Table 4.10 Crop Demand and Land Requirements

		Region III					Luzon				
		1990	1995	2000	2005	2010	1990	1995	2000	2005	2010
1	Human Population by Region (in 1000 persons)	6,191	7,005	7,925	8,966	10,145	33,234	38,716	45,345	53,409	63,282
2	Effective Demand for Rice and Rice Products (in metric tons)	736,729	822,862	919,065	1,026,516	1,146,528	3,788,934	4,229,180	4,723,079	5,277,418	5,899,875
3	Real Demand for Rice and Rice Products (in MT)	789,972	882,330	985,485	1,100,701	1,229,387	4,240,659	4,725,756	5,270,586	5,882,829	6,571,177
4	Buffer stock for rice (in metric tons)	197,493	220,583	246,371	275,175	307,347	1,060,165	1,181,440	1,317,647	1,470,708	1,642,795
5	Total Rice requirements (in metric tons)										
	a. Based on effective demand	934,222	1,043,445	1,165,436	1,301,691	1,453,875	4,849,099	5,410,620	4,901,296	6,748,126	7,542,670
	b. Based on real demand	987,465	1,102,913	1,231,856	1,375,876	1,536,734	5,300,824	5,907,196	6,588,233	7,353,537	7,106,972
6	Effective demand for corn and corn products as Food (in metric tons)	37,146	41,635	46,667	52,307	58,628	75,126	83,628	93,144	103,799	115,735
7	Corn requirements as Feed (in metric tons)	328,715	382,798	461,613	578,831	755,834	1,200,022	1,296,266	1,477,804	1,725,990	2,065,419
8	Total corn requirements (in metric tons)	365,861	424,433	508,280	631,138	814,472	1,275,148	1,375,893	1,570,948	1,829,744	2,184,155
9	Effective demand for coconut (in metric tons)	6,191	7,204	8,382	9,753	11,348	131,103	152,532	177,636	207,068	241,597
10	Effective demand for vegetables (in metric tons)	290,977	328,829	371,604	419,944	474,572	1,521,689	1,707,787	1,918,205	2,156,261	2,425,747
11	Real demand for vegetables (in metric tons)	315,741	356,814	403,230	455,684	514,961	1,694,934	1,910,033	2,154,114	2,431,230	2,746,019
12	Effective demand for root crops (in metric tons)	30,955	34,696	38,889	43,589	48,857	291,853	823,588	359,169	399,096	443,931
13	Real demand for root crops (in metric tons)	191,921	215,115	241,112	270,250	302,911	1,030,254	1,151,510	1,288,049	1,441,873	1,615,263
14	Effective demand for fruits (in metric tons)	241,449	282,908	331,485	388,404	455,095	1,168,686	1,364,598	1,594,675	1,865,041	2,102,943
15	Equivalent area requirement of crop demand using potential yield and recommended cropping index (in ha)										
	Rice (based on effective demand)	130,644	139,345	148,928	159,466	171,042	696,440	740,928	790,288	644,958	904,435
	(based on real demand)	140,086	149,416	159,691	170,991	183,403	779,800	827,860	881,442	940,949	1,007,030
	Corn	93,811	108,829	130,328	161,830	208,839	261,327	284,207	324,597	379,121	454,940
	Coconut	2,064	2,401	2,794	3,251	3,783	53,702	50,844	59,212	69,022	80,533
	Vegetables (based on effective demand)	13,699	15,482	17,495	19,771	22,343	91,435	102,466	114,917	112,414	128,756
	(based on real demand)	14,865	16,799	18,984	21,454	24,245	109,722	123,260	138,573	137,091	151,088
	Rootcrops (based on effective demand)	1,839	2,062	2,311	2,590	2,903	19,189	21,133	23,298	25,715	28,414
	(based on real demand)	11,404	12,782	14,326	16,056	17,998	62,014	68,992	76,825	85,622	95,515
	Fruits	8,048	9,430	11,050	12,947	15,170	50,347	58,525	68,098	79,310	92,456

Table 4.11 Growth Rates in Agriculture Value Added and Production volumes in Three Scenarios

rticular	Localization	Glocalization	Globalization
GVA Growth Rate	4.30	4.51	3.97
Production Growth Rate			
Rice	3.45	2.85	1.96
Corn	10.39	14.24	12.71
Vegetable	5.30	7.11	4.24
Roots and Tubers	11.55	10.92	12.40
Banana	9.01	9.46	8.60
Mango	6.80	7.34	7.57
Fruits and Nuts	18.38	18.56	16.27
Sugarcane	0.12	-0.79	-0.79
Coffee	23.72	19.07	15.79
Cattle & Other Lives	2.79	5.65	5.31
Hog	2.51	4.53	4.19
Poultry	3.47	5.93	5.59
Marine/Inland Fisher	1.70	0.63	0.63
Aquaculture	6.06	4.77	4.77

Source: JICA-CLDP Master Plan Study Team

CHAPTER 4

FIGURES

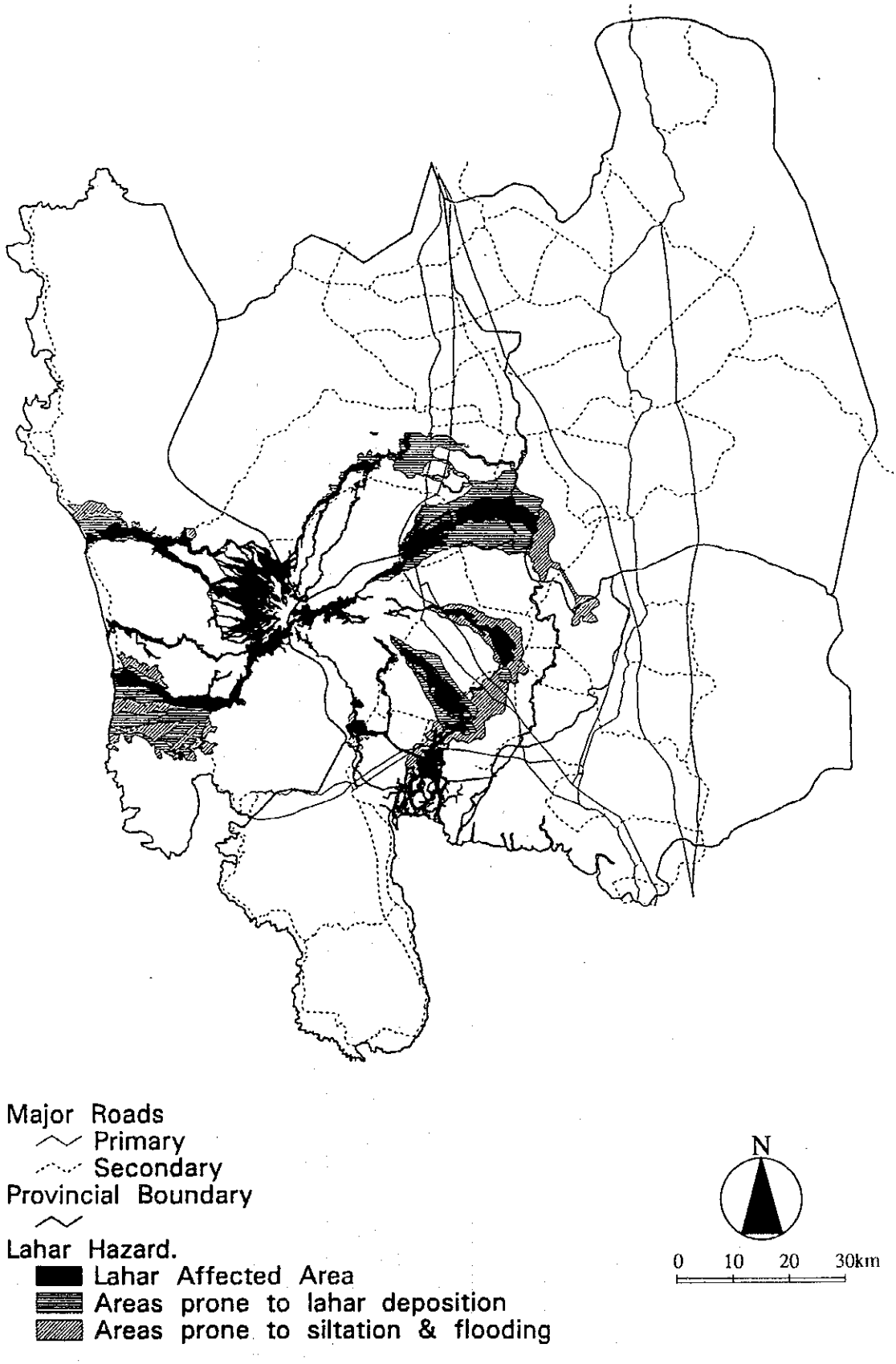


Figure 4.1 Lahar Hazard Area

Figure 4.2 Schematic Illustration of Proposed Land Use in Various Scenarios

LEGAL STATUS	A & D LANDS						PRODUCTION FOREST	PROTECTION FOREST
pedoecological zone	WARM LOWLANDS				WARM COOL UPLANDS		WARM COOL HILLYLANDS	COOL HIGHLANDS
existing land use	IRRIGATED PADDY	RAINFED PADDY	GRASSLANDS	DIVERSIFIED CROPS	DIVERSIFIED CROPS	GRASSLANDS	FOREST OR GRASSLANDS	FORESTS
potential land use	IRRIGATED PADDY	PADDY, CORN, VEGETABLE & DIVERSE COMMERCIAL CROPS			DIVERSE UPLAND & COMMERCIAL	MANAGED PASTURE	AGROFORESTRY & TREE CROPS	PROTECTION AREAS
proposed land use localization	IRRIGATED PADDY	MIXED FARMING, RICE & CORN WITH VEGETABLES AND PULSES		DIVERSIFIED CROPS	MULTI-STOREY FARMING		AGRO FORESTRY	PROTECTION AREAS
proposed land use globalization	IRRIGATED PADDY	COMMERCIAL VALUE ADDED CROPS EXPORT ORIENTED			MULTI-STOREY FARMING	MANAGED PASTURE	TREE CROPS	PROTECTION AREAS
proposed land use glocalization	IRRIGATED PADDY	MIXED FARMING	COMMERCIAL CROPS	DIVERSIFIED CROPS	MULTI-STOREY FARMING	MANAGED PASTURE	AGROFORESTRY & TREE CROPS	PROTECTION AREAS

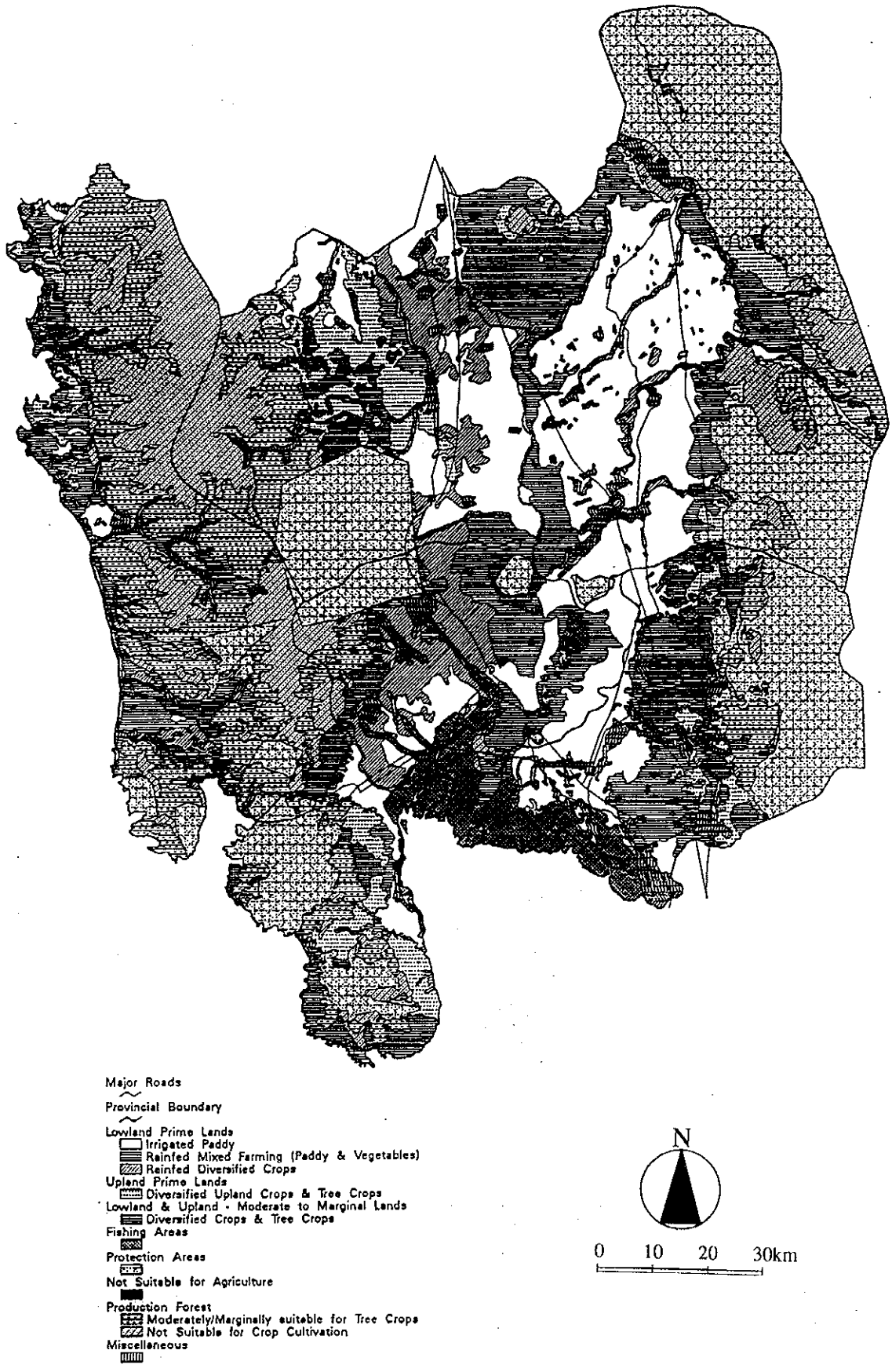


Figure 4.3 Proposed Land Use in 2010 in Localization Scenario

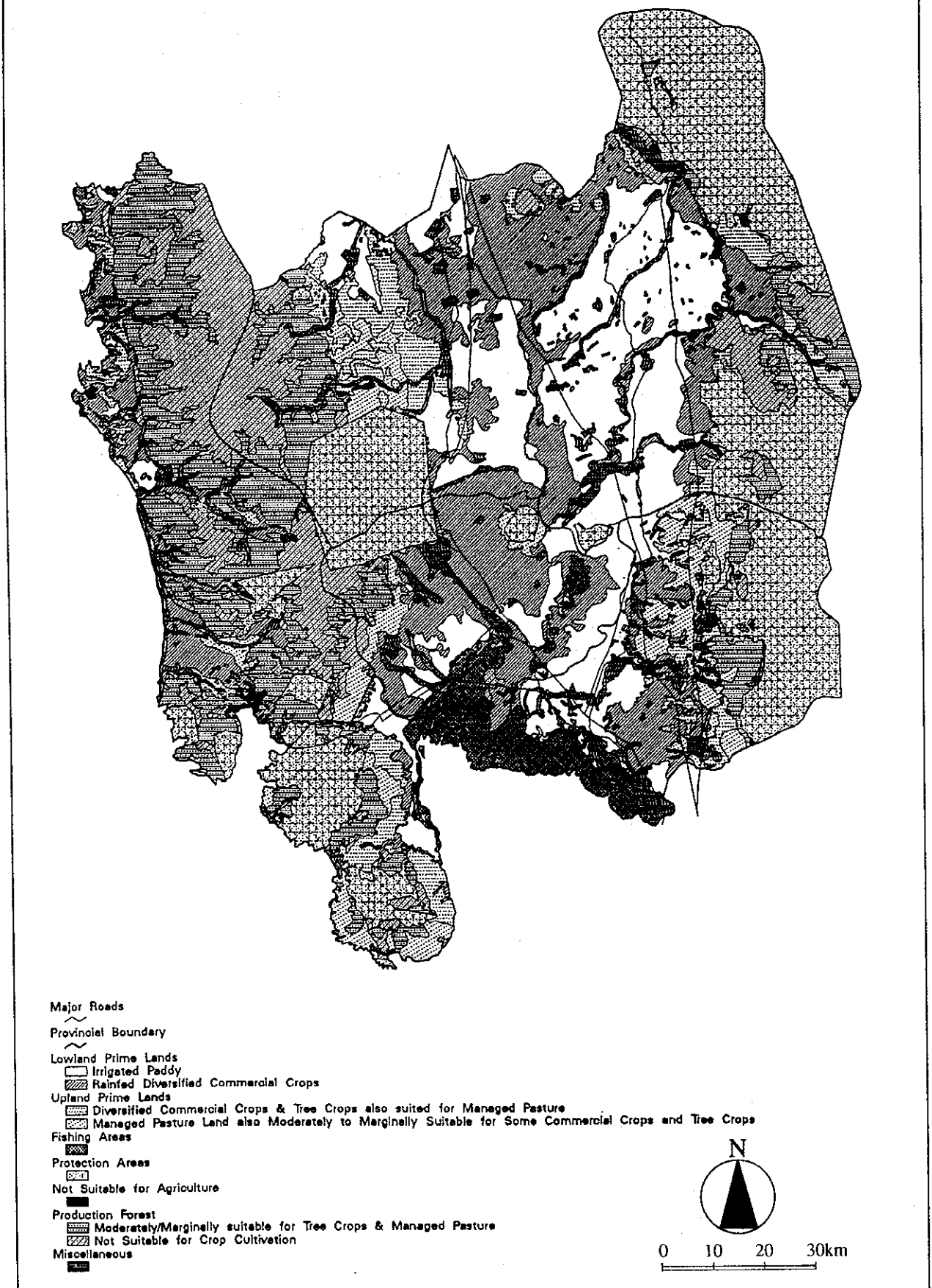


Figure 4.4 Proposed Land Use in 2010 in Globalization Scenario

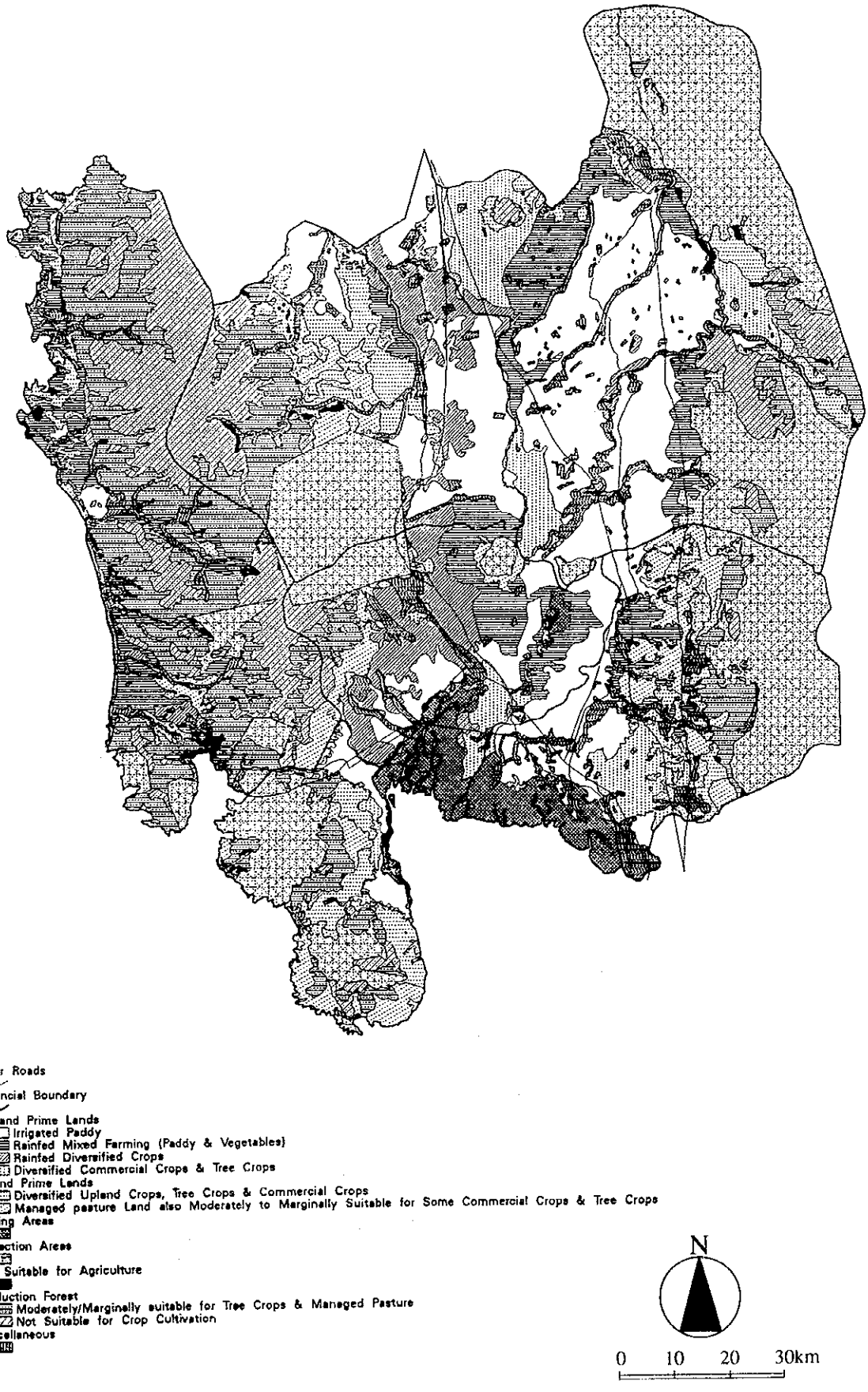


Figure 4.5 Proposed Land Use in 2010 in Glocalization Scenario

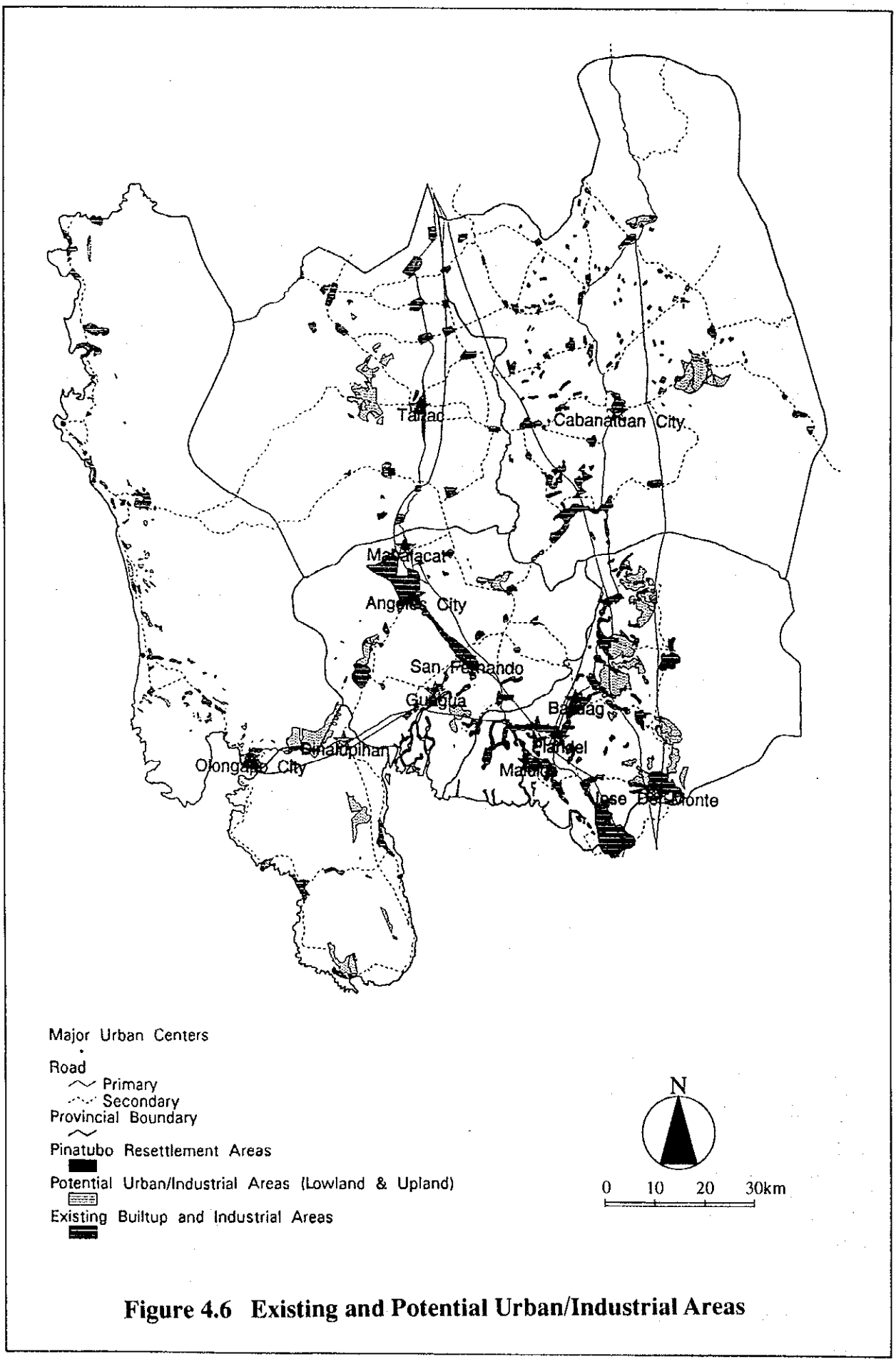


Figure 4.6 Existing and Potential Urban/Industrial Areas

CHAPTER 5

CHAPTER 5 RECOMMENDED MEASURES

5.1 Policy Measures

5.1.1 Political committment

First and foresmost, it must be stressed that a strong political committment to rural sustainability is essential for successful implementation of the proposed strategic framework. It has been observed many times in the past that the political context has vastly interfered with the best designed ventures. Land and natural resources conservation are not a vote winning issue with the electorate. Officially declared government policies concerning natural resources conservation and protection are not converted into actions because resources are allocated to more visible infrastructure programmes which promise more immediate benefits. New approaches to planning involving local communities and farmers could change this; but this needs to be supported by strong political committment and belief from the national and regional governmental units for targeting and achieving sustainable rural development.

5.1.2 Decentralization of decision-making and public participation

The design and implementation of agricultural, forestry and integrated conservation and development projects benefit from the devolution of planning down to the local level. The Government policy of decentralization needs to extend also to strengthening community self-management by supporting the formation of village development committees, village conservation committees, land apportionment committees, and less formal groupings such as cooperatives, farmer's associations, and women's groups. This will effectively lead to the formation of a community infrastructure which can provide a vehicle for popular participation in the land use planning process. In this alternative development paradigm, the main input of the ideas, needs and aspirations of the people are throughly discussed at the community level and fed into the community plan (municipality plan). The interface with government policy and strategic planning is when the province development plan is formulated by the government department in consultation with the elected community (municipality) leaders considering both the national and regional plans on one hand and the municipality development plans on the other hand.

5.1.3 Applied research, extension and adoption of innovative information dessimination methods

The need to strengthen the ability of both agricultural and forestry institutions is recognized to conduct applied research, and provide information and extension services to farmers and foresters on locally relevant technical innovations. Agricultural and forestry research programs need to re-define their objectives towards problem solving research, directed

towards providing practical answers to practical problems. It must be recognized that considering independent piecemeal research components concerning various aspects of farming like livestock, cropping and pasture would not lead to improvement in relevant or appropriate farming systems. Integrated research of the whole farming system involving multi-disciplinary teams is necessary. Again, more on-farm research and trials, and much more use of pilot studies are necessary to avoid the problem of mis-applied technology.

Extension was suggested in the strategic framework as the primary vehicle for land use improvement. Traditional extension services developed on experiences of developed countries of North America and Europe have often not been adequate in addressing the needs of developing countries like the Philippines because of the large number of farmers involved. Innovative approaches like the FAO's bottom-up or "learning by doing" integrated pest management, and the Training and Visits System (T & V) approaches need to be considered for adoption in Central Luzon.

The critical problem is how a limited number of extension staff can maintain contact with a large number of farmers. The T & V system in India uses selected "lead farmers" for the last stage of multiplying the dissemination of information. The system is also directed towards training of extension staff. In the Philippines as in other developing countries, education beyond primary level is concentrated in urban areas. Extension staff also face a transport problem. Thus, extension services are typically under-staffed and under-trained. The T & V seeks to correct these difficulties as follows.

- Regular training is provided to all staff, received from the next upward level of seniority.

- Orderly work plan imposed by a regular schedule for all officers.

- The extension agent does not attempt to meet every individual farmer, but on each of his two- weekly visits he spends a day or half a day with a group of lead farmers each of whom take the message back to his group of perhaps twenty other farmers.

In addition to the above, there are expanded roles the private sector can play in providing information to farmers as well.

5.1.4 Roles of aid and technical assistance

There are several changes in approach to conservation projects which need to be kept in mind in formulation of aid and technical assistance projects to improve their chances of success in implementation. Projects to be prioritized include those searching for agricultural systems which will allow sustainable land use, projects which stress on control of land degradation by

improved farming rather than through land conservation methods, and projects which stress on building up of the capabilities of local staff and local institutions so that they can manage their own affairs without external technical assistance. The role of NGOs or community based organizations (CBOs) in rural development is increasingly being recognized. Projects assisting organizations at lower levels or grassroot levels are needed. CBOs need to work within the existing social structure, and if necessary try to change it from within.

Aid and technical assistance projects in land husbandry should be formulated increasingly with significant direct assistance to NGOs and CBOs as well as LGUs to evolve a strong human community infrastructure for sustained participatory rural development planning, gradually assume increasing responsibilities for project activities during implementation, and particularly following completion. Lessons from past development programmes in the Philippines and other developing countries need to be considered in design of projects. There must be a strong committment to the programme by donor agencies, the host government and implementing agencies. There must be an unequivocal assurance that long term funding will be provided. Donor planning including this project should be cautious of "persuasive optimism" about forecasts of the effects of formulated projects. Agricultural systems change slowly and a ten-year horizon should be considered as the norm. Project design should be based on limited attainable objectives keeping in view the capacity of the recipient and local institutions to play their part in a proposed project - i.e. in implementation. Caution is necessary against over optimism about benefits of new agricultural practices, the ability of existing services to dessiminate new ideas and the time required to make things happen.

5.1.5 Strengthening institutions and organizational issues

The need for strengthening environmental institutions is acute in the forestry sector and those involved in protected area management. Staff trained to deal with social and participatory issues are needed, including modes of linking local communities and commercial forestry interests. Legal, administrative and financial means are needed to improve the ability of agencies to manage protected areas. Staff training and orientation towards conservation are necessary rather than production, encouraging initiatives to resolve conflicts between protected areas and people, to find ways to involve community groups and NGOs in protected areas management.

Managing protected areas requires organizational strengthening as follows.

- Systematic strengthening of forestry policy formation and planning and training of DENR field operations and support staff in the operational skills of "forest managers".

- Substantial increase in resources to improve mobility and communications at the field level for improved monitoring.

- Improving integrity in DENR operations by building multiple checks into monitoring ststems, transparency and accountability in decision making.

- Increased regional redistribution of DENR resources in line with decentralization and focus of field operations concentrating on NIPAS areas.

- Identification of areas where NIPAS areas and long established (ancestral) land claims overlap, and creating new local organizations to share management responsibilities in such areas.

- Creating new organizational arrangements for the involvement of existing settlers in NIPAS areas and in buffer zones near NIPAS area, in management of NIPAS areas.

- Strengthen the research capability of DENR's Ecosystem Research and Development Bureau by giving it more applied focus and an orientation that serves field operations.

Organizational changes for managing municipal fisheries include the following:

- Creation and strengthening of local organizations of municipal and barangay fishery resources to assist in control of access and management of stocks;

- Legislative empowerment of municipal governments to regulate access to municipal fisheries;

- More active protection by BFAR field staff, with the support of law enforcement agencies of municipal waters from illegal use by commercial fishermen;

- More active protection by DENR and local governments of municipal fishing waters from pollution; and

- Expanded use of NGOs to promote cooperation among users of municipal fisheries and education of municipal fishery users on habitats, life cycles and ecological system interactions.

"Best Practices" for strengthening environmental institutions - a concept for guiding both government and donor interventions with environmental institutions need to be developed. This could be by defining a set of technical areas to be covered by technical assistance (TA) followed by definition of steps leading to increased TA effectiveness.

In addition to the above mentioned traditional approach to institutional strengthening through TA, more innovative approaches need to be tried. One approach would be to combine traditional investment lending for environmental institutions with institutional enforcement. A second approach would require the close participation of bilateral donors. Under this approach strong institutional performance or policy reform favouring the environment would be rewarded with increased concessionality on environment-related loans.

5.1.6 Public infrastructure investments - impact and direction

There is a need for better analysis of the impact of public infrastructure investments on land use and settlement patterns, such as roads, irrigation, electricity and markets. In the absence of direct controls on land use (such as zoning in urban areas), decisions on public investment and leasing of public lands have profound land use impacts. More careful assessment of the social and environmental impacts of investment projects is necessary, together with more careful attention to economic incentives awaiting those coming in the tracks of infrastructure development.

Grants and concessional loans from international donors would be readily forthcoming for a well planned land and natural resources management program backed up by institutional and policy reforms. Public investment programs to upgrade land and natural resources management in Central Luzon need to focus increasingly on the following areas:

- Reforestation of critical watersheds;
- Forest nursery establishment and assistance for production and distribution of plant propagation materials required in upland conservation farming and agroforestry;
- Provision of equity to establish an extra-governmental development fund which would be used for: (a) community based NGO and local government projects to improve resource management and enhance livelihood among upland farming and coastal fishing populations; (b) enhanced private sector managed efforts to expand tree crops and tree plantations in uplands through nuclear estates and contract farming schemes;
- Provision of vehicles, communication and monitoring equipment required to upgrade the efforts of regional line agencies and local government units charged with enforcement of national and local resource use regulations in forestry and fisheries and provision of technical support to upland agriculture, community forestry, and coastal livelihood activities;
- Problem solving research areas identified in this CLDP program.

5.1.7 Approaches to making environmental interventions more self-financing

(1) Natural resources access and use

As long as access to natural resources (fishing areas, mangroves, uplands and forests) is relatively costless, leaseholders, small farmers and fishermen may not be induced to use sustainable resource use practices. Gaining access to resources must be made more costly to individuals or corporate groups. This calls for a capture of the full economic rent by the public sector for the use or purchase of public resources. This could be effected by calling for open auction bidding of access rights for licensing of commercial and baby trawlers, large scale fish traps, timber and mineral concessions, pasture leases etc.

For the public sector to succeed in capturing rents, government control of access to the land resource will have to be better enforced, so that illegal use of the resources becomes more costly than legal licensing or purchase. In view of the costs of enforcements, upgrading of enforcement efforts should be designed with revenue yielding efficiency as the main criterion. Efficient capture of economic rents by governments would have several benefits: (a) there would be ample sources of funds for resource renewal programs; (b) larger scale farmers and fishermen would begin to find intensification of production more advantageous than extensive production using a larger share of the resource base; and (c) the preemption of rents by governments would deflate the political and social conflict over access to public resources.

(2) Pollution control approaches

Pollution control approaches are an important element of any land management strategy. The most fundamental approach is to expand the application of user charges and "polluter pays" principles. Another promising idea is to use revenues generated from "green" revenue-producing policies, such as increased stumpage fees or land rents to cross-subsidize technical research and extension in more sustainable agricultural and forestry practices. This idea has direct appeal in Central Luzon and in the Philippines where the need for technologies for marginal and degraded lands is increasingly urgent.

A third approach is to build on the Envrionmental Fund concept used in Europe based on earmarked revenue sources, to help finance pollution control projects. A fourth and perhaps most promising approach is the use of "improvement levies" to help finance large infrastructure investments with positive environmental impacts (such as mass transit, sewage and sanitation, and water treatment plants). The idea of improvement levies is to broaden the tax base from those who directly use the investment i.e. metro system riders or water consumers (one usage) to those who enjoy the positive externalities (i.e. real estate owners whose property values rise as a result of improved access, and the wealthier communities

whose marginal utility from improved urban sanitation exceeds what they would have to pay based solely on water bills).

5.1.8 Technological alternatives favouring the poor

Certain land uses, or technological alternatives for land use, have implications for income distribution, which should be recognized in land use policy. The following appear to contribute more to increase in income of impoverished families rather than wealthier families or groups: (a) caribao logging (in residual or secondary forests), as opposed to capital-intensive logging, and community concessions as opposed to individual concessions; (b) upland crops cultivation, as opposed to ranching; (c) sustained use of mangroves (or mangrove replanting), as opposed to fishpond use; and intensification of fishpond production, as opposed to new conversions; (d) control of trawling effort (commercial and baby), as opposed to restrictions on other gears; and (e) natural farming and organic farming as opposed to mechanized farming with large input of fertilizers and pesticides.

5.1.9 Approaches to reforestation and upland farming

(1) Government policy thrust

The reduction of conflicting demands on public land as mentioned earlier necessitates a change in government policy thrust to reducing areas under direct government management with a corresponding increase in local and/or private management. NIPAS areas (identified and delineated) which need to be protected in perpetuity could be under the Central Government control. Scarce administrative resources should be concentrated towards managing these areas. All other areas should gradually devolve to local and/or private management. This might be the regional level for timber or park management, the provincial level for occupied, non-forested public land, the municipal level for near shore water areas, or the community level where indigenous communities already have adequate local management systems. The rent recovery right necessary for inducing sustainable management of resources also need to be transferred to the lower government or social level. Form and terms of ownership or use rights need to be modified to induce sustainable use of land.

Alternatives to "kaingin" farming like Sloping Agricultural Land Technology (SALT) and other integrated farming methods need to be developed at the earliest in the upland area of the provinces with active involvement of local people and NGOs. The Integrated Social Forestry (ISF) program could be promoted with further refinements. CSCs issued under the ISF are heritable within the 25-year limit, but otherwise non-transferable and thus not a "bankable" instrument. Despite the weakness of the CSC, it at least strengthens the land occupants against conflicting claims, e.g. of powerful absentee claimants. Collective CSCs called

Community Forest Stewardship Agreements, are issued mainly to organized tribal groups for common management of their community area.

(2) Reforestation

In view of the limited resources available with which to provide forests for future use, reforestation strategy should be based on benefit-cost analysis. Natural regeneration and enrichment planting of degraded forests are the least costly approaches, and should have first priority. Replanting of deforested areas is the most costly approach, and the least likely to succeed, particularly on sites characterized by poor or deteriorated soil. If watershed protection is the primary goal, cheaper and more effective alternatives should be explored.

Probably the greatest impediment to reforestation is the threat which reforested public lands pose to the interests of existing settlers and potential encroachers, because reforestation reinforces the Government's claim on the land. Hence only an approach which is fully accepted by the local community is likely to succeed. This will involve livelihood assistance, and short-term assistance such as employment in reforestation programs will not be sufficient. Fast-growing species for fuelwood (ideally fertility-restoring leguminous trees) should precede or be mixed with longer-maturing species. Intercropping with annual or tree crops should be supported, as well as interplanting of "minor" forest products like rattan. Phasing reforestation over several years to arrive at mixed age stands, and developing a community organization for management (including selective harvesting) of the maturing forest would also be essential elements.

(3) Upland farming

Experiences in the Philippines indicate that upland farmers are there to stay - exclusion is difficult and eviction impossible on any scale. The SALT package which has been most widely promoted by NGOs and by the Government through the DENR's ISF program and lately DA's upland extension work, is an alley cropping system developed and popularized by the SALT project of the Mindanao Rural Life Baptist Center in Davao del Sur. The main advantage of the SALT technology is that it is an integrated package; it provides short-term subsistence and long-term cash income; it reduces soil erosion and replenishes soil nitrogen. It is, however, a form of continuous cultivation, and this raises questions about how farmers are induced to make the transition from rotational to continuous cultivation.

In combination with various tree planting activities under the ISF program, alternative techniques (e.g., vetiver grass strips) may be introduced to reduce erosion . The major reason to encourage tree planting by upland farmers is to provide fuelwood and concurrently to protect timberlands against degradation. This has implications for the selection of species and location of plantings which should be recognized in upland extension programs.

5.1.10 Land tenure and reform

Assuming the land tenure issues in A & D lands can be cleared away under the CARP and by projects designed to achieve asset reform along with land reform, there remains the question of the extent to which the public's right to rents on public property should be transferred along with land use rights (essentially the present situation, as resource use fees are so low). For property which is not to be re-classified A & D and titled, it is most important to institute land use fee structures which approximate economic rents. Aside from increasing government revenues, the main purpose would be to eliminate the rent-seeking behavior which now causes land use patterns to deviate from economic optima, in particular exploitation of public land for uses which could be equally served by private land (e.g., fishponds), and preference for extractive uses over production (e.g., logging over plantation forestry or processing).

Disposal of public lands to poverty groups through A & D classification and titling or an improved form of CSC would be preferable to retention as public land, to create incentives for adoption of settled agriculture and conservation techniques.

Tenure provisions and land tenure issues in public forest lands could be tackled in various ways as follows.

- A census of forest or upland occupants needs to be conducted preferably by a non governmental institution with no vested interests in these areas, first to differentiate the population to distinguish appropriate ways of solving their problems. Land tenure issues of indigenous groups with long established land claims need to be tackled by legally recognizing indigenous common management regimes, which offer collective tenure in return for cooperation in resource management and exclusion of new immigrants. Better established groups could be induced to form development corporations to undertake management or conservation programs within the public forest under contract from DENR. Particularly impoverished groups might be the target for employment involving resource protection and facilities maintenance. Gatherers of forest products or fuelwood might have their access legitimized through licensing in return for observing some environmentally protective regulations, since selective gathering and harvesting are not inconsistent with conservation. Farmers or communities in buffer zones could be offered an improved version of the CSC contract (to provide increased tenurial security), as an incentive for adopting appropriate and conservative land use practices. The census and survey of the socio-economic status of forest land occupants, which would result in their differentiation, is thus critical to address their problems.

- The issue of new immigrants attracted by the prospect of tenured land occupancy, along with other economic improvements to upland or coastal areas, also needs to be addressed. Rather than restricting access to projects and programs like the ISF to occupants who can demonstrate residence in the uplands from a pre-determined year, an alternative approach could be to require new immigrants to pay for their occupancy rights on terms comparable to those of lowland beneficiaries of land reform, allowing for lower land productivity levels. This would be unnecessary for longer term residents, who usually can already claim ownership rights by virue of their length of residency, tax declarations and land improvements.

- The problem of illegal tenancies based on landlord claims to ownership of public land established through tax declarations needs to be addressed. Strong government actions are needed to undercut or weaken this practice, including particularly (a) provision of alternative source of local government revenues, (b) regulatory measures to preclude use of tax claims on public land as collatoral by banks, and (c) titling of such land, but only to actual occupants.

- Managed pasture leases should not be allowed in critical watersheds or near NIPAS areas, or the fee structure for pasture leases in or near environmentally fragile areas needs to be set at prohibitively high levels.

- CSC, pasture lease, Community Forest Lease (CFL) and other similar contracts need to be revised to strengthen their incentive value in promoting conservation agriculture, agroforestry and silviculture. They should be transferable, but only to land occupants, automatically renewable, heritable and probably divisable, subject to cancellation only upon failure of occupants to meet very explicit responsibilities, and should give rights to harvest or exploit all improvements made to land, such as trees planted. This would give CSCs or CFLs market and collateral value, and the recipient considerable tenurial security.

  The CSCs or CFLs should be available on a priority basis first only to established occupants, and after meeting their needs, be sold by the Government to new immigrants. The CSC or CFL needs to be offered as a stimulus and full titling as a reward, for adoption of sustainable techniques in farming and silvicultural activities. Typically, a 10 year transient period could be considered for the recipient to demonstrate use of sustained land use practices, to be awarded by full land titling. In coastal resources management, again appropriate tenure instruments for control of seabed and shoreline areas need to be defined and evaluated along the lines of CSCs, in order to promote investments in mariculture and use of artificial reefs as well as sustained fishing practices.

5.1.11 Land Resources Information Center

This strategy calls for the setting up of an integrated natural resource information center for Central Luzon using a geographic information system (GIS). NEDA Region III office in San Fernando, Pampanga has built up significant expertise in this area. With additional technical and logistical supports, it could be the location for the regional information center. This is to serve as a basis for reliable and efficient planning, enable geographic analysis of problems, and reduce confusion on sources of information from different agencies as in the case at present. A main center along with sub-centers located in different participating agencies like DTI, BSWM and DENR, as well as in each province connected by an appropriate network needs to be developed. This would also help in decentralizing collection and compilation of natural resources information to the provinces and lead to buildup of expertise at the province and local levels.

5.2 Technical Approaches

Matching existing land use with its potential is the objective of improving land husbandry. Technical approaches form an important part in achieving this objective. Before discussing technical approaches to land management, a change in emphasis in line with helping the poor subsistence farmers need to be stressed. Conventional land management approaches start with sound land use and appropriate mechanical protection works, followed by improved farming methods. However the poor subsistence farmer cannot afford a large investment of cash or labour in mechanical works. Hence, first priority is to propose improved farming methods which help conserve land resources and follow up with mechanical works where they are necessary to supplement good land husbandry. Changes in farming systems or methods which lead to improved land conservation need to demonstrate to a farmer as leading to increased production or as better optimizing the use of his resources.

For new farming systems or technology to be adopted enthusiastically by farmers, it must result in clear on-site benefits offering short-term improvements with large increments. The improvement must also occur within the timespan of the farmers' planning. For crops, this is typically one year or shorter. New technology must not require foregone benefits, particularly food. It must not increase risk and preferably should reduce it. Lastly, a technology which is the development or improvement of an existing practice will be accepted more readily than something which is completely new. New technologies developed in the Philippines which have potential for adoption in Central Luzon like artificial reefs, mariculture, and upland farming techniques like SALT, need to be proven and demonstrated through economic oriented field research and pilot studies. Approaches are discussed below under the broad land use categories of (a) lowland and prime agricultural lands, (b) uplands, hillylands and production forests, (c) lahar areas, and (d) coastal and fishing areas.

5.2.1 Lowland prime agricultural lands

The objective is to practice sustained intensified agriculture in the prime agricultural lands, a significant part of which is irrigated. This is to be done by careful management of external inputs in order to achieve an equilibrium between high output and conservation of the resource base. Priorities include maximization of biological fixation, increasing efficiency of fertilizer use, improving weed control, improving water management at the farm level, and substituting agronomic and biological tools for chemicals to control pests.

Sustainable intensification of irrigated lands need to be increasingly science based. More careful caliberation of fertilizer needs - such as the balance between the three main components of fertilizer, can lower application rates while improving yields. Mixed and integrated farming and livestock systems, involving both foraging and use of manure need to be promoted in irrigated as well as rainfed areas. Improved germplasm will contribute to local yields not only in foodcrops, but in speciality cash crops and perennials. An integrated approach to water resources management is necessary and ways to improve irrigation water use efficiency need to be promoted.

5.2.2 Uplands, hillylands and production forests

Aiming at development and promotion of appropriate cropping systems which are profitable, environmentally sustainable and in line with the land's potential is the priority for management of uplands, hillylands and production forests. Though inappropriate land use is to be avoided or corrected, it must be accepted that it will continue, and may even increase. Therefore sufficient attention needs to be devoted to developing technology, and agro-farming and agro-forestry systems on steep lands. Upland dwellers need to be involved and convinced to adopt the developed technologies.

Various models exist for developing agriculture or agro-forestry in uplands, hillylands and production forests. Agro-forestry can be defined as the use of trees and shrubs with crops and pastures, and possibly livestock, in an integrated farming system. Perennial crops are ideally substituted for annuals, given their much greater drought tolerance and soil conservation characteristics. In degenerated swidden areas and secondary growth forests, there are opportunities for taungya cultivation (crops are cultivated between tree plantings, and as the trees grow the farmer is given a new piece of land to repeat the process), fallow period management, intensive mixed cropping, multi-storey farming and perennial cropping. However, it must be remembered that such cropping models are highly site-specific, and the need to be tested and adopted locally, preferably as part of a strengthened extension system working with farmers. They also cannot be considered outside of available markets and the need to return profits. Figure 5.1 shows an integrated package of land use practices from

Malawi as an illustrative example. Similar packages need to be determined for Central Luzon through increased research and pilot testing.

Poor farming methods which result in loss of vegetative cover are the main cause of soil erosion. It was emphasized earlier that technologies which are low cost, short-term and easily adopted by farmers and upland dwellers and which involve no or little mechanization need to be developed. Detachment of soil particles can be controlled by adopting appropriate soil management practices which will increase soil organic matter content, prevent the formation of soil crusts and compacted layers and which generally improve the soil structure and water holding capacity. In terms of crop management and agronomic measures this involves making more and better use of crop residue for mulching, introducing better crop rotations, promoting relay cropping, improving pasture management, contour cropping, and strip cropping.

Structural measures such as bench terraces, check dams, gully plugs, and diversion ditches used to control runoff on lowlands are not very cost effective on marginal lands like degraded forest area and steep land. Alternative approaches that are low cost, short term and easily adopted by local communities need to be determined. Some of the most promising approaches involve vegetative technologies (contour planting, planting grass and legumes, vegetative crop cover management, contour hedges and contour farming). Several species have been proposed for conservation use including napier grass, vetiver grass, and the tree species leucaena.

Vegetative systems have other advantages over structural systems than their low cost. Unlike structural measures which require detailed site planning, vegetative measures require relatively less technical input. Individual farmers can proceed under their own initiative.

5.2.3 Lahar areas

Observations of standing crops affected by Mt. Pinatubo in Central Luzon showed that banana, sweet potato, patola and ampalaya were not adversely affected by ash/sand fall. The agricultural areas covered or prone to lahar hazard should aim towards cultivating crops which are relatively unaffected by ashfall or lahar or which grow well in lahar affected soil. Research findings have determined that lahar can support the growth and development of selected farm crops and ultimately give reasonable yields when provided with adequate amount of water and fertilizer. Some varieties of sweet potato, asparagus, cassava, mungbean, peanut, red cowpea, pigeon pea, corn, sorghum, sesame and leguminous cover crops have been reported to be suitable for growth in lahar areas. It has also been reported that a number of fodder and pasture species may be grown in lahar.

5.2.4 Coastal and fishing areas

Artificial reefs (ARs) which are simple structures made of bamboo, cement, rubber tires, or other materials represent an attempt to approximate the nutrient trapping function of natural coral reefs, although it is impossible (at reasonable cost) to match a design which evolved over millenia precisely to serve these functions more efficiently. AR fishing requires no fuel and hence have an economic advantage. ARs also tear nets and keep trawlers away, thus redistributing the catch in favor of small fishermen. ARs are also effective attractants or concentrators of fish. ARs thus need to be promoted as they represent one means of privatization of coastal resources and could provide a productivity increasing nucleus around which more extensive common property management schemes could be constructed. Research into profitable use of ARs need to be supported.

Other activities which have promise but need to be more actively researched include establishment of reef santuaries, which are effective in increasing fish yields in nearby areas, and mariculture, which ranges from seaweed, mussels and clams to more exotic shellfish.

5.3 Development Targets

Development targets of land utilization in Central Luzon in the year 2010 are determined on the basis of proposed land use determined for the glocalization scenario (Table 5.1).

Presently lahar covered areas (52,320 ha), lahar potential areas (47,625 ha) and flooding and siltation prone areas (35,055 ha) are not included in the land husbandry improvement. These areas when located in public forest lands should be targeted for natural forest regeneration, or otherwise no action or intervention is recommended until the year 1998, upto when the threat of lahar is expected to be present. Thereafter, based on the experience gained by field observations of lahar covered areas and active pilot research into plant growth and survival, these areas should be targeted for appropriate agro-forestry development with active involvement and participation of the local population which was displaced or resettled from these areas due to the eruption of Mount Pinatubo. Some of the lahar hazard areas on A & D lands in the short term could be target areas for extensive research efforts for crop cultivation, use of ash as construction materal, other industrial uses, and also for ornament preparation. Until 1998, it can be expected that agricultural support services for these areas for normal sustained crop cultivation would be minimal. Thereafter, these lands provide opportunities for diversified uses including conversion to industrial or built-up areas or possible reversion to agricultural use.

The exact state (land cover, soil and vegetation) of these lands and the development needs of areas where these lands are located, should shape governmental policy after 1998 to give direction and determine appropriate land use for these presently lahar hazard prone areas.

A total area of 768,000 ha (42.6%) are determined to be prime agricultural lands targeted for intensive cultivation of various crops. Of these, presently irrigated areas targeted towards rice cultivation are 281,000 ha (15.6% of total and 36.6% of total prime agricultural lands). Further increase in irrigated areas should be extended to cultivation of other crops including corn.

Mixed farming of rice or corn with pulses, legumes and vegetables is to be promoted in 117,000 ha (15.2 % of prime agricultural lands). Diversified lowland crops other than rice are targeted in 65,000 ha (8.5% of prime agricultural lands), while commercial crops (value added, export oriented) are targeted in 82,000 ha (10.7% of prime agricultural lands). Multi-storey farming-combining tree crops with suitable commercial crops and/or diversified crops are to be promoted in the uplands (defined here as land having 8 to 18% slope) in 96,000 ha (12.5% of prime agricultural lands).

Managed pasture lands also marginally suitable for multi-storey farming are determined to be 85,000 ha. A portion of these lands (32,000 ha) are also identified for future urbanization/industrialization needs. The remaining 53,000 ha are targeted for managed pasture with limited multi-storey farming.

Fishing areas are 42,000 ha (5.5% of prime agricultural lands). Protection areas which largely include NIPAS areas, residual secondary forest areas, mangrove forests, swamps and NIPAS areas constitute about 377,000 ha (20.9% of total area).

Miscellaneous land use category which largely includes existing built-up areas, water bodies and river wash areas are 107,000 ha (5.9% of total area). Potential urban/industrial areas targeted for development are 37,200 ha. These include 5,390 ha in lowlands (0~8%) and 32,000 ha in uplands (8-18% slope).

Production forest areas determined suitable for agro-forestry development include 223,000 ha (12.4% of total area). Aiming at a total forest cover of 33% (including protection and production forests) is determined reasonable. Presently environmentally constrained areas including presently lahar covered areas, and potential lahar hazard areas (until 1998), and flooding and siltation prone areas are 135,000 ha (7.5% of total area). Low intensive use of these areas is expected until 1998 after which the threat of lahar is expected to diminish. The siltation and flood prone areas (35,000 ha) would also be brought to suitable agricultural land use by 1998 as these problems would be solved by then with implementation of priority projects related to flood control.

CHAPTER 5

TABLES

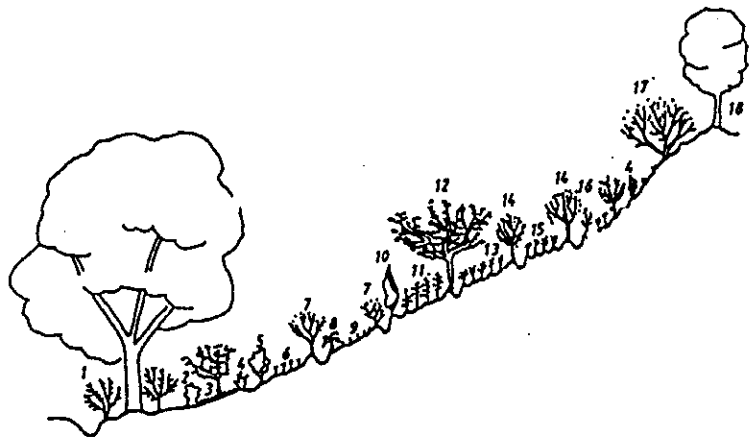
Table 5.1 Development Targets in 2010 for Central Luzon based on Glocalization Scenario

Land use category	Area (000'ha)	%
Irrigated paddy	281	
Rainfed mixed farming	117	
Commercial crops	82	
Diversified crops	65	
LOWLAND PRIME LANDS	545	
Multi-storey farming *	96	
Managed pasture or Marginal multi-storey farming	85	
UPLAND PRIME LANDS	181	
FISHING AREAS	42	
PRIME AGRICULTURAL LANDS	**768**	**42.6**
PROTECTION AREAS	**377**	**20.9**
MISCELLANEOUS	**107**	**5.9**
PRODUCTION FORESTS FOR AGROFORESTRY DEVELOPMENT	**223**	**12.4**
NOT SUITABLE FOR CROP CULTIVATION	**326**	**18.1**
FOREST LANDS	181	
A & D LANDS *	10	
ENVIRONMENTALLY CONSTRAINED AREAS	135	
TOTAL	**1,801**	**100**

* Potential urban/industrial areas totalling 37,200 ha are included in these categories

CHAPTER 5

FIGURES



key

1. Khaya nyasica (Mbawa) planted to protect the streambank with an initial nurse crop of Sesbania sesban. Mbawa used eventually for timber.
2. Sisal hedge to control livestock. Old leaves cut and the fibres used for string and making sisal-cement roofing sheets.
3. Improved permanent pasture for grazing, some trees like Mtet (Acacia species) left for shade and to provide thorny branches for temporary fences.
4. Planted goat-proof hedge, eg Caesalpina decapetala.
   Buffer strip on the contour of Guavas underplanted with a legume ground cover, which is cut
5. and carried to feed livestock.
6. Field of groundnuts on boxed contour ridges.
7. Raised contour marker ridge planted to Leucaena for fodder, fertilizer, thin poles, and firewood.
8. Bananas planted on the contour and heavily mulched.
9. Planted pasture of Rhodes grass/legume mixture grazed by livestock.
10. Buffer strip on the contour of citrus and mango fruit trees underplanted with a legume cover, which is cut and carried to stall-fed livestock.
11. Field of maize interplanted with beans on boxed contour ridges.
12. Raised contour marker ridge planted with Acacia alibied (Nsangu), which enriches the soil by dropping its leaves at the start of the rains. In between the Nsangu trees, Leucaena is planted on the contour ridge.
13. Field of soya beans planted on boxed contour ridges.
14. Raised contour marker ridge planted to Leucaena (Hawaiian Giant cultivar) used for fodder, fertilizer, building poles, timber, and firewood.
15. Field of fire-cured tobacco planted on boxed contour ridges.
16. Woodlot underplanted in first few years with sweet potatoes and cow peas.
17. Bamboos planted in pockets of deeper soil on a rocky hillside.
18. Natural trees left on rocky hills. Can be carefully cropped for firewood, poles, string, local medicines,etc. A useful place to put a beehive.

Figure 5.1 An Illustrative Package of Land Use Practices on Uplands or Steep Lands from Malawi

APPENDIX

APPENDIX A SOME ENVIRONMENTAL DATA OF REGION III, PHILIPPINES

1. Climate

Region II is classified into two climate types. The western side of Pampanga river basin belongs to Type 1 which has a pronounced dry season (December to May) and a wet season (June to November). The eastern side on the coast belongs to climate Type 4 characterized by uniformly distributed rainfall. Typhoons have a great influence on climate and weather. Nineteen typhoons hit the Philippines and Luzon on the average every year. In Region III, the mean monthly temperature is highest in April and May (29°C), and lowest in December and January (25°C). The average annual rainfall is 1,800 mm in Muzoz, and 3,600 in Iba. January and February are the driest months with less than 10 mm rainfall. Highest rainfall occurs form July to September.

2. Topography

Region III's topography is generally flat lands broken by mountain rises known to be volcanic in origin. Region III has 25 principal rivers, the biggest of which is the Pampanga river formed by the confluence of the Pantabangan, Carranglan an Diammam rivers. There are two major river basins - the Agno river basin in the north and the Pampanga river basin in the south. With the eruption of Mt. Pinatubo in 1991, ecological and physical changes have affected the region, particularly the provinces of Pampanga, Tarlac and Zambales. Clogging of major river systems by lahar deposits has caused flooding in a wider area every year. Some of the previously fertile and arable agricultural lands are covered with tons and meter-deep lahar deposits.

3. Geology

Base rock of Region III consists of trusive and pseudo-stratified rocks. In Pampanga Delta, quarterly alluvial is sedimentary. Bataan peninsula and uplands of Nueva Ecija are overlaid with Pliocene, Pleistocene and recent volcanic deposits (mostly Andesits and Basalts). Major faults occur in the western part of the region near the Zambales mountain range.

4. Mineral resources

Distribution of Mineral resources in Region III is as below.

Province	Mineral Resources	
	Metallic	Non-Metallic
Bataan		Rock, Gravel, Sand and Lime
Bulacan	Iron core	Clay ore, gypsum ore, guanno ore, construction material ore, silica rock form ore, rock phosphate, marble ore and salt (from sea water)
Nueva Ecija	Copper, manganese, gold deposits (small amount)	Feldspar, quartz sand, marble and white clay
Pampanga		Pulmicite, pumice
Tarlac		Pumice, rock aggregate, sand, gravel, stones, cobbles and boulders
Zambales	Gold, copper, chromite, silver	Crushed stones/rocks, jade, pumice, white clay, rock aggregate, salt, stones, cobbles, boulders and silica quartz

Source: Major Development Programs and Projects, 1986-1992

5. Marine resources

Coastline of Manila Bay consists of coral reefs, seagrass bed areas, mangrove areas, tidal flats and estuary areas. According to Manila Bay Environmental Profile, total mangrove area of Manila Bay in Region III is estimated to be 1,260 ha. About 2,500 ha of the tidal flats are on the Manila Bay in Region III. The biggest tidal flat area is Bangkong Malaped in Sasman, Pampanga. The estuary areas are rich in the larvae of crabs and shrimps. Dominant species of fish in the northern portion of Manila Bay in Pampanga include mullet acetes, and shrimps. In Bataan and Bulacan, anchovies, mullet, shrimps, acetes, threadfin brea, whiting and blue crab are some of the fish resources.

6. Conservation area

The 1992 National Integrated Protected Areas Systems Act (NIPAS), categorizes protected areas into 8 types: strict nature reserve, natural park, natural monument, wildlife sanctuary, protected landscapes and seascapes, resources reserve, natural biotic areas and other categories established by law, conventions or international agreements.

There are seven national parks and one protected seascape area in Region III. These include the Aurora Memorial Park, Mt. Arayat National Park, Bataan National Park, Biek Na Bato National Park, Capas Death March Monument National Park, Minalungao Cauc National Park, Roosevelt National Park, and Masinloc and Oyon Bay Protected Seascape Area. Fig. A1.1 shows the location of these areas and Table A1.1 presents the details.

Table A.1 Conservation Area in Central Luzon, 1994

NAME	LOCATION	ESTABLISHMENT		AREA	SPECIAL FEATURES/REMARKS
		LEGISLATION	DATE	(HECTARE)	
NATIONAL PARKS:				32,902.21	
1. Aurora Memorial	Bongabon, Nueva Ecija and Baler Quezon	Proclamation No. 220	11/11/37	(2,356 .(X))	Dipterocarp forest: streams and rivers: springs for swimming area
		Proclamation No. 744	08/11/41	1,486.(X))	and invigorating climate
2. Mt. Arayat	Arayat and Magalang, Pampanga	Proclamation No. 594	06/27/33	(3,714.03)	Remnant of natural forest; natural waterhole, scenic spots:
		Proclamation No. 203	09/16/37	3,715.23	and recreational resort.
3. Bataan	Hermosa, Orani, Samal, Abucay, Pilar,	Proclamation No. 24	12/01/45	(31,000.00)	Historical; tropical moist forest; waterfalls: and with
	Bolanga, Bagac and Morong, Bataan	Proclamation No. 25	04/18/66	(29,853.00)	sandy beaches along coastal zone.
		Proclamation No. 1956	03/25/80	(23,853.00)	
		Proclamation No. 192	04/11/89	23,688.00	
4. Biak-na-Bato	San Miguel and Dona Remedios Trinidad,	Proclamation No. 223	11.16/37	(2,117.00)	Where Pact of Biak-na-Bato was signed; limestone formations; caves;
	Bulacan	Proclamation No. 2204	06/05/82	(330.62)	remnants of dipterocarp forests. Proclamation 401 excludes
		Proclamation No. 84	03/09/87	(2,117.00)	2,078.22 ha. from the area coverage of the pack for mineral
		Proclamation No. 401	04/11/89	658.85	watershed and forest reservation.
5. Capas Death March Monume	Capas, Tarlac	Republic Act 826	08/14/52	1.54	Erected in honor of the World War II death March participants.
6. Minalungao	Gapan and Gen. Tinio, Nueva Ecija	Republic Act 5100	06/11/67	2,018.00	Cathedral like caves; exquisite rock formations:
					and natural swimming pool.
7. Roosevelt	Hermosa and Dinalupihan, Bataan	Proclamation No. 567	03/30/33	(1,485.00)	Remnants of dipterocarp forest; natural spring; and recreational resort.
		Proclamation No. 508	12/17/65	1,334.59	
Protected Seascapes Area					
1. Masinloc and Oyon Bay	Masinloc, Zambales	Proclamation No. 231	08/18/93		
GAMES REFUGES AND					
BIRD SANCTUARIES;				55,452.35	
1. Lake Malimanga Birds and Fish Sanctuary	Candelaria, Zambales	Proclamation No. 1949	03/14/80	12.35	
2. Angat Game Refuge and Bird Sanctuary	Norzagaray, Bulacan			55,400.00	

APPENDIX B

Table B1 Proposed Land Use in Three Scenarios

(Unit: 1,000 ha)

	Localization	Globalization	Glocalizaiton
Lowland Prime Lands			
Irrigated Paddy	284	281	281
Mixed Farming	199	0	117
Diversified Crops	67	0	65
Commercial Crops	0	265	82
Upland Prime Lands			
Multi-Story Farming	92	96	96
Managed Pasture	0	84	85
Moderate/Marginal Uplands			
Multi-Story Farming	88	0	0
Production Forests			
Tree Crops/ Agro-Forestry	223	223	223

Source: JICA Team

Table B2 Projected Food and Feed Supply and Demand

Particular	1990 Position	Localization	Glocalization	Globalization
2010 Population ('000)	6,191	10,499	10,499	10499
Mean per capita consumption for Region III (kg/year)				
Rice & Other Products	119	119	119	119
Vegetables	47	47	47	47
Rootcrops	5	5	5	5
Corn & Other Products	6	6	6	6
Fruits	39	39	39	39
Meat	21	21	21	21
Fish	33	33	33	33
Production (Supply) [MT]				
Rice (milled)	1,146,558	2,257,800	2,009,400	1,689,600
(unmilled)	1,910,930	3,763,000	3,349,000	2,816,000
Vegetable	112,037	314,885	442,370	254,270
Rootcrops	42,511	378,230	337,720	512,000
Corn (Food)	17,304	104,990	104,990	104,990
Fruit	124,869	932,075	991,690	821,900
Meat	59,111	29,276,741	46,750,273	43,828,151
Fish	150,256	409,107	321,781	321,781
Corn Feed	0	23,600	146,725	87,800
Demand [MT]				
Rice (milled)	736,729	11,249,381	1,249,381	1,249,381
(unmilled)	1,409,420	2,439,787	2,400,457	2,349,822
Vegetable	209,977	493,453	493,453	493,453
Rootcrops	30,955	52,795	52,495	52,495
Corn (Food)	61,910	104,990	104,990	104,990
Fruit	278,087	470,985	470,985	470,985
Meat	130,011	220,479	220,479	220,479
Fish	204,303	346,467	346,467	346,467
Corn Feed	193,875	335,545	508,111	260,647
Sufficiency Level				
Rice	135%	154%	139%	119%
Vegetable	38%	64%	90%	51%
Rootcrops	137%	721%	643%	975%
Corn (Food)	28%	100%	100%	100%
Fruit	45%	198%	210%	174%
Meat	45%	50%	80%	75%
Fish	73%	118%	93%	93%
Corn Feed	0%	7%	29%	33%

Note: Base year of project - 1990
Source: JICA-CLDP Master Plan Study Team

Table B3 Agricultural Value-Added Projection by Crop, Livestock and Fishery in Central Luzon under Glocalization Scenario

		1990		Glocalization	
Province	GVA/TON (Pesos)	Volume (MT)	GVA (Pesos)	Volume (MT)	GVA (Pesos)
Palay	3,859	1,910,930	7,374,278,870	3,349,000	12,923,791,000
Corn	3,721	17,304	64,388,184	248,175	923,459,175
Vegetables	4,973	112,037	557,160,001	442,370	2,199,906,010
Okra		1,110		43,300	
Squash		3,492		72,000	
Watermelon				20,000	
Eggplant		17,473		98,130	
Tomato		24,618		47,040	
Mongo		3,130		9,300	
Onion		33,400		126,000	
Asparagus		45		15,000	
Garlic		492		11,600	
Cabbage		2,718			
Soybeans					
Others		25,559			
Roots & Tubers	2,267	42,511	96,372,437	337,720	765,611,240
Ginger		302		97,720	
Cassava		8,583		156,500	
Sweet Potato		21,211		83,500	
Others		12,415			
Banana	3,985	34,096	135,872,560	208,000	828,880,000
Mango	8,141	75,000	610,575,000	309,000	2,515,569,000
Fruits and Nuts	5,875	15,773	92,666,375	474,690	2,788,803,750
Peanut		1,417		79,200	
Papaya		7,111		333,000	
Cashew		86		30,000	
Calamansi		1,691			
Jackfruit		1,188		8,490	
Avocado				24,000	
Others		4,280			
Sugarcane	439	2,178,020	956,150,780	1,860,000	816,540,000
Coffee	19,706	426	8,394,756	13,980	275,489,880
Cacao	16,085	10	160,850	14,925	240,068,625
Coconut	22,442	2,023	45,400,166		
Other Crops			353,000,000		
Total for Crops		4,339,388	10,294,419,979	7,257,860	24,278,118,680
B. LIVESTOCK					
*Cattle, Other L.	940	527,890	496,216,600	1,584,742	1,489,657,480
*Hog	2,534	1,054,830	2,672,939,220	2,556,531	6,478,249,554
*Chicken &Other P.	167	11,768,760	1,965,382,920	42,609,000	7,115,703,000
*Other Poultry	319	1,688,250	538,551,750		
Total for Livestock		15,039,730	5,673,090,490	46,750,273	15,083,610,034
C. FISHERY					
Marine/Inland	22,369	42,549	951,778,581	48,267	1,079,687,878
Aquaculture	33,480	107,707	3,606,030,360	273,514	9,157,243,698
Total for Fisheries			4,557,808,941	321,781	10,236,931,576
D. FORESTRY			19,000,000		
E. SERVICES			873,133,575		2,107,943,062
GRAND TOTAL			21,417,452,985		51,706,603,353

* Volume - No. of Heads
Unit - GVA/Head

Source: JICA Study Team

APPENDIX C. Sources of Information and Bibliography

1. Phillipine 2000, Medium Term Philippine Development Plan, 1993-1998

2. Medium Term Central Luzon Regional Development Plan, 1993-1998, Regional Development Council, National Economic Development Authority, San Fernando, Pampanga

3. Area Ecological Profile of Central Luzon, Department of Environment and Natural Resources, Environment management and protected areas service, Region 3, San Fernando, Pampanga

4. Central Luzon medium term environment and natural resources sector development plan, 1993-1998.

5. Comprehensive Agrarian Reform Program (CARP), RA No. 6657, Presidential Issuances, Department of Agrarian Reform, Manila.

6. Department of Agrarian Reform 1992 Accomplishment Report, Prepared by Planning Service, DAR, Manila

7. The CARP 2000: Medium Term Development Plan (1993-1998).

8. Remote Sensing and GIS for Natural Resource management, ADB Environment paper no. 9.

9. DENR Regional Forestry Master Plan (upto year 2015), Draft of the Forestry Master Plan, 1991, DENR, Region 3, Pampanga.

10. The Integrated Soial Forestry Program: a primer, 1992.

11. Mount Pinatubo Interim Action Report, Draft Environmental assessment, Jan. 1993, US Army Corps of Engineers, Louis Berger International Inc. (final report due Dec. 1993)

12. Philippine Environmental profile, Vol. 1 and Vol 2, OECF, May, 1992 (done by Dames and Moore International).

13. Statistical Profile 1992, DENR Region 3

14. 22 thematic maps of region 3 at scale 250,000 concerning various aspects of land and soil capability, land use etc. obtained from BSWM, Ministry of Agriculture (refer attached list from NEDA region 3).

15. Various thematic maps at scale 250,000 indicating the spatial development planning framework for region 3 prepared manually by NEDA region 3 before Mount Pinatubo eruption.

16. NEDA region 3 long term regional development master plan (draft, prepared before Mount Pinatubo eruption) along with maps indicating the spatial development plan in A4 size.

17. A report om Philippine Environment and Development, Issues and Strategies, United nations Conference on Environment and Development, Rio de Janeiro, Brazil

18. Philippines Environment and Natural Resources Management Study, A World Bank Country Study, 1989.

19. Towards an environmental strategy for Asia, World Bank Discussion Paper 22, 1993.

20. World University of the Environment in the Subic Rainforest - A Concept Paper by Shay Cullen, SSC, Preda Foundation, Inc., Philippines.

21. The natural way of farming - The theory and practice of green philosophy by Masanobu Fukuoka, Japan Publication Inc., Tokyo, 1991.

22. National Physical Framework Plan 1993-2022, National Land Use Committee, National Economic and Development Authority, Republic of the Philippines, 1992.

23. National Handbook on Land and Other Physical Resources, National Land Use Committee, National Economic and Development Authority, 1991.

24. Plantation Forestry in the Tropics, by Julian Evans, Oxford Science Publications, 1992.

25. Useful farming practices, Association for International Cooperation of Agriculture and Forestry, Japan.

26. Agroecology- The Scientific basis of alternative agriculture, by Miguel A. Alfieri, Westview Prers (Boulder), 1987.

27. Decentralization and Empowerment, Gaudioso C. Sosmeña, Jr., Manila, Philippines 1991.

28. Social Reconnaissance Surveys conducted for each province of Central Luzon as part of present CLDP Study by lead NGOs in each province.

29. Development plans for various crop groups 1992-1995, Department of Agriculture, 1 Jan. 1992.

30. Medium Term Development Plan 1994-1998 of various provinces in Central Luzon.

31. Land Husbandry, by Norman Hudson, Cornell University Press, Ithaca, New York, 1992.

32. In Search of Alternatives, Rehabilitation Options and Alternatives for the Mount Pinatubo Victims Final Report prepared by Philippine Business for Social Progress (PBSP), July 1993.

33. Land evaluation for forestry, FAO forestry paper 48, FAO, 1984.

34. Nature and Principles of Land Evaluation, FAO Soil Bulletin Series, 1977.

35. Crop Development and Soil Conservation Framework for Luzon Island, Agricultural Land Management and Evaluation Division (ALMED), BSWM, Department of Agriculture, Philippines, 1993.

36. Symposium proceedings on sustainable agricultural development of Mount Pinatubo - affected areas Farming Systems and Soil Research Institute, College of Agriculture, University of the Philipines at Los Baños, College, Laguna, Nov. 5 - 6, 1992.