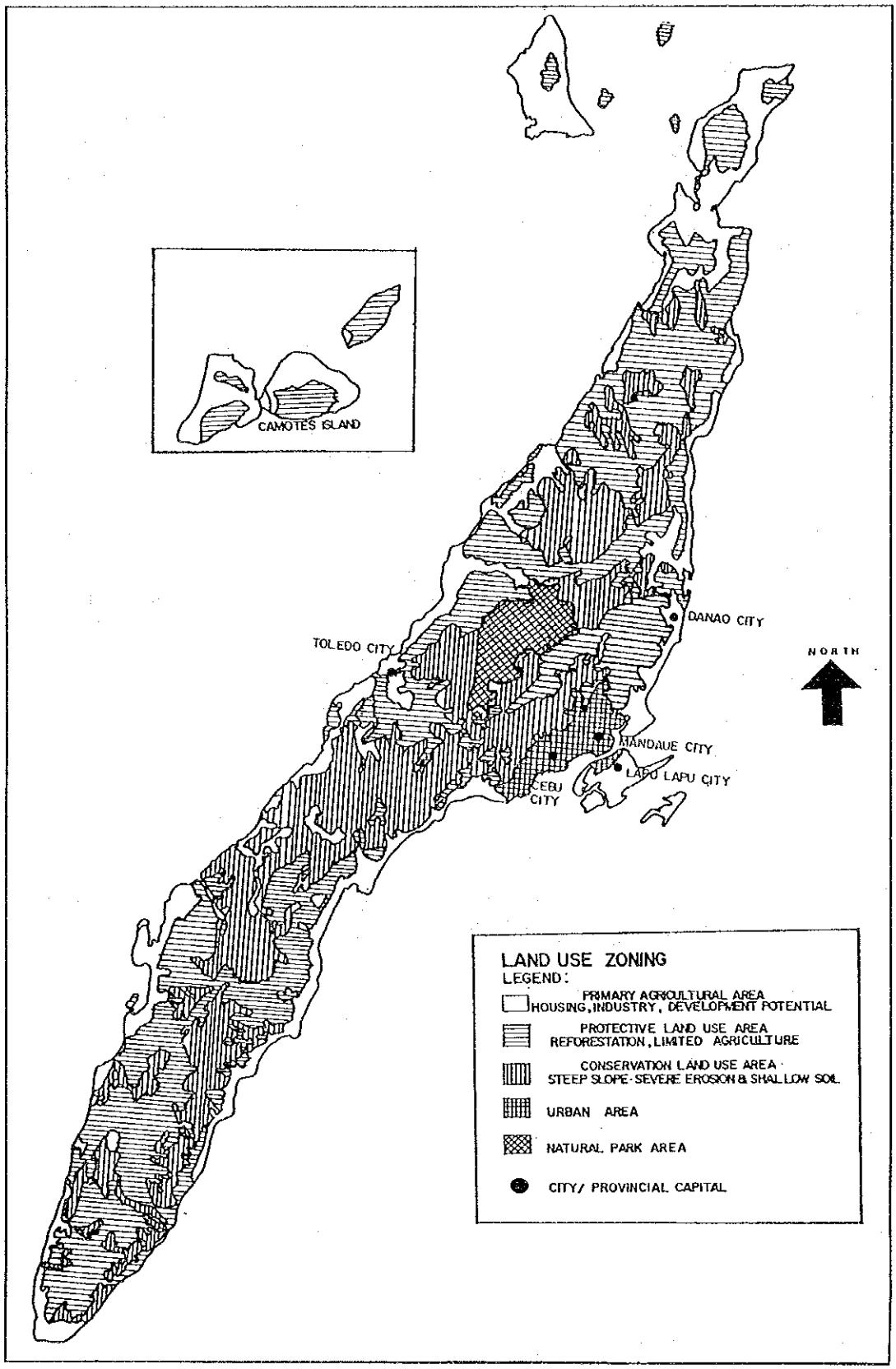


FIGURE 6.5.1 LAND USE ZONING MAP

6.6 SUMMARY AND RECOMMENDATIONS

6.6.1 LIMITATION OF LAND RESOURCE

Most suitable area for general land use in the study area is calculated at 64,580 ha (14%) and moderate suitable area is 22,087 ha (5%) according to the result of the data analysis. Most suitable area is mainly distributed in the coastal lowlands surrounding the Cebu and Mactan, Camotes and Bantayan islands. Given this limited area, proper land use planning and zoning should be done on a coordinated manner for compatible land use purposes.

Area of not suitable for general land use occupies 265,617 ha (56%) and marginal suitable area is 118,483 ha (25%). The total low suitable areas for land use reaches 384,100 ha (81%) of the study area. These extensive low suitable areas are either mainly hilly upland or mountains with steep slope, higher erosion potential, shallow soils and poor vegetation.

This means that the favorable land resources for future development is relatively limited in the study area. The local government must identify potential activities that can be of best use in these low suitable areas for future development.

6.6.2 DEVELOPMENT OF THE DATA AND INFORMATION

For the purpose of resource management and land use planning, detailed and correct data are indispensable. Data availability on existing situation of Cebu is still few and not progressing. Topographic map of scale 1:50,000 covering the whole province was compiled in 1950s and the contents of the map are already old fashioned, which really needs updating. Updating and recompilation of the topographic map is very slow and delayed. In Metro Cebu Area, a scale of 1:5,000 topographic map was prepared only recently by the technical cooperation project of German government (GTZ). But the coverage of this map is limited. Large scale existing land use map and soil map are not prepared yet. These data are supposedly the basic information for resource management and regional planning. Aerophotography is also not available for resource survey. Satellite images such as SPOT or Landsat can be applicable for data updating, however, these images should be carefully used due to the limitation of accuracy.

Data base development should also be pursued to support the future planning activity. Several GIS are already constructed and operated in Cebu, but the contents of the data base and the system capability should be largely enhanced and better still interrelate or interact as a network. From the medium to long term point of view, more investments should be made for the development of new base maps and resource inventories and computer-based information systems to support the regional planning and proper decision making.

6.6.3 LARGE SCALE TOPOGRAPHICAL MAPPING IN THE URBAN AREA

Preparation of large scale topographic map with scale at 1/1,000 - 1/2,500 for the urban area including local city and towns is very important. Large scale topographical maps can provide the basic information and material for detail urban land use planning, land use zoning, urban land use management, and utility management and so on.

These maps can also be used as the basic material for property tax assessment, if the property boundary is plotted. For local municipalities, large scale topographic maps should be prepared in mainly urbanized areas such as poblacion, where most activities and undertakings are concentrated.

6.6.4 ENHANCEMENT OF LAND USE PLANNING CAPABILITY OF LGUS

The local government units are now mandated to prepare their comprehensive land use plan. It is recommended that local municipalities must prepare the land use zoning in proper scale. Local officers in this field have reported the compilation of land use zoning map of having poor basic materials.

In order to promote and support the land use zoning and planning preparation of LGUs, enhancement training and capability-building of local experts are recommended as indispensable tools. The following study areas for land use planning are recommended:

- Methodology of basic data collection and acquisition
- Compilation of basic maps and statistics
- Methodology of data analysis and evaluation
- Basic concept of land use and management

6.6.5 PROPER LAND USE MANAGEMENT OF THE HILLY AREA

More attention should be focused on the land use of hilly area. Because of the limitation of flat land and the expansion of urban area, land use will eventually encroach into the hilly upland. Housing development for example are now seen in the surrounding hilly area of the Metro Cebu.

These developments should be carefully planned so as not to cause the environmental degradation such as erosion, land collapse or destruction of the natural scenic view of the landscape.

6.6.6 PROMOTION OF PROTECTIVE LAND USE IN THE UPLAND AREA

Many barangays are located in mountainous areas and the people living there are basically very dependent on agriculture. They are observed to be harvesting corn, vegetables, fruit, etc. from farms of steep slope with rocky soil.

In these areas, CVRP and reforestation project by DENR have been conducted in selected barangays. According to the experiences of these projects, many technical things have been accumulated. In order to recover the forest resources and environmental quality in the upland area, protective land use interventions such as reforestation, contour farming, micro-water shed management, etc. should be widely promoted.

The promotion of protective land use is recommended in such watershed areas like Balamban, Sapangdaku, Mananga and Kotkot. These watersheds are where the water resource developments are planned, but they have wider high erosion potential areas and many barangays located within the watershed have been given higher priority for the promotion of reforestation activity.

CHAPTER 7

ENVIRONMENTAL MANAGEMENT

CHAPTER 7

ENVIRONMENTAL MANAGEMENT

7.1 EXISTING ENVIRONMENTAL CONDITIONS AND ISSUES IN CEBU PROVINCE

7.1.1 OVERVIEW

(1) Topography

The island province of Cebu is generally mountainous except for the narrow coastal plains where the cities and towns are located. The mountain range rises gradually from the southern end of Santander but more abruptly on both the southeastern and southwestern coasts.

It starts as a rolling plain from Bogo down to Medellin and Daanbantayan in the north. The highest peak is about 1,000 meters above sea level in Central Cebu.

(2) Soil

The soil parent material in Cebu is basically limestone, especially along the coastal areas. Also, parts of the hilly lands in the region are shale, with a high calcareous content. Mismanagement of soil resulted to unproductive croplands.

Deforestation resulted to poor vegetable cover which eventually increase the susceptibility of the soil to beating action of raindrops and scouring effect of run-off.

(3) Meteorology

The Province falls under a combination of humid and moist rainfall. The climate is characterized by a short dry season usually lasting from one to three months. Table 7.1.1 shows that annual rainfall ranged from approximately from 700mm to 1700mm in 1992.

The Province is near the typhoon belt such that more serious typhoon affect the region. September and October are considered the wettest months while February to April are dry months. The climate of northern Cebu, however is characterized by no pronounced rainy period and no dry season either.

TABLE 7.1.1 RAINFALL IN CEBU PROVINCE

(unit : mm)

Station	1980	1985	1990	1992
Northern Cebu				
Kalanan	246.7	1,257.9	2,091.5	1,258.7
Medellin	1,480.2	1,449.0	-	-
Central Cebu				
Sinsin	1,660.9	2,037.7	2,447.7	1,018.4
Talamban	2,323.7	1,984.5	1,041.1	1,169.8
Lusaran	2,135.5	1,167.3	573.8	1,066.5
Mactan Airport	1,694.1	1,730.2	1,839.8	1,149.1
Adlaon	1,778.2	1,923.7	1,893.3	1,144.3
Southern Cebu				
Mantalungon	1,557.2	1,947.6	2,030.0	1,718.0
Oslob	937.7	998.8	767.6	697.6
Barili	1,428.4	2,127.6	1,047.1	711.0

Source: Water Resource Center

(4) Vegetative Cover and Conservation Area

The forest lands of Cebu occupy about 32% of the entire land area which is 508,830 hectares. The remaining portion which is 343,460 hectares is classified as alienable and disposable land.

Table 7.1.2 shows that conservation areas consisting of the proclaimed national parks, regular reforestation projects, watershed[1] projects and areas with slopes greater than 50%. Those areas set aside for production forest purposes comprise all timberlands outside of conservation areas which have slopes less than 50%.

7.1.2 UPLAND AREA

Of the total land area of 508,030 hectares, around 68% (343,460 ha) is classified as alienable and disposable while 32% (165,370 ha) is classified as timberland. However, actual land use does not follow such classification. Of the area classified as timberland, only 6.5% (10,879 ha) are covered by second growth forest and established plantations. The other areas have been converted to croplands (23.5%), under other types of unauthorized land use (5.5%) while the rest remains unproductive and idle (64.5%).

Cebu's watershed are all in critical condition. Soil erosion is widespread. According to the data by DENR and the land use analysis in this CIADMP study, only 18% of the total land area is free from apparent erosion. This sorry state is the result of the following environmental critical issues that continue even until today in upland area:

[1] "Watershed" has several definition. In this CIADMPS, we adopt the following definition. "wastershed" is the whole area that drains into particular river or lake.

TABLE 7.1.2 CONSERVATION AREA IN CEBU PROVINCE

Conservation	Area (has)
1) Central Cebu national Park	11,893
2) Sudlon National Park	696
3) Mainit-Mabugnao National Park	57
4) Cebu City Reforestation Project	7,236
5) Osmena Reforestation Project	2,710
6) Southern Cebu Refo. & Devt. Project	20,516
7) Lake Lanao Game & Refuge Sanctuary	692
8) Areas with slope more than 50% outside the above cited projects	2,234
TOTAL	46,034

Source: FMS DENR Region VII

Notes: 1) Mananga Watershed Project is Classified as conservation area with 6,325 hectares (Including A &D land) but its area is not reflected above since it is already covered in both Cebu Reforestation Project and Osmenia Project.
2) The total timberland area with slope more than 50% is 3,832.42 hectares. Only, 197.53 hectares is found within the identified projects hence only 2,234 is added.
3) A parcel of second growth forest is found within the above projects.

- Insignificant forest cover due to rampant cutting of trees for fuelwood, charcoal and housing materials, conversion of timberlands to farmlots, and, recently, rapid expansion of the road network and residential construction, especially in the foothills of Metro Cebu. The province is zero in terms of closed canopy forest;

- Inappropriate farming practices in the uplands contributes to soil erosion and denudation. Slash and burn farming prevents the regeneration of forest areas and increases the area of unproductive land once the farmer leaves the field;

- Population pressure and settlements in the upland areas including those with steep slopes coupled with improper land use and intensive and extensive cultivation. Most areas above 18% slope are planted with cash crops instead of forest trees without any soil and water conservation measures;

- Low production in agriculture and related activities mainly due to overuse and inefficient utilization of lands and other natural resources. Farming activities using inappropriate technologies are done even on steep slopes;

Aside from soil erosion, these issues also have other serious environmental effects. These are:

- Acute fresh water supply problem. Surface water is very limited because of siltation of rivers, lakes and reservoirs. The dependence on underground water has resulted to over pumping and saltwater intrusion;

- Adverse hydrologic change such as droughts, floods and deterioration of water quality; and

- Loss of valuable flora and fauna (genetic "erosion").

7.1.3 COASTAL ZONE AREA

Cebu's coastline has an estimated length of 827 kms (including islands and islets). The coastlines have several openings from river mouths of more or less 47 identified watershed rivers originating from the uplands. These river systems have their origins from many headwaters mostly found along mountain ridges.

At present, there is limited information as to the estimated total annual sediment load from these river systems. As a very rare example, Sahagun (1985) estimated that the sediment yield for Mananga River was 7,000 metric tons per sq. km per year. It is evident, however, that sediments generated by river flow as well as tidal and wind actions are responsible for the accretion and erosion in most coastal areas of the province.

While the coastal areas are affected by the degradation of upland resources, environmental issues arising from increased human activity along the coast is also a major cause of the degradation of the coastal zone. Among the critical issues in the coastal zone are as follows:

- Biodegradable, non-biodegradable and toxic wastes from industries, manufacturers and settlements are dumped into rivers, creeks, canals storm drainage the coastline destroy the natural marine habitat;
- Illegal and destructive fishing practices like the use of poison and dynamite aggravates the destruction of coral reefs, plankton and other living aquatic animals;
- Cutting of mangroves for fuelwood and charcoal-making and conversion of mangrove areas to other purposes like fishponds and reclamation projects likewise destroy habitat and breeding grounds of marine species;
- Siltation in coastal areas particularly along ports; and
- Coastal zone areas are subject to erosion and frequently deteriorated by extraction of beach sand and removal of corals.

7.1.4 METRO CEBU AND OTHER URBAN AREAS

Most of the coastal areas along Metro Cebu have industries and manufacturing facilities. Solid and liquid waste from domestic and industrial sources polluted the coastal waters thereby destroying the aquatic habitat of marine flora and fauna. Aside from industries, the coastal zone is site of ever increasing number of settlement. This is attributed to the unchecked population growth and the limited employment opportunities in the rural areas. Most of the migrants come from the rural areas in search for work in the City. The existing environmental pollution resulting from the rapid population growth and the unguided industrialization are characterized below.

(1) Water Pollution

(a) Ground water quality

To meet increases in water demand, exclusive and non-public wells for individual households are constructed. Proliferation of wells may result in over pumping which eventually will cause sea water intrusion (refer to Figure 7.1.1).

Results of MCWD analysis, for example, show that ground water salinity in Lapulapu pump station has exceeded the permissible level of the Philippine's National Standard Drinking Water. Table 7.1.3 shows that chemical quality of the coastal ground water in various points in Metro Cebu is characterized by the dominant ions of alkaline earth and weak acids (Ca^{2+}, Mg^{2+}, HCO^{3-}). Some wells near the coast as well as waterlogged areas between Consolacion and Liloan exhibit high chloride (Cl^-) content.

TABLE 7.1.3 GROUND WATER QUALITY IN METRO CEBU

(unit: mg/l)

Cation	Permissible Level	Talisay	Pardo	Lahug-Guadalupe	Talamban	Consolacion	Mactan	Compostela
Ca^{2+}	75	104- 160	52 - 125	87 - 104	80 - 116	88 - 121	88 -174	104 - 160
Mg^{2+}	50	22 - 34	4 - 46	15 - 30	7 - 280	2 - 14	-	5 - 49
Na^+	-	-	-	-	-	-	-	60 - 625
$NH4^+$	-	-	-	-	-	-	-	<0.02
Anions								
NO_3^-	30	4 - 7	7 - 30	7 - 36	7 - 13	4 - 13	9 - 1	9 - 31
Cl^-	200	14 - 17	17 - 61	14 - 55	15 - 36	14 - 130	43 -757	16- 889
$SO4^{2-}$	200	50 - 55	<0.02- 30	7 - 29	17 - 34	<0.02 - 28	10 - 37	17 - 150
Parameter								
TDS	-	492-526	350-646	414-584	384-508	326-700	354-1800	426-1762
TSS	-	4-56	2-32	4-34	2- 38	2- 18	6-104	6- 46

Source: MCWD

(b) Surface water quality

Metro Cebu's four major rivers (Busay, Butuan, Guadalupe, and Mahiga) and their tributaries are already in deteriorated state due to solid and waste water discharges. These rivers are now considered to be biologically dead.

In terms of heavy metal content, river water samples were analyzed at the University of San Carlos (USC) Water Laboratory for the following elements: Lead (Pb), copper (Cu), cadmium (Cd), chromium (Cr), nickel (Ni), zinc (Zn), mercury (Hg), and arsenic(As) (this is not heavy metal but one of the toxic substances). Numerous of times concentration of the heavy metal in water samples was found to have exceeded standard (Philippines Water Criteria for toxic for fresh waters - Class C).

The study was conducted from April 1992 to July 1993 by the German funded project "Industrial Pollution Control-Cebu" (IPCC). According to the study, especially, Pb and Cu are much concentrated in these river.

Furthermore, according to the water sampling data of DENR-EMPAS Region VII in 1992, in Butuanon river, especially, the value of Bacteria and Biological Oxygen Demand (BOD) far exceeded the permissible level by as much as from three to ten times in some sampling stations.

Also, Sapandaku river in Toledo City is severely affected by the mine tailings from Atlas Consolidated Mining and Development Corporation.

(c) Marine water quality

Marine water quality should also be maintained to make it suitable for sustenance fishing, conservation of wildlife and sustenance of tourism industry. But unfortunately, this is not so in some areas in Metro Cebu.

Case in point is Talisay. Table 7.1.4 shows that Coliform bacteria far exceeded the standard by as much as 24 times. Although any error should be considered in these data due to the inconsistency of sampling conditions, the situation is very serious considering that people in the locality still collect mussels for food in the shallow bay at low tide.

TABLE 7.1.4 COLIFORM BACTERIA IN TALISAY BEACHES IN 1992

(unit: MPN/100 ml.)

Station	Pook	Sawsawan	Cogon	Duljo	Ludo
Sampling date					
4/21	490	49	46	13,000	24,000
5/19	33	46	47	13,000	24,000
6/17	-	23	23	490	350
7/14	2,400	49	8	350	540
8/31	-	240,000	130,000	-	5
9/29	130	54,000	790	4,900	240,000
10/20	-	27	-	-	920
11/25	49	1	1,600	540	2,400

Source: "Environmental Profile Metro Cebu"
Note: Standard is 1,000 MPN/100 ml.

(2) Air Pollution

Air quality as measured in terms of Total Suspended Particulate (TSP) has likewise deteriorated. Blamed for this condition is the increasing number of motor vehicles majority of which are diesel-fed. Also responsible are stationary sources of air pollutants, e.g., power plants, industries, and manufacturing firms. Attendant to air pollution is noise and traffic nuisance.

In 1992, DENR Region VII reported that a number of air sampling stations, particularly, Mandaue Highway air sampling station failed in air quality standard of TSP from September to December (refer to Table 7.1.5).

Also, not only in the center of Cebu City but also along the South Coastal Road (National road) in Talisay City, the dust and noise nuisances with the traffic congestion already have suffered as unpermissible situation.

(3) Waste Problems

(a) Solid waste

The Metro Cebu Development Project Office (MCDPO) and the Department of Public Services (DPS), reported that volume of solid waste collection has indeed increased in recent times. Although DPS is responsible for the collection and handling of solid waste in Cebu City, it cannot determine the approximate quantity of solid waste generated yearly as significant volume of solid waste remain uncollected because these are dumped by households and at times by industries elsewhere. This determined but

definitely large volume of uncollected garbage which is dumped into rivers, creeks and canals, or burned causing additional burden to the already deteriorating environmental quality (refer to Table 7.1.6, and Photoes 7.1.1 and 7.1.2).

TABLE 7.1.5 AIR QUALITY TSP (PM-10) MONITORING VALUS AND EVALUATION IN METRO CEBU

Sampling Station & location	7/1/92	8/6/92	9/18/92	10/6/92	11/1/92	12/18/92
DENR Region 7 Office (Banilad, Mandaue)	117.14 (P)	113.94 (P)	55.30 (P)	70.70 (P)	105.80 (P)	70.10 (P)
San Miguel Corp. (Highway, Mandaue)	594.85 (F)	149.36 (P)	248.20 (F)	252.70 (F)	367.00 (F)	220.20 (F)
Marine Colloids Philippines (Looc, Mandaue)	193.23 (F)	33.6 (P)	136.0 (P)	92.94 (P)	146.50 (P)	117.20 (P)
Ludo & Luym Corp. (Tupas St., Cebu)	53.88 (P)	91.88 (P)	146.75 (P)	81.86 (P)	179.60 (F)	135.20 (P)
O. Cabando's Residence (Sudlon, Lahug, Cebu)	110.87 (P)	59.46 (P)	226.25 (F)	67.50 (P)	-	764.64 (F)
Engr. Abangan's Residence (Pardo, Cebu)	96.97 (P)	20.84 (P)	64.12 (P)	149.00 (P)	165.96 (F)	No Sampling

Source: DENR Region VII, "Regional Statistical Report in 1992"
Notes: T S P: Total Suspended Particulates (PM-10) = High volume with 10 micron particle-size inlet; Gravemetric.
T S P: Standard value (Short term) = 150 ug/cu. cm.
Evaluation: (P) denotes "Passed"; (F) "Failed"

TABLE 7.1.6 SOLID WASTE QUANTITY IN CEBU CITY

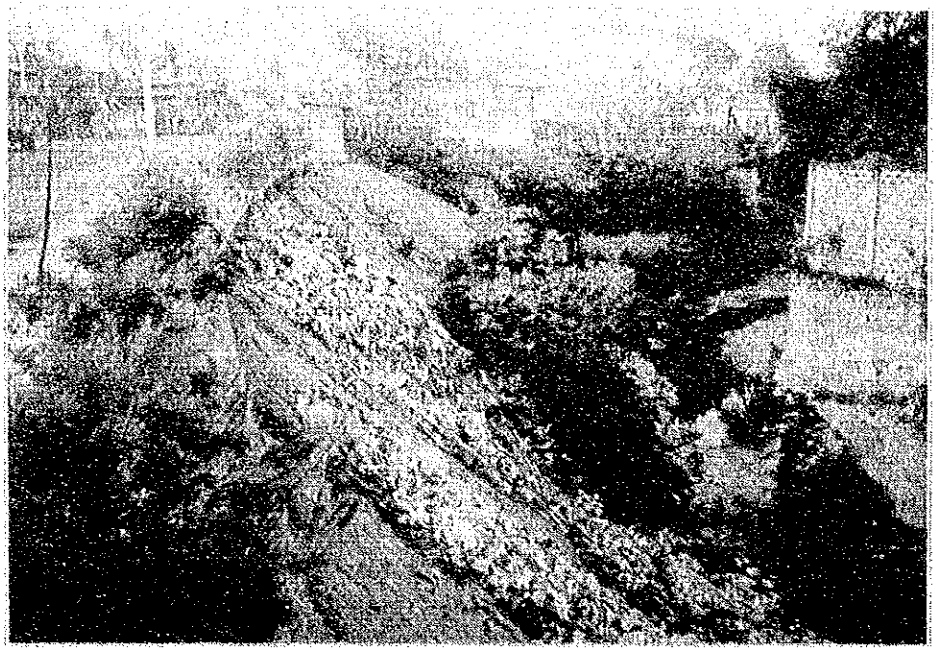
	(unit)	1991	1992	1993
Average solid waste generation	tons/day	363.10	-	-
Cover ratio	%	64.00	-	-
Total solid waste collection	1000 cu. m.	-	309.53	343.19
Average solid waste collection	cu. m./day	775.00	859.91	953.31

Source: 1) MCDP(PHASE II), "Report on Solid waste management (1991)
2) DPS, "Comparative Report on Volume of Garbage collected for 1992&1993."
Note: Average solid waste generation and coverage ration are estimated data by MCDP

(b) Industrial waste

Needless to say, the toxic and hazardous waste is considered the most serious environmental problems because of its effect on human health. Heavy metal contamination have disastrous effects. In Metro Cebu, most of the small and medium sized electroplating company do not have appropriate industrial waste treatment and disposal facilities. Also, there are reported cases of high heavy metal content of water samples in selected rivers in Metro Cebu.

In terms of the industrial waste, DENR-EMPAS is responsible for the management and control the waste. Although, appropriate policies and regulations are already put in place, enforcement seems to be the main problem.



Illegal dumping to Guadalupe river in the center of Cebu City. This is the only one of the examples. It can be seen that the same scene in every places in some rivers and creeks in Cebu Ctiy.

PHOTO 7.1.1 ILLEGAL DUMPING IN CEBU CITY

Uncollected garbage also can be seen in any time in the city not only the corner but also along the main street. some garbage was burned with the other undefined garbage. Some garbages are scattering on the street.

PHOTO 7.1.2 UNCOLLECTED GABAGE (BURNED) ALONG THE MAIN STREET

(4) Unsanitary Conditions

Reported cases of water borne diseases occur mostly in densely populated areas in the province. This condition exists due to the poor level or sometimes even absence of safe water supply as well as sanitary and sewerage facilities. Cholera, dysentery and diarrhea are among the leading causes of morbidity in Cebu City. Also, the number of the water borne diseases still increases in recent time (refer to Table 7.1.7). These do not include yet, the other impacts of inadequate waste collection and disposal on human health.

The World Bank in 1992 reports a high infant mortality rate in the Philippines in 1990 at 41 per thousand live birth, a notch lower than Vietnam although any discrepancy should be considered in this kind of data. Of the countries studied by the report, Thailand and Malaysia were able to substantially reduce infant mortality rates from the 1965 level (refer to Table 7.1.8).

TABLE 7.1.7 MORBIDITY NUMBER OF WATER BORNE DISEASES IN CEBU CITY

(unit : person/year)

Diseases	1988	1989	1989/1988	1990	1990/1988
Cholera	6	20	3.3 times	149	24.8 times
Dysentery	200	227	1.1 times	408	2.0 times
Diarrhea	4,259	8,188	1.9 times	13,326	3.1 times

Source: Department of Health

TABLE 7.1.8 INFANT MORTALITY RATE IN LOWER-MIDDLE AND LOWEST INCOME COUNTRIES

(unit: per 1,000 live birth)

year	Philippines	Thailand	Malaysia	Viet Nam
1965	72	88	55	134
1990	41	27	16	42

Source: World Bank, "World Bank Development Report 1992"

7.2 ENVIRONMENTAL MANAGEMENT IN CEBU PROVINCE

7.2.1 ENVIRONMENTAL ADMINISTRATION AND LEGISLATION

(1) Environmental Administration

In terms of exiting environmental administration, the main environmental agency in government is the Department of Environment and Natural Resources (DENR). However, other national and local government agencies whose main functions may not be environmental protection may also have regulatory or developmental functions that affect environmental policy making.

By virtue of Executive Order No. 192 issued in 1987, the Environmental Management Bureau was created within the DENR. Pursuant to the decentralization policies of the government, the regulatory functions of the DENR were delegated to the regional offices. The bureaus under the DENR, namely, Forest Management, Land Management, Mines and Geo-Sciences, Environmental Management, Ecosystems Research and Development, and Parks and Wildlife, recommend policies and programs for implementation by the regional offices of the DENR. As an exception, the Environmental Management Bureau (EMB) still performs regulatory function in the implementation of the EIA system because of the lack of trained manpower in the regional offices.

Thus the EMB implements the EIA system while the DENR regional offices implement the pollution control laws, rules and legislation.

Furthermore, there are other national agencies whose mandate affects the formulation and implementation of environmental policies.

The DA is in charge of the implementation of programs on soil conservation, measures to protect marine ecosystems, and the regulation of agriculture chemicals such as fertilizers pesticides. The Department of Public Works (DPW) is responsible for the construction of flood control systems, sewerage facilities, and solid waste disposal systems. Similarly, the Department of Health (DOH) takes charge of environmental health and sanitation; the Philippines Coast Guard enforces laws on marine pollution; the Department of Science and Technology (DOST) undertakes environmental research; and the Housing and Land Use Regulatory Board is responsible for enforcing regulations on land use.

(2) Environmental Legislation

The Philippine's national environmental legislation including the procedure for environmental impact assessment (EIA) are well formulated. Most of these are patterned after those of the United States. Noteworthy sectoral legislation are described below.

Aside from the sectoral legislation described bellow, other legislation related to the environment have been provided so far. What appears to be the problem is in the implementation and enforcement of these laws.

- Forestry — The Forestry Reform Code of the Philippines (PD 389 as amended by PD 705) updates and revises all forestry laws in the country. Emphasis is placed on the utilization of forest resources which will not disrupt the natural processes for growth and sustainability.
- Fisheries — PD 704 declares as State policy preservation of optimum productivity of fishery resources through conservation and protection. The decree prohibits and provides for penalties against destructive activities such as fishing using explosives, toxic substances, and trawl fishing in shallow waters.
- Minerals — The main environmental legislation related to minerals is PD 463. The legislation amends the Mining Act of 1936 which requires all mining lease contractors to comply with pollution control laws and regulations. Also, PD 1198 imposes fees on mine waste and tailings generated from mining operations.

- Air and Water Quality Management: In terms of air and water quality management, PD 984 as amended by EO 192 is main legislation. The legislation sets up the administrative and regulatory machinery for pollution control. The implementing rules and regulations of this law (as amended by DENR Administrative Orders No. 34 and 35 Series of 1990) establish air and water quality standards that define maximum allowable limits of emissions from industrial activities.

- Solid Waste Management: PD 825 stipulates that improper disposal of garbage and littering are punishable by imprisonment or payment of fine or both.

  Also, an important provision of RA 6969 is the outright prohibition of the entry of hazardous and nuclear waste and their disposal in the country

- Sanitation: PD 856 is probably known as the Sanitation Code of the Philippines. It places responsibility on local government units the provision of adequate solid waste disposal system in their area of jurisdiction. Also, the Code provides that industrial facilities shall be allowed to locate only in places provided by local zoning ordinance. The local health authority is empowered to determine the suitability of location where no zoning law, ordinance, or policy exists.

7.2.2 EXISTING NATURAL RESOURCES MANAGEMENT

(1) Upland Area

Current natural resources management programs in the upland of Cebu are being implemented by national line agencies, LGUs, and NGOs. The fundamental framework in these initiatives follows the concept of community-based resource management (CBRM), ranging from poverty alleviation, local capability building, delivery of basic social services, environmental advocacy and natural resources conservation.

The major natural resource development programs are the following three categories: 1) Reforestation, 2) Watershed Rehabilitation, and 3) Social Forestry.

Upland projects belonging to these program categories invariably exhibit in their design those measures that address the issues on 1) land use, 2) tenurial security in the uplands, 3) soil erosion control, 4) upland farming technology transfer, and 5) restoration of vegetative cover. Projects under these program categories are carried out both jointly and individually by the DENR, DA, LGUs, and a host of NGOs The main bulk of these projects are administered and financed by the DENR.

(a) Reforestation

Since 1989, the main mode of reforestation implementation is through contracts as provided under the National Forestation Program of the DENR. In this scheme, the DENR awards reforestation contracts to qualified families of upland farmers, LGUs, community organizations and NGOs. Reforestation costs are set to a maximum of twenty thousand pesos per hectare and paid in favor of the contractor on a progressive billing basis, subject to inspection and validation of field performance. This twenty

thousand pesos budget per hectare already covers all the activities prescribed under the contract, such as nursery establishment, seedling production, site preparation and planting, maintenance and protection.

On the other hand, contract reforestation projects involving larger areas such as those awarded to community organizations, LGUs and NGOs usually encounter difficulties in the implementation, i.e. supervision of planting crews, and financial management.

From the point of view of environment conservation, it appears from experience that while farmer contractors, although difficult to manage on account of their numbers, they are better able to implement contracts over a shorter period than what is normally required by contract on LGUs, community organizations and NGOs.

(b) Social forestry

The Integrated Social Forestry Program (ISFP) was launched by the Ministry of Natural Resources in 1982 through LOI No. 1260. ISFP includes such programs as Forest Occupancy Management(FOM), Communal Tree Farming (CTF) and Family Approach to Reforestation (FAR).

The objectives of the ISFP are the following:

1. To increase income and economic well-being of occupants and other marginal and sub-marginal upland farmers

2. To provide livelihood or employment opportunities to landless and other segment of the poor

3. To satisfy needs of rural communities for food, fodder, fuelwood, wood construction materials, raw materials for cottage and other rural-based forest industries

4. To accelerate reforestation and rehabilitation of open and denuded forest lands

Under the ISFP, actual occupants-cultivators of government-owned lands prior to December 31, 1981 are eligible to receive, and therefore be relieved of the fear of being resettled elsewhere, a 25-year renewable Certificate of Stewardship Contract (CSC). The CSC, which is transferable to his next-of-kin or predecessor-in-interest, guarantees the holder the privilege to occupy and cultivate his parcel of timberland subject to his compliance to the agroforestry prescription of 75% allocated for cash crops and 25% for forest and fruit trees including the adoption of soil conservation farming techniques. Furthermore, the CSC guarantees the holder the privilege to harvest all proceeds on his farmlot, including trees, crops and livestock, without the trouble of obtaining tree cutting permits otherwise required from non-CSC holders.

(c) Watershed management

The management of watersheds is likewise a responsibility of the DENR. In the province of Cebu, there are only two such projects, namely the Mananga Watershed Rehabilitation Project and the Asturias Watershed Rehabilitation Project. These are implemented in the traditional fashion whereby DENR personnel directly employ local residents as wage earners in such activities as seedling production, tree planting, construction of gabions, check dams, and other structures.

The scope and positive impacts of these projects to the local environment are negligible, being grossly constrained by meager funds. Limiting annual budgets project activities

to a few sporadic gabions and checkdams and the remaining funds are allocated to personnel salaries.

The Mananga Watershed is a queer case of bad management. At least there are four separate and equally persistent agencies: DENR, Protected Area Management Board (PAMB), Mananga Watershed Development Authority (MWDA), Metro Cebu Water District (MCWD), elbowing each other for a measure of control over its management, being equally justified and well-intentioned in terms of environmental conservation.

(2) Coastal Zone Areas

There have been no comprehensive projects and programs regarding natural resource management in coastal zone areas in the province before except only during pilot project implementation of the Central Visayas Regional Project I (CVRP-I) beginning mid-1984 up to 1992. As pilot project, natural resource management used the watershed approach at Badian-Alegria watershed-uplands and coastal (nearshore fisheries) through community-based resource management (CBRM).

As early as 1985, the Provincial Government of Cebu initiated replication of the same project to other municipalities of the province. It started by officially providing one million pesos provincial funds, and can be released only for exclusive project use if: (1) the municipal government staff would undergo one week theoretical and one week field exposure training, and can submit a natural resource management plan for either upland agriculture and coastal fisheries or both, and (2) municipal government can allocate from their own funds as counterpart of the provincial funds.

The scheme of implementation has been progressively expanding and more municipal government took part of the program. Unfortunately, the present provincial government stopped the counterparting of funds to municipal level for their community-based resource management.

Also, under the Institutional Strengthening Component of CVRP-I, the Regional line agencies of the DA and DENR were encouraged to focus their projects and program on appropriate technologies in the uplands inasmuch as more than 70% of the farmers in Cebu province are tilling lands for agricultural production in the uplands and even in timberland areas.

The Bureau of Fisheries and Aquatic Resources (BFAR) now merged with the DA formerly emphasized on fish production; improvement of fishing gear and motorization under its Expanded Fish Production Program. Only during the time of CVRP-I that BFAR attempted to include community-based nearshore fisheries management as part of its project activities in order to rehabilitate the degrading resource-base in the nearshore.

In the late 1980s, the Provincial Government of Cebu, the DENR, DA and the German Agency for Technical Assistance (GTZ) implemented the Cebu Upland Project (CUP) in selected southeastern municipalities of Cebu Province. This project focused more on upland development and management in the coastal areas.