

4.5 INFRASTRUCTURE SECTOR

4.5.1 Road Facilities

A sufficiency review, that is, the ability of the road system to absorb forecast demand, was conducted by evaluating alternative road systems featuring varying types of infrastructure improvements. Comparative findings were used to assess the adequacy of the strategic improvements previously presented in Section 2.9 of this report. Identified deficiencies subsequently serve as the basis upon which the focused road improvement program presented in this section is founded. The discussion is of necessity abridged; the interested reader is therefore urged to consult *Volume 6* of the final report for comprehensive detail regarding demand forecasting procedures and strategy formulation/evaluation¹.

1) Performance of the Committed Network

The modeling of years 1995, 2000, 2005 and 2010 demand on the existing (1996) road network upgraded by committed improvements was undertaken. Committed improvements include Highways 1 and 9 upgraded in line with on-going IBRD and ADB projects which will, in essence, improve both facilities to high-order two-lane highways. It is also accepted that improved feeder roads for Dung Quat port will be available at commencement of port operation, which is currently postulated as occurring during year 2005. Findings confirm that the pre-eminent road facility is, under present and future demand conditions, Highway 1. This facility absorbs the vast majority of pcu kilometers expended in the study area, and achieves, by far, highest average loadings per road kilometer (Table 4.5.1).

Table 4.5.1 Highway Loading Indicators Under Present and Future Demand Conditions Existing Road Network with Committed Improvements

Item ⁽¹⁾	Highway Number						
	1	9	14	14B	24	49	PH ⁽²⁾
Year 1995							
Total Pcu Kilometer (000)	2,245.4	122.4	109.7	72.7	62.4	36.2	*
Pcu km per Road Kilometer	5,524	1,466	362	1,155	902	591	598
Year 2000							
Total Pcu Kilometer (000)	4,535.8	171.7	162.0	149.9	103.1	87.1	*
Pcu km per Road Kilometer	11,158	2,056	534	2,382	1,492	1,422	738
Year 2005							
Total Pcu Kilometer (000)	9,761.0	342.7	468.1	280.1	239.8	214.7	*
Pcu km per Road Kilometer	24,012	4,104	1,543	4,453	3,470	3,508	1,784
Year 2010							
Total Pcu Kilometer (000)	20,502.3	1,048.4	2,664.5	634.5	508.5	584.9	*
Pcu km per Road Kilometer	50,436	12,556	8,782	10,088	7,359	9,558	4,435

(1) Passenger car unit (pcu) kilometers expended by interzonal car, bus, truck and motorcycle trips.

(2) Average utilization of all province highways in network.

The indicated years 2005 and 2010 Highway 1 unit loadings suggest that additional capacity beyond that envisaged by the on-going IBRD and ADB projects is required. This observation is

¹ "Final Report - Volume 6: Road Sector Demand Forecasts, Strategy Formulation, and Priority Project Feasibility Reviews", *The Study on the Integrated Regional Socio-economic Development Master Plan for the Key Area of the Central Region of the Socialist Republic of Viet Nam*, prepared for Development Strategy Institute, Ministry of Planning, by Japan International Cooperation Agency, October, 1996.

even more relevant when again noting at this point that modeling demand consists of interzonal trips, and does not include short intra-zonal journeys such as those, for example, made entirely within Da Nang city.

A more detailed review of the Highway 1 corridor within the study area is therefore desirable (Figure 4.5.1).

- Under year 1995 demand conditions, Highway 1 generally operates at an acceptable level of service. Only in vicinity of Da Nang does demand approach assignment (practical) capacity.
- The Da Nang area segment of Highway 1 has reached its maximum capacity under year 2000 demand conditions. In other words, congested operation with interrupted flow and frequent delays will be the norm.
- Under year 2005 conditions, the entire Hue-Da Nang segment of Highway 1 has exceeded its practical capacity, and almost reached maximum capacity. Demand in vicinity of Hue city and Da Nang city exceeds maximum capacity. This suggests that as maximum capacity is reached, some proportion of trips will be suppressed or diverted to other modes. In either case, the continued economic expansion of the Hue and Da Nang areas is jeopardized due to a shortfall in road infrastructure. Capacity shortfalls are also noted in vicinity of Quang Ngai. This is largely catalyzed by the Dung Quat industrial complex, and underscores the importance of providing an adequate distributor road system for Dung Quat port and industrial complex once associated facilities come "on line".
- Year 2010 demand, which is not shown in Figure 4.5.1, far exceeds Highway 1 capacity along virtually all segments. Widespread infrastructure upgrading will be required by that time period.

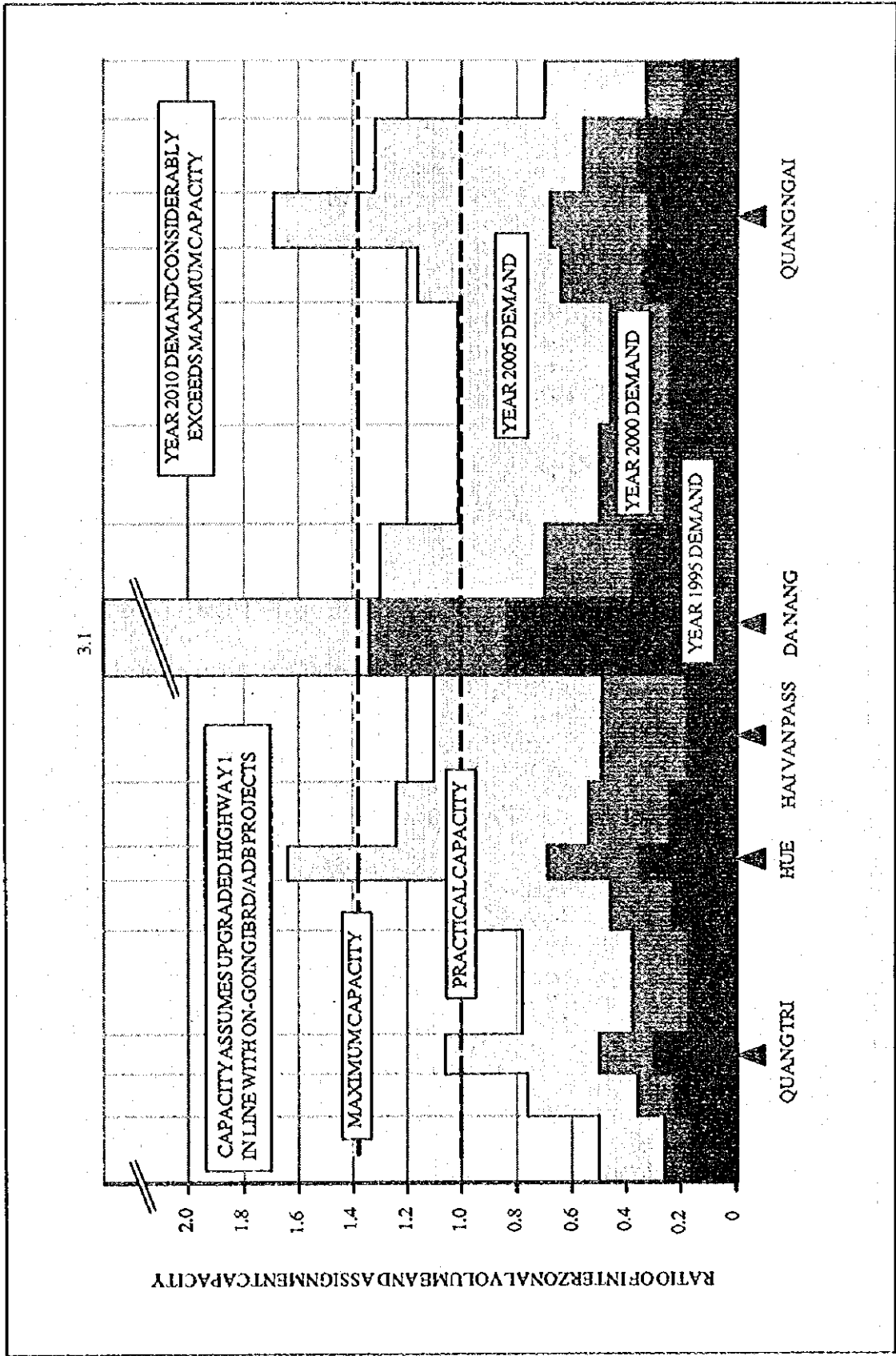
2) Project Formulation

Components of the road strategy discussed in the previous section are already being realized in a variety of ways:

- Upgrading of Highway 1 and (probably) Highway 9 will proceed under auspices of the IBRD and/or the ADB.
- Highway 14 is already being improved under sponsorship of, and funding by, the Government of Viet Nam.
- Road infrastructure to support Dung Quat port and industrial zone is integrated with the planning of industrial and ports specialists associated with the current study.
- Upgrading of commune and district roads is linked with realization of the current study's Integrated Rural Development Program and Tourism Infrastructure Improvement.

Thus, key remaining issues are the upgrading of east-west linkages (Highways 14B, 24 and 49) as well as the provision of enhanced road capacity in the Hue-Da Nang corridor. These two projects therefore emerge as the focus of subsequent road improvement processes as well as economic feasibility reviews (refer Sections 7.5 and 7.6).

Figure 4.5.1 Highway No.1 Sufficiency under Present and Future Demand Scenarios



(1) The Hue-Da Nang Highway

Demand forecasts confirm that enhanced road capacity between Hue and Da Nang emerges as a priority project. The alignment and extent of a new Hue-Da Nang Highway (HDH) will be governed by several conditions:

- The road should be operational by (preferable prior to) year 2005, and should extend from just north of the Hue metropolitan area to a point south of the Da Nang metropolitan area. The HDR will therefore be capable of absorbing longer-distance "through" trips as well as shorter journeys which view the Hue Bypass and Da Nang Bypass as attractive options.
- The location of the Hai Van pass tunnel sections are largely fixed¹. Thus, HDH segments to the north and south of the Hai Van tunnels must be linked with the designated tunnel portals. Furthermore, it is understood that the Hai Van tunnels will initially feature a two-way, two-lane cross-section. Therefore, based on system continuity considerations and findings of the modeling process, it is proposed that the initial (year 2005) HDH carriageway also consist of two lanes.
- The HDH alignment should be convenient to existing and planned major urban concentrations, activity precincts and significant generators of road-based activity located within the Hue-Da Nang corridor. Concurrently, the alignment must be sensitive to the study areas environmental, social and cultural fabric.
- It is likely, due to the high implementation cost of the HDH, that the participation of the private sector in BOT (build, operate, transfer) or similar schemes will be sought. This, in turn, strongly implies that users of the HDH will be subject to toll levies.

Highway 1 within the study area (and other parts of the nation) is an arterial without any form of access control. It is used by pedestrians and all conceivable forms of vehicles ranging from animal-drawn carts and bicycles to the fastest cars and largest commercial vehicles. Highway 1 must accommodate all forms of trips ranging from the very short to extremely long. Roadside development is intense with the net result being extensive ribbon (strip) development along virtually the entire extent of Highway 1, with each roadside activity having almost unlimited freedom of movement onto/off of Highway 1. Consequently, Highway 1 is, not surprisingly, unable to consistently cope with this mix of functions and uses; operations and safety have been seriously degraded in recent years, and will continue to worsen in future as traffic increases and ribbon development intensifies. It is felt that on-going IBRD and ADB-sponsored projects will provide respite from these concerns only in the near-term future; however, more pronounced longer-term solutions are needed.

The Government has developed preliminary plans for a motorway which will eventually link Ha Noi and HCMC. It is highly unlikely that a multi-lane motorway-class facility will be required in the study area within the current study's planning horizon. However, key preliminary actions, particularly right-of-way reservation, should proceed at the earliest opportunity.

The HDH strategy has, in response, been adapted to avoid operational problems similar to those encountered on Highway 1, and integrate longer-term motorway plans (Figure 4.5.2):

¹ "Pre-feasibility Study of Hai Van Pass Tunnel of Highway No. 1", by Express Highway Research Foundation of Japan, for IBRD and Ministry of Transport, Government of Viet Nam, March, 1996 (Draft Final Report)

- The initial (year 2005) concept calls for the provision of a high-order two-way, two-lane carriageway. However, it is strongly urged that about 50 meters of right-of-way be reserved.
- Strict zoning controls must be instituted (and rigorously enforced) which prohibit any form of access from abutting properties into the right-of-way. If necessary, fencing should be installed to prevent access. The importance of this action cannot be over-emphasized as it is the only effective measure to prevent the chaos which now exists along Highway 1.
- Instead, a frontage road (and/or Highway 1) will provide direct access to properties abutting the HDH right-of-way. Only at suitable distances (say every 5-10 kilometers) should high-order HDH intersections (either grade separated or signal controlled) be provided.
- In future, as the motorway (or a multi-lane arterial) concept reaches maturity, adequate right-of-way is available for constructing a paralleling carriageway. Furthermore, existing intersections can readily be upgrade to full interchanges.

The HDH corridor was, for analytical purposes, subdivided into four main sections: Hue Bypass, Lan Co/Chan May, Hai Van pass, and Da Nang Bypass. Within each of these four sections, a series of alternatives were designated (Figure 4.5.3). A further option, that is, upgrading Highway 1 to multi-lane status (sections HB3, LC1 and DB1; refer Figure 4.5.3) was included.

These alternatives were reviewed with representatives of the Ministry of Planning, the Ministry of Transport as well as local People's Committee's. In addition, highway construction/costing specialists were dispatched to conduct field reviews appropriate to the pre-feasibility level of detail. A ranking process was subsequently completed which subjectively compares the relative merits of each alternative in each section with competing alternatives. A three-level scale was adopted:

- + implies that the alternative is superior to other options and/or is likely to catalyze superior benefits.
- o implies that the alternative is neutral when compared to other alternatives, and/or exhibits no pronounced benefits/disbenefits.
- implies that the alternative is inferior to other options and/or is likely to catalyze disbenefits.

Evaluations were conducted to assess likely economic, social/cultural, environmental and road system ramifications (Table 4.5.2).

Figure 4.5.2 Corridor Development Strategy for Hue -Da Nang Inter-city Highway

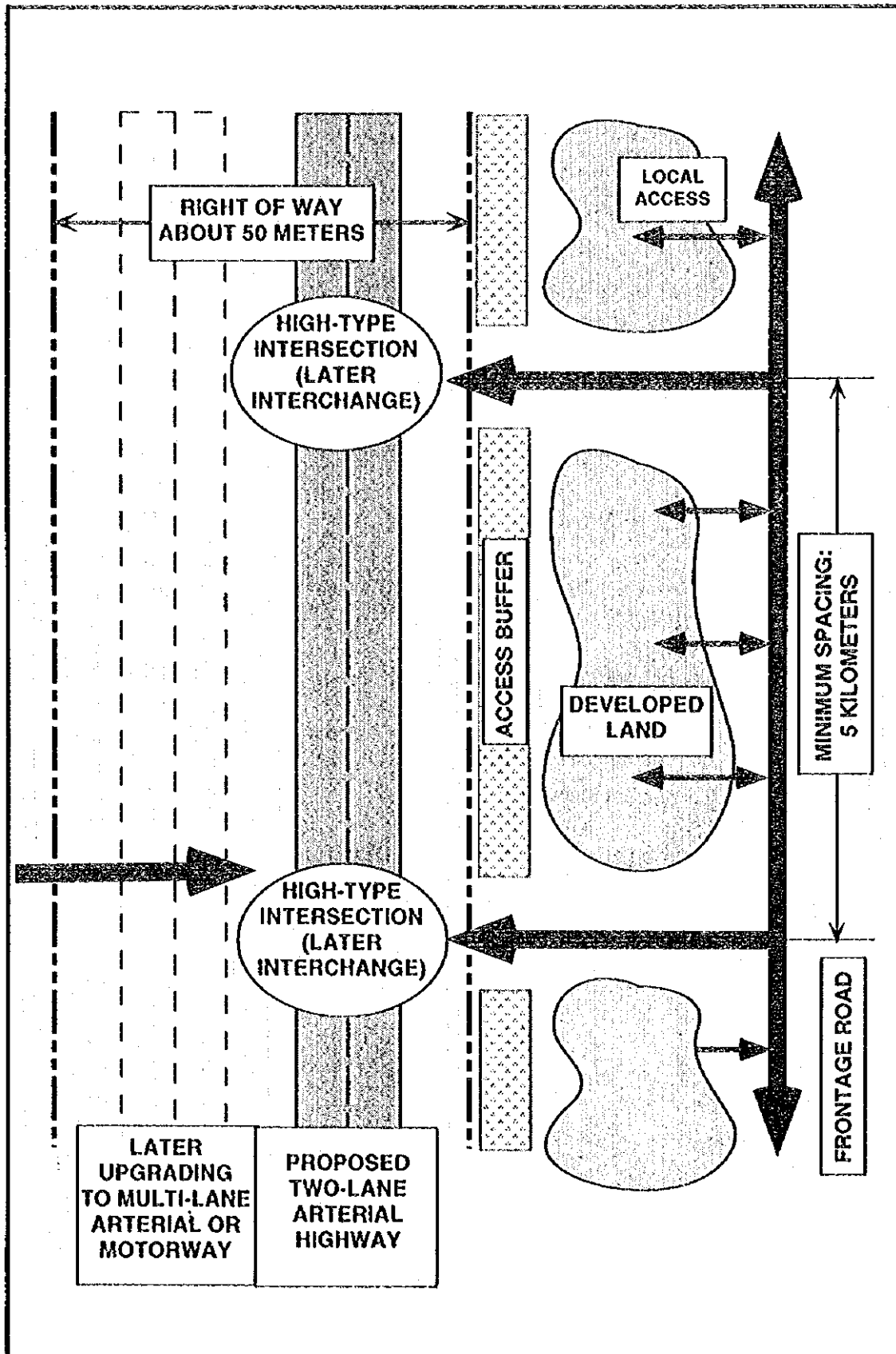
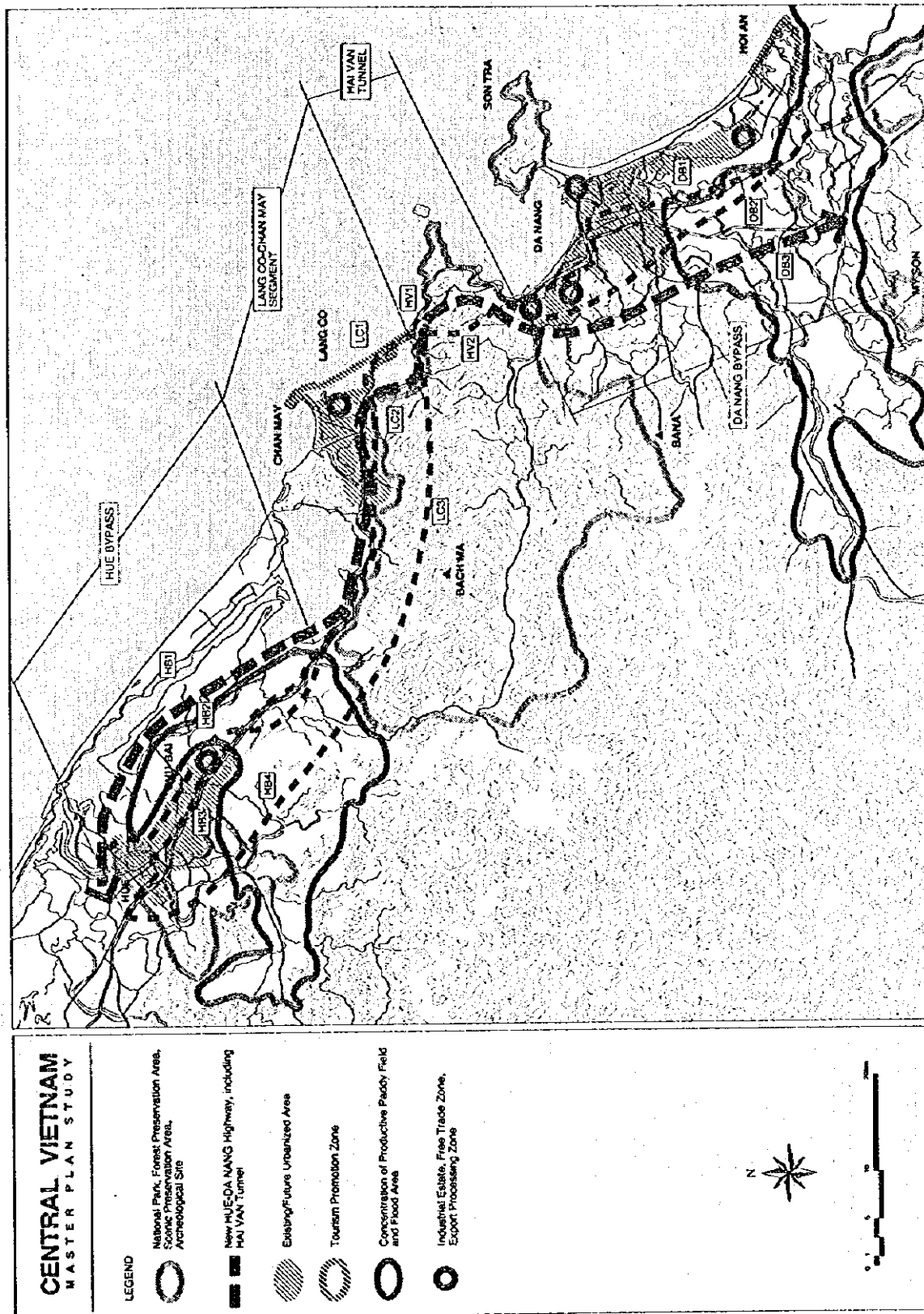


Figure 4.5.3 Alternative Alignments for Hue-Da Nang Inter-city Highway



**Table 4.5.2 Subjective Comparison Process
Hue-Da Nang Highway Alternative Alignments**

SECTOR	PARAMETER	HUE BYPASS				LANCO			HAI VAN		DANANG BYPASS		
		HB1	HB2	HB3	HB4	LC1	LC2	LC3	HV1	HV2	DB1	DB2	DB3
Economic	Paddy Acquisition†	-	-	+	-	0	0	0	0	0	+	-	-
	Construction Cost	-	-	+	-	0	0/+	-	+	-	+	-	-
	Land Acquisition	+	-	-	+	-	+	+	0	0	-	-	+
	Development (1)	0	0	0	-	0	+	-	0	0	-	+	+
Social and Cultural	Community Disruption	+	+	-	-	-	0	+	0	0	-	-	+
Cultural	Preserve Cultural Assets†	+	+	0	-	0	0	0	0	0	0	0	0
	Health and Safety	0	0	-	0	-	0	0	0	0	-	0	0
	Pollution, Noise, Vibration	0	0	-	0	-	0	+	+	-	-	-	+
Natural	Flora and Fauna	0	0	0	-	+	+	-	0	0	0	0	0
Environment	Erosion and Flooding	+	-	+	-	+	+	-	-	+	+	-	-
	Landscape (2)	+	+	-	-	0	0	-	0	0	0	0	0
Road System	Corridor Extension (3)	0	0	0	+	0	0	0	0	0	-	-	+
	Operating Profile (4)	+	-	-	+	-	+	+	0	0	-	0	+
	Accident Potential	+	+	-	+	-	+	+	0	0	-	0	+
	Conversion to Tollroad	+	+	-	+	-	+	+	0	0	-	+	+

(1) Enhanced access to new production centers, inducement to development and integration/strengthening of the economy.

(2) Impacts upon scenic areas, national parks and forest areas.

(3) Alignment compatible with potential inland extension in future north and south of the study area.

(4) Vehicle speed and safety as well as carriageway capacity.

Note: Refer Figure 4.5.3 for illustration of HDH segments.

Principal conclusions are:

- While upgrading existing Highway 1 to multi-lane status (sections HB3, LC1 and DB1) is technically possible, it is judged impractical due to right-of-way constraints as well as very high costs and extensive community disruptions catalyzed by an extensive right-of-way acquisition/road widening process. Furthermore, an upgraded Highway 1 cannot be operated as a toll road, nor does it offer opportunities for eventual incorporation into a motorway scheme (other than as a paralleling or feeder road). Thus, realization of the HDH along a new alignment is strongly preferred.
- Alignment HB1 is the preferred alternative for the Hue Bypass. It can be built on largely unused land (sand formation), does not intrude into paddy area (unlike alternatives HB2 and HB4) and totally avoids the Hue scenic as well as cultural preservation area (unlike alternative HB4). Furthermore, the coastal lagoon area is underutilized from a developmental (agricultural, fishery) point of view; alternative HB1 remedies this problem.
- Alternative LC2 is preferred along the Lang Co-Chan May segment since it offers good access for the Chan May complex at reasonable construction cost and minimal natural impact. Alternative LC3, on the other hand, would penetrate Bach Ma National Park and the abutting forest preservation areas. Construction costs for alignment LC3 would also be extremely high due to mountainous terrain.
- The lengths of the Hai Van pass alternatives are similar - on the order of 14 kilometers. Alternative HV1 requires three tunnels (1.8, 2.5 and 1.6 kilometers in length) as well as six bridges totaling 900 meters in length. Alternative HV2 consists of a single tunnel of 5.0 kilometers length, and two bridges totaling 850 meters in length. Construction cost of alternative HV2 is some 10 percent higher than alternative HV1, and, due to the single-tunnel length, would require a complex

ventilation system as well as an evacuation tunnel. Alternative HV1 is, for these reasons, the preferred choice¹.

- Alternative DB3 is the preferred Da Nang Bypass option. Its western location provides excellent accessibility for planned industrial estates northwest of Da Nang, completely avoids the existing/future metropolitan area and is optimally located for future extension direction Dung Quat/Quang Ngai. Improved east-west feeder roads link alternative DB3 with major tourist attractions such as the Cham Towers at My Son (Province Highway 610) and Hoi An town (Province Highway 609).

Segments HBI, LC2, HV1 and DB3 (refer Figure 4.5.3) therefore reflect the preferred HDH alignment.

The HDH will likely evolve as a tolled road. Since tollroads are rare in Viet Nam, several assumptions regarding HDH operation were required during the course of the study. Consequently, it is recommended that the toll levy be distance-proportional (i.e. the total amount of the toll charge varies with distance traveled on the HDH) and administered via a closed system. That is, a coded, magnetic card (similar in appearance to a credit card) is issued to each motorist upon entry to the HDH. This card contains a variety of computer-generated information, the more important being type of vehicle and entry point. The card is surrendered at the exit point, at which time the amount due is automatically calculated and toll is paid by the motorist. All toll booths at which the "take card" and "pay toll" transactions are completed are located astride entry/exit lanes; no disruption to mainline HDH traffic is required. It is suggested that motorcycles and non-motorized vehicles not be permitted to use the HDH.

No firm toll policy exists at present in Viet Nam; a realistic approach which relies on savings in vehicle operating cost catalyzed by improved quality of the HDH can therefore be used to define a range of reasonable tolls. Due to higher speed as well as capacity (and more moderate Hai Van pass horizontal and vertical alignment) vehicle operating cost on the HDH will be lower than on Highway 1. It is reasonable that some 60-80 percent of these savings can be recouped in the form of tolls². Analyses suggest that, for the composite HDH corridor, out-of-pocket vehicle operating cost savings (difference between HDH and Highway 1) average some six US cents per kilometer. Thus, a reasonable composite base-year unit toll rate might be on the order of five cents per kilometer. In comparison, composite unit toll rates applied on the five elements of the Java (Indonesia) tollway network vary from 6.1 to 9.8 cents per kilometer. This is consistent with findings of the study area review, particularly when considering differences in unit national income between Indonesia and Viet Nam.

(2) East-West Highways

Successful functioning of the twin north-south routes (Highway 1 and Highway 14) absolutely requires that adequate east-west linkages be available. This role is filled by Highways 9, 14B, 24 and 49.

These four east-west roads currently feature differing characteristics.

- Highway 9 (Quang Tri province), as previously discussed, already represents a key road with national/international implications.
- Highway 49 (Thua Thien-Hue province) links Hue city with Aluoi town. A ferry crossing is required some 10 kilometers west of Hue at the Huong River. Highway 49 is typically a five meter earth/gravel road, although paved sections (4.5-5 meters) are provided at mountain passes. The eastern half of Highway 49 can generally be termed as lying in flat terrain, the western half in rolling and mountainous terrain.

¹ Refer "Prefeasibility Study of Hai Van Pass Tunnel of Highway No. 1", op.cit, for further technical discussion regarding these issues.

² For example, PT Jasa Marga, the national tollroad authority of the Government of Indonesia, has adopted a policy that unit tolls should, on average, recover 70 percent of VOC benefits catalyzed by the presence of the tollroad.

Surface conditions of the earth/gravel sections is poor, while paved sections are typically in good condition. A recently constructed earth-surface spur west of Highway 14 near the Quang Tri province boundary extends Highway 49 almost to the Lao PDR border.

- Highway 14B (Quang Nam-Da Nang province) links Da Nang with A Nghia and, at the Highway 14 junction, Than My. Highway 14B is generally in good condition and features a 5.5 meter paved width, wider in vicinity of Da Nang. Unfortunately, extensive damage caused by heavily loaded trucks can effectively close the road to all but the largest vehicles, such as in vicinity of the Vu Gia River bridge during field inspections in January, 1996.
- Highway 24 (Quang Ngai province) provides important access to Ba To town and, via the Ba Vi pass, Kon Tum and points beyond. Highway 24 suffered severe damage during the 1995 floods and, as a result, was closed west of Ba To for reconstruction during most of 1996. East of Ba To, the road typically features a width of 5.5 meters and gravel surface, although passes are asphalted. Terrain is generally rolling or mountainous. Recent road improvements east of Ba To ensure reasonable surface quality for graveled conditions. The Mot, in cooperation with provincial People's Committees, is now pursuing the upgrading of Highway 24 between Highway 1 and Kon Tum. The recent improvement east of Ba To town (5.5 meter gravel surface, asphalted passes), as well as (mid-1996) reconstruction west of Ba To in Quang Ngai province, are elements of this effort.

It is recommended that Highways 14B, 24 and 49 be upgraded to high-order two-lane status (Class III per Ministry of Transport criteria). This implies a paved seven meter width (plus flanking non-motorized vehicle lanes) in flat terrain and six meter width in rolling/mountainous terrain. All bridges must be of suitable load-bearing capacity.

These improvements can readily be achieved; however, Highway 14B near Da Nang requires additional capacity enhancement. Transport demand along Highway 14B between the HDH and Da Nang city is expected to be intense. Thus, expansion to multi-lane status between the HDH and Highway 1 will likely be required during the post-2005 period. This is consistent with on-going improvements: Highway 14B between Highway 1 and the Da Nang Tourism Park (east of Highway 1) is currently being upgraded to multi-lane status. Highway 14B north of that point and along the western edge of the Da Nang Tourism Park has already been improved to a high-order, multi-lane urban arterial. In addition, as part of the current studies Tourism Sector Improvement Plan, it is also proposed that a new multi-lane road be constructed along the southern edge of the Da Nang Tourism Park to include a new bridge over the Han River. This new road would therefore link Highway 14B (and, inter-alia, Highway 1) with Province Highway 603 bypassing the existing (and congested) Han River road/rail bridges.

The upgrading of Highway 49 near Hue also requires special consideration. At present Highway 49 immediately west of Highway 1 meanders for about 10 kilometers through an area studded with scenic and cultural attractions before reaching the Huong River ferry. This segment of Highway 49 is also flanked by moderate to high intensity urban development. The upgrading of this road segment to Class III status is undesirable from developmental as well as cultural perspectives, and technically difficult. It is instead proposed that a Highway 49 bypass be constructed between the Huong River and Highway 1. This new alignment, which includes bridges over the Ta Trach and Huu Trach Rivers, could largely follow an existing local road corridor. Direct access to the HDH would also be available via a link with, and improved cross-section of, Province Highway 3 (which could conceivably be incorporated as a part of Highway 49) (Figure 4.5.4).

(3) The Southern Precinct

Demand reviews have confirmed that the advent of Dung Quat port, Dung Quat industrial estate and Van Tuong township, as well as continued growth of the Quang Ngai urban area, requires

commensurate upgrading of the road network. It has been assumed that the Dung Quat complex (Phase I) will be operational by year 2005; however, the status of on-going (October, 1996) negotiations between the Government of Viet Nam and potential foreign participants is far from settled. Questions persist as to actual opening date, scale of development, and staged implementation schedules.

It is therefore difficult to associate supporting road infrastructure with a specific time frame; instead, road improvements must be linked with actual progress of Dung Quat construction. Once Phase I is realized (whether year 2005 or not) a series of roads must concurrently be constructed east of Highway 1 which link Dung Quat/Van Tuong with Highway 1 and Quang Ngai, to include a major new crossings of the Tra Khuc River (Figure 4.5.5). However, if the Dung Quat complex intensifies at a pace currently foreseen by the Government, and catalyzes a large commensurate increase in urban population as well as workforce, additional road improvements are needed. This would include a southward extension of the HDH to a point south of the Quang Ngai urban area, as far as Province Highway 622 or, depending on available funding, Highway 24. Province Highways 622, 625, 627 and 628 must concurrently be upgraded to link with Highway 1, and a new east-west connection must be constructed for Dung Quat port near the northern border of Quang Ngai province (refer figure 4.5.5).

3) Strategy Finalization and Staging

A final series of assessments were undertaken which related future demand (years 2000, 2005 and 2010) with an improved future road network. This network builds upon the "existing plus committed" system (which encompasses Highway 1 and Highway 9 upgraded in accordance with on-going IBRD/ADB projects, plus enhanced access roads for the Dung Quat/Van Tuong complex) by including:

- The new Hue-Da Nang Highway;
- Upgraded access/loader roads linking the HDH with Highway 1, to include four lanes along Highway 14B between the HDH and Highway 1;
- Highways 14B, 24 and 49 upgraded to Class III standard; and,
- Highway 14 upgraded to a minimum of Class IV standard.

Demand forecasts reveal several distinct patterns:

- East-west highways, with the Class III Highways 14B, 24 and 49, are expected to operate at acceptable levels for the foreseeable future. Four-laning Highway 14B between the HDH and Highway 1 is justified in light of heavy future demand along this important axis.
- Highway 1 outside of the Hue-Da Nang corridor is expected to operate at an acceptable level of service under year 2000 demand conditions. However, some segments are likely to approach their assignment capacity under year 2005 demand conditions, and virtually the entire highway will have failed (exceeded maximum capacity) under year 2010 demand conditions. This clearly confirms that on-going Highway 1 improvement projects under sponsorship of the IBRD and ADB will benefit near to mid-term Highway 1 operation. However, in the long-term (year 2010) more radical solutions are needed.

Figure 4.5.4 Improvement Strategy for Highway No.49 Corridor

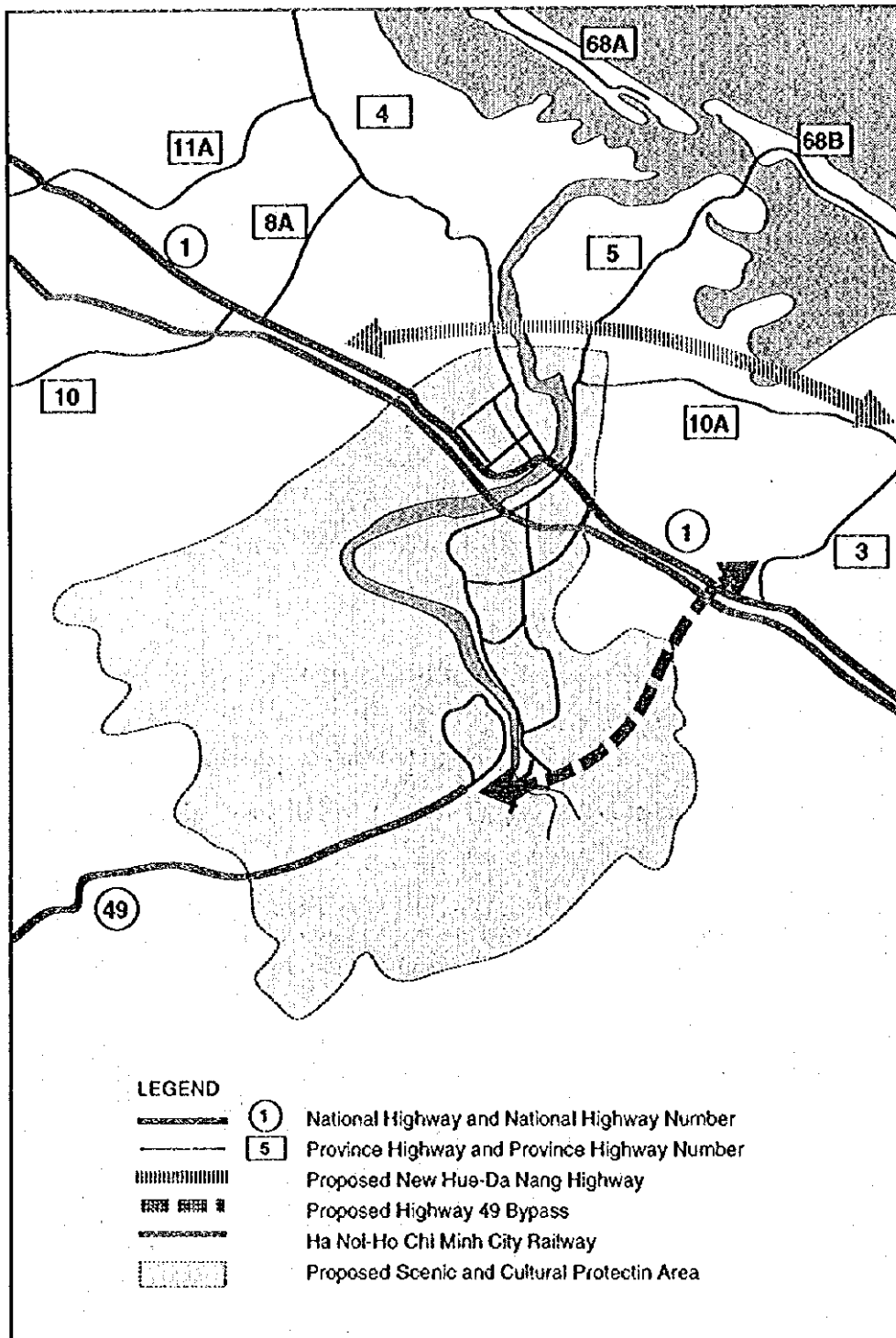
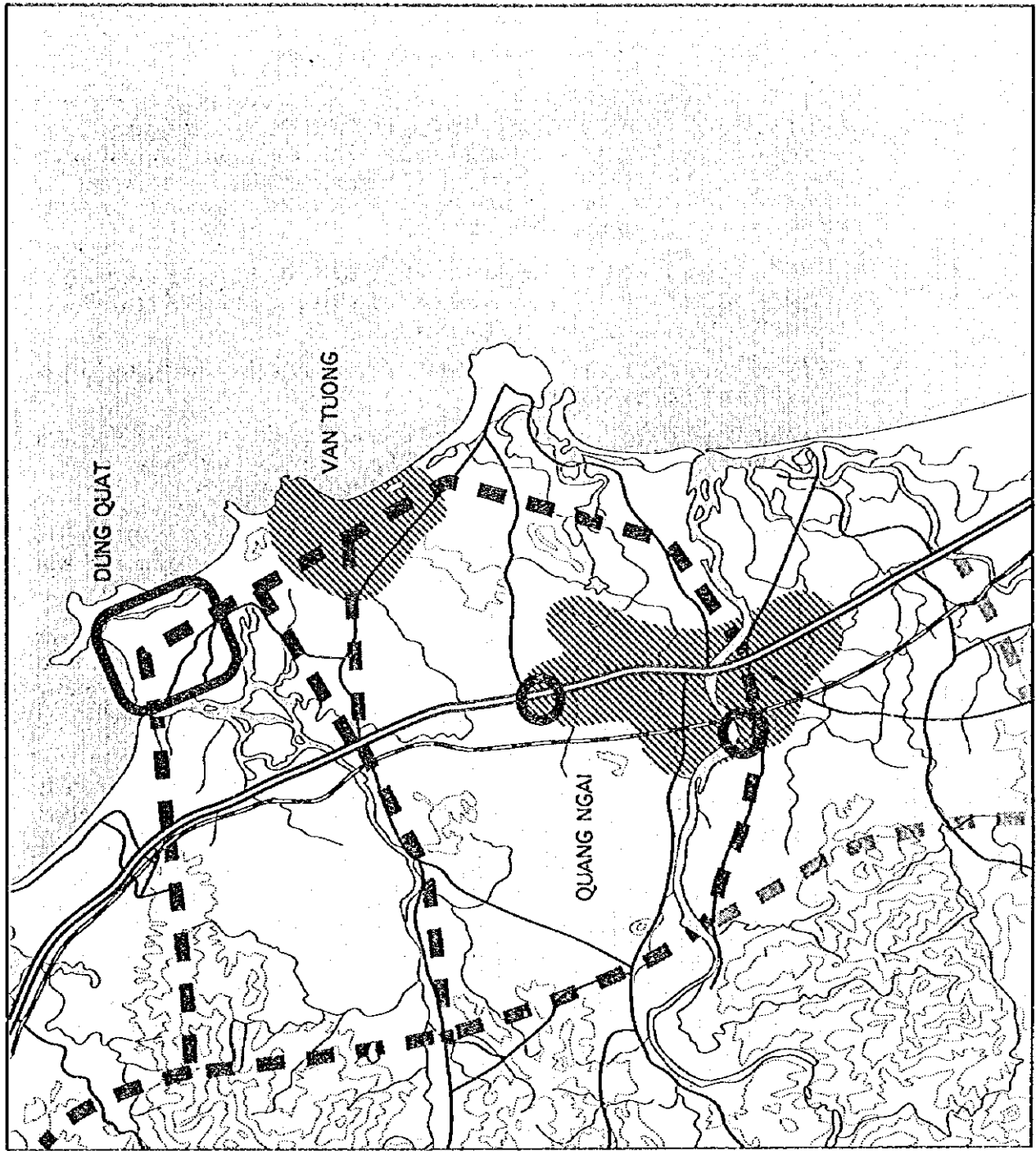


Figure 4.5.5 Improvement Strategy for Southern Precinct



CENTRAL VIETNAM
MASTER PLAN STUDY

New North-South Highway

PHASE I
at opening of DUNG QUAT

PHASE II
Year 2010

PHASE III
Year 2010

Highway 1

Existing/Future Urbanized Area

Industrial Estate, Free Trade Zone,
Export Processing Zone

0 1 5 10 20km

Figure 4.5.5
Improvement Strategy
for Southern Precinct

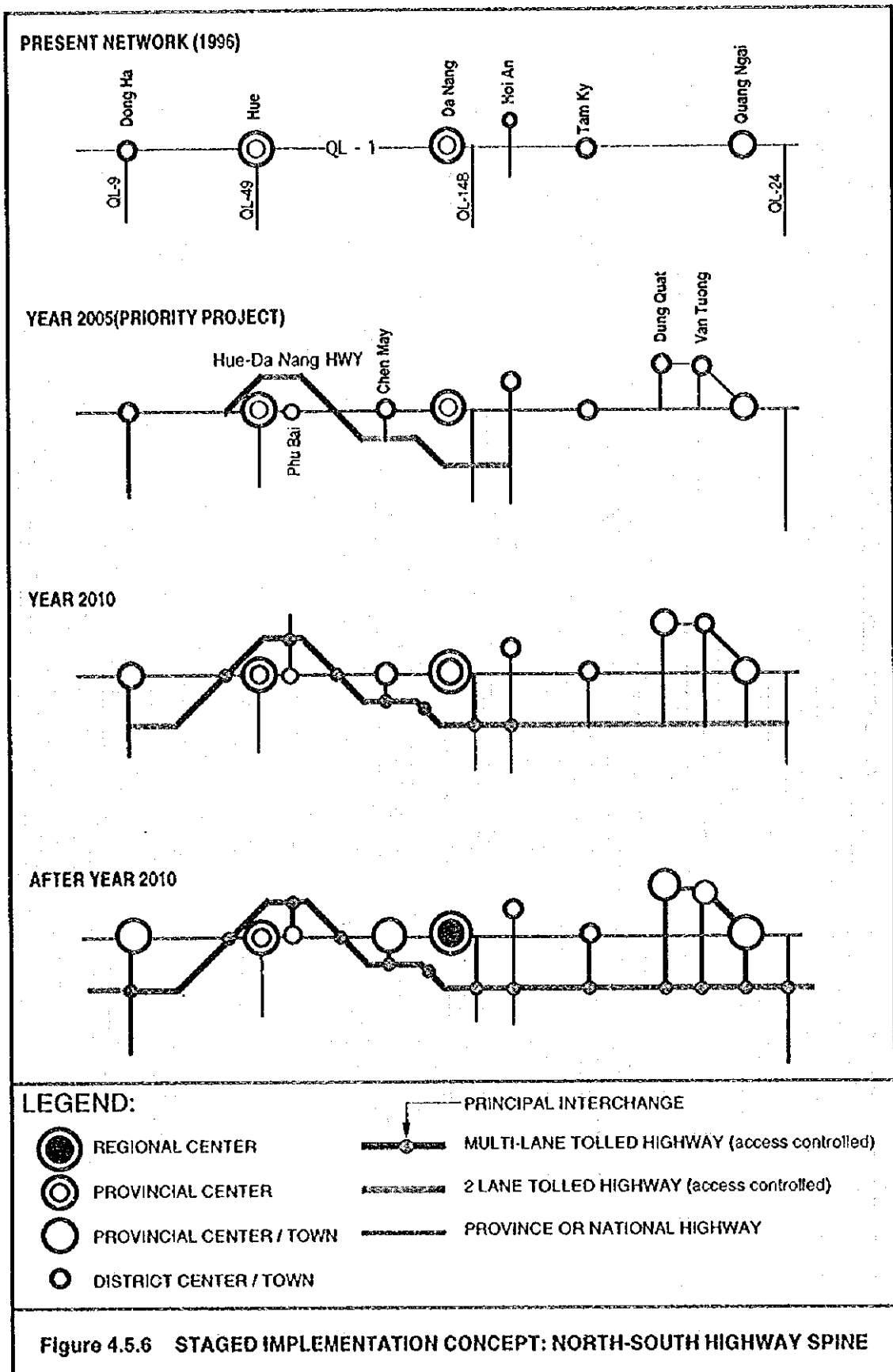
Similar conclusions emerge in the higher-volume Hue-Da Nang corridor:

- Under year 2000 demand conditions, Highway 1 still operates at an acceptable level of service. However, the subsection paralleling the HDH Da Nang Bypass segment is shown as approaching its assignment capacity. This is not surprising given the rapid socio-economic growth expected of Da Nang, and underscores the desirability of conducting a detailed, comprehensive urban transportation study for the Da Nang metropolitan area at the earliest opportune time.
- The HDH, which is slated for opening by year 2005, is shown as operating at acceptable levels of service. However, the Da Nang Bypass subsection of Highway 1 is expected to approach maximum capacity.
- Under year 2010 demand conditions the HDH has exceeded capacity. Highway 1 is shown as having failed completely.

These findings confirm that the focus of additional improvements (beyond those incorporated in the future road network) must center on the critical Highway 1 corridor. In response, a staged implementation concept for the north-south spine has been defined (Figure 4.5.6).

- The committed upgrading of existing Highway 1 in line with on-going IBRD and ADB projects should, in the first instance, continue. These improvements will essentially transform Highway 1 into a high-order, two-lane road.
- Construction of the HDH should, as a priority project, be initiated as soon as possible to ensure availability by (preferably prior to) year 2005. The goal is to establish a two-lane, access controlled facility, in line with criteria previously detailed in Figure 4.5.2. It is anticipated that a closed, distance-proportional toll system will be instituted along the HDH.
- By year 2010 (end of the current study's planning horizon) it is likely that a four-lane cross-section will be required along the HDH. Furthermore, two-lane extensions appear justified north as far as Highway 9, and south as far as Highway 24. It is expected that this entire system will continue to be access controlled, and operate as a tolled facility with unified toll structure.
- Extension beyond Highways 9 and 24, as well as upgrading to multi-lane status over the entire extent of the study area, is conceivable beyond year 2010. It is likely that at least partial realization of the Government's plan for a Ha Noi-HCMC motorway can be integrated with the post-2010 concept assuming recommendations regarding the right-of-way reservation are indeed implemented.

Figure 4.5.6 Staged Implementation Concept for North-South Highway Spine



4.5.2 Port

1) Cua Viet Port

After completion of one wharf, construction of an additional wharf and issues pertaining to port capacity shall be decided based on assessment of economic viability as well as actual operations and maintenance practices especially as related to the navigation channel.

It is advisable to view this port as a local port for coastal transshipping.

2) Chan May Port

One pier for construction material and equipment is to be provided by year 2000. Responding to demands of years 2005 and 2010, wharves with capacities ranging from 5,000 to 40,000 DWT will be constructed.

Three alternative plans are proposed as shown in Figure 4.5.7.

3) Lien Chieu Port

Based on existing facilities and on-going construction, Lien Chieu Port would be classified as a specialized port. Further in-depth technical and economical feasibility studies are essential to determine if the Hoa Khanh area (south-east side of Lien Chieu District) is appropriate for siting a new port site.

4) Tien Sa Port

Construction of a new container wharf including workshop and utilities are scheduled to be completed by year 2000. A breakwater will be constructed by year 2000 with ADB financial assistance.

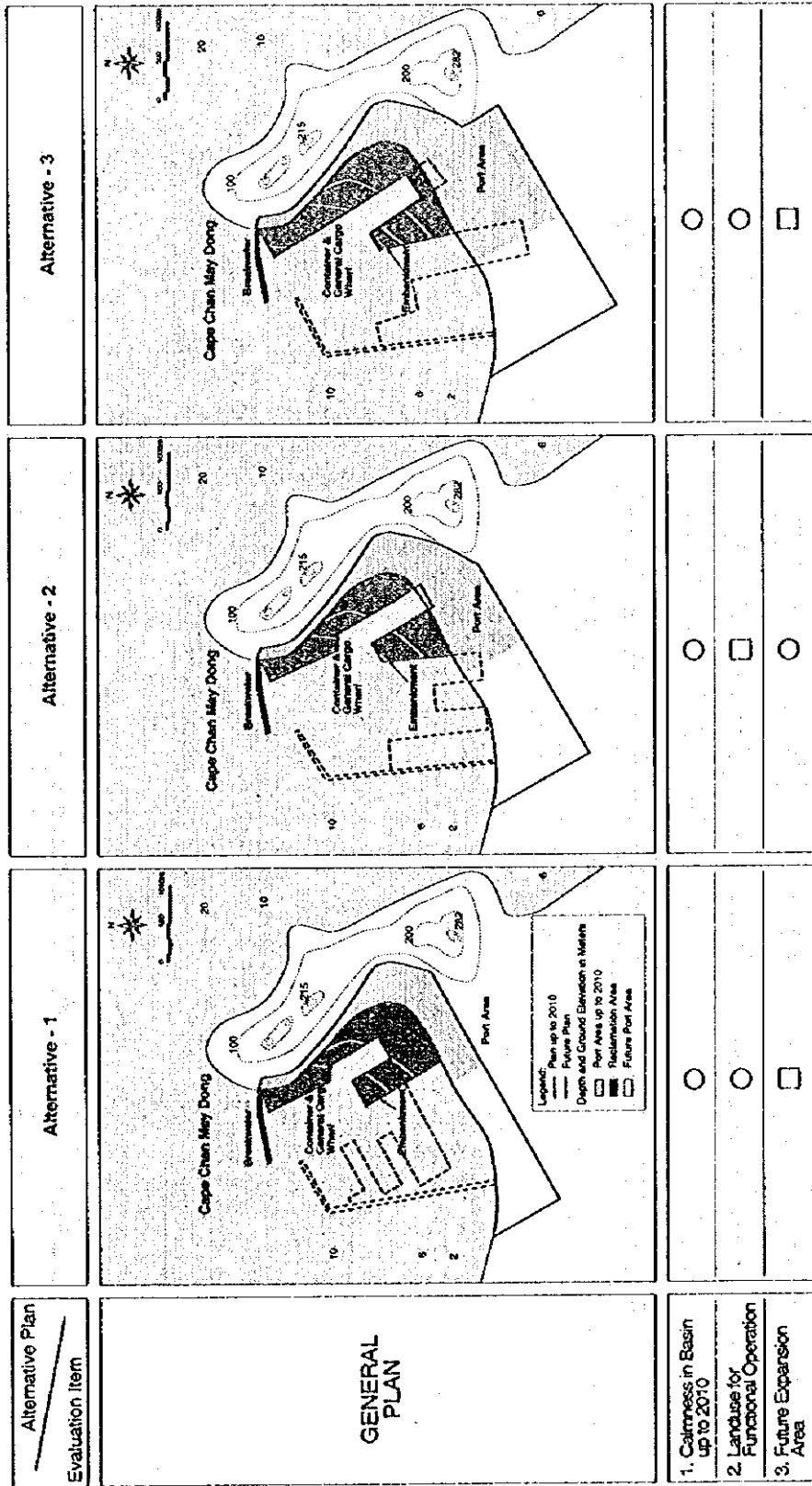
5) Dung Quat Port

Dung Quat Port Implementation plan is divided into three phases:

- (1) Urgent Phase : Wharf for 1st Stage Refinery Product and a separate wharf for construction material and equipment
- (2) Phase - 1 : Wharf for 2nd Stage Refinery Product and Phase - 1 Public Wharf as well as shipyard
- (3) Phase - 2 : Phase - 2 Public Wharf

Summarized schedules for ports development and financial schedule are shown in Figure 4.5.8 and Table 4.5.4, respectively.

Figure 4.5.7 Comparison of Chan May Port Plan



Note: ○ Advantageous
□ Fair

Construction costs for the three alternatives are almost same

Source: JICA Study Team

Having the established forecast for the seaports in the study area, and likely limitations in the capacity of the existing port facilities, review of anticipated port capacity sufficiency is required. In order to present a reasonable picture, the following two factors should be duly taken into consideration and necessary adjustments should be made accordingly.

- The proportions of the total forecast demand as estimated on the basis of the Asian precedent experiences (6.8, 11.5 and 21.0 million tons in the year 2000, 2005 and 2010, respectively) are reasonable in conjunction with the refined petroleum products to be produced from the Dung Quat industrial complex (10.9 and 21.8 million tones in the year 2005 and 2010, respectively),
- Likely share of the general cargo flows going to the northern ports (Cua Viet, Hue and Da Nang) and to the southern port (Dung Quat) in the study area, and
- The potential cargo volume of some 2 million tones generated to/from the inland countries (Lao PDR and north-eastern Thailand via the East-West Trade Corridor of GMS) may possibly use the new Hue-Da Nang (Chan May) port in the year 2010.

In working out the port allocation ratios, the future hinterland population distribution is applied with the result that some two-third of general cargo flows are likely to use the northern ports and the rest one-third use the Dung Quat port.

Table 4.5.3 shows the forecast demand and capacity requirements of the ports in the study area.

Table 4.5.3 Forecast Demand and Capacity Requirements

Forecast Demand & Capacity Requirement	2000	2005	2010
Forecast demand (mil. tones)	6.8	11.5	21.0
Refinery & related demand (mil. tones)		10.9	21.8
Capacity Requirement (mil. tones)	3.5	22.4	42.8
(1) Cua Viet Port	0.2	0.2	0.2
(2) Da Nang Port (Tien Sa Port)	3.3	3.3	3.3
(3) New Hue/Da Nang (Chan May) Port		3.0	8.1
(4) Dung Quat Port		15.9	31.2

Source: JICA study team



Table 4.5.4 Disbursement Schedule

(unit: million US\$)

	up to 2000	up to 2005	up to 2010
Construction cost for Chan May, Tien Sa & Dung Quat	76	511	220

Figure 4.5.8 Implementation Schedule of Port Development

Port		Year														
Name	Classification	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cua Viet	Local						1)									
Chan May	Public/Commercial				Wharf for construction material & equipment				Phase 1 Wharf					Phase 2 Wharf		
Lien Chieu	Specialized	Hai Van Cement Jetty							Oil Bury and Jetty							2)
Tien Sa	Public/Commercial			1- Container Wharf		Refrigerator										
Dung Quat	Industrial/Public				Wharf for Construction Material & Equipment		Wharf for 1st Stage Refinery Product					Wharf for 2nd Stage Refinery and Phase 1 Public & Shipyard				Wharf for Phase 2 Public & Shipyard

Notes:  Under construction
 Planned
 - - - 1) Plan requiring further assessment
 - - - 2) Sufficiency analysis by managerial body

4.5.3 Environmental Sanitation

The number and variety of problems in the study area's environmental sanitation sector as well as the still limited financial and technical absorptive capacity indicate that development to substantially improve the present service levels call for a long-term action and need careful preparation and planning. At the same time, implementation of development projects in some places are urgently needed to avoid further deterioration of the existing situation on environmental sanitation.

Together, it is very important that the environmental sanitation development should be established in harmony with other sector projects in urban, industry and tourism development, since environmental sanitation can be addressed as the supporting sector for other sectors in the main. Based on such consideration, the development target and strategy of the environmental sanitation sector are discussed hereinafter.

1) Development Target and Strategy in the Whole Study area

As described precisely in the section on the macro-economic sector, the whole study area is projected to attain in 2010: (1) some 6.5 million population with 1.8 to 2.5 % annual growth, (2) totally some 980 million USD of GDP in industry and service sectors with 25 to 56 % growth. Such socio-economic growth will result in the following necessities in the environmental sanitation sector of the study area.

- Water supply: Rapid increase in water demand caused by: (1) population growth, urbanization, and enlargement of industrial and service activities, (2) enhancement of urban living style.
- Sewerage: (1) Pollution load increase with increasing waste water discharge from urban areas and industrial zones, (2) diverse categories of

waste water discharge, (3) expansion of urban zones which need adequate storm water drainage.

- Solid waste disposal: (1) increasing solid waste generated from urban, commercial and industrial activities, (2) diverse categories of solid waste.

Consequently, the development plan toward 2010 in environmental sanitation of the study area must cope with : (1) abatement for inadequate situation at present, and (2) mitigation or betterment keeping pace with the enlargement of population, urban area and industry activities resulted from the socio-economic growth in the future. The development plan for the environmental sanitation sector is formulated and proposed in this section, based on the consideration that the service and utilization levels in the study area should be upgraded to the level of the ASEAN countries until 2010 so as to support sound and sustainable socio-economic development in the Region.

Though this section describes some investment cost required for the development, it should be noted that they are aimed at providing advanced information on the magnitude of required cost for reference only. The result from the development plan as discussed later in detail forecasts the total magnitude of cumulative investment amount will reach some 1,900 million-USD in 2010. Of this amount, some 1,300 million USD equivalent to about 200 USD per capita is possibly to be financed by the public sector and some 600 million USD possibly to be self-financed by various industries.

It is clearly anticipated that a major issue on implementation will be how to arrange and allocate the required investment fund. It may be noticed that the proposed development plan is too ambitious from the view point of budgetary affordability. Nevertheless, what should be strongly pointed out is that serious and large-scale deterioration of human and natural environment is foreseen in the study area, unless appropriate measures be undertaken against the negative impact to be caused by rapid socio-economic growth. To the end, the development plan should be subject to more precise discussions and studies on the level of the whole study area and on the level of each Province. In this respect, it is highly recommended that a comprehensive master plan study specifically for environmental sanitation infrastructure in the study area should be worked out at the early stage.

(1) Water Supply

In urban water supply, major issues of the study area are to increase the coverage of safe water supply and to ensure the standard per capita consumption with providing suitable quality water. It is also necessary that adequate water supply in terms of both quantity and quality is provided to support the industrial growth. The specific target in 2010 in water supply is summarized and proposed as follows:

Target of urban water supply in 2010:

- Unit consumption: 150 lit/cap.d in urban area (on the daily average base)
- Population coverage: 90 % in urban area, 50 % in the whole study area, and
- Leak loss from pipe network: less than 15 %.

Target of industrial water supply in 2010:

- Water production: equivalent to the unit demand of 2.0 to 7.0 m³/d per GDP-1000 USD).

Table 4.5.5 shows an incremental water supply scheme by the phase toward the target year of 2010. It is projected that in the whole study area, the production capacity of urban water supply and industrial water supply will increase to some 780,000 m³/day and some 1,000,000

m³/day in 2010, respectively. Figure 4.5.9 outlines that the rough estimation of cumulative investment amount*¹ required for the project development would reach approximately 430 million USD*² in 2010, including some countermeasures for sea water intrusion to raw water sources.

Table 4.5.5 Development Plan on Water Supply in the Study Area

Items	Phase			
	Present (1995)	2000	2005	2010
A. Urban Water Supply				
Population (x 1000)	4,774	5,355	5,922	6,480
Share of Urban Population (%)	22.6	24.0	27.6	33.1
Unit Consumption (daily average, lit/cap.d)	60-78	100	125	150
Population Coverage in Urban Area (%)	50-60	70	80	90
Population Coverage in the Whole Area (%)	4.8-22	24	37	50
Transmission Loss (%)	30-40	25	20	15
Non-living Consumption and Loss (cu-m/d)	61,500	196,300	245,371	350,934
Water Production Capacity (cu-m/d)	107,900	357,100	491,020	780,700
B. Industrial Water Supply				
Industry GDP (million USD)	52	90	198	387
Unit Demand (cu-m/d per GDP-1000USD)	8.0	6.9	3.7	2.2
Water Demand (cu-m/d)	414,000	621,690	731,738	851,840
Water Production (cu-m/d)	478,000	746,000	878,000	1,022,000

Note: The figures on the urban water supply are related to the piped-water supply facilities for living, commercial activities and others in urban areas including some parts of surrounding rural areas.

Source: JICA Study Team

For the attainment of this goal, the implementation plan necessary in the study area should be directed to the following issues.

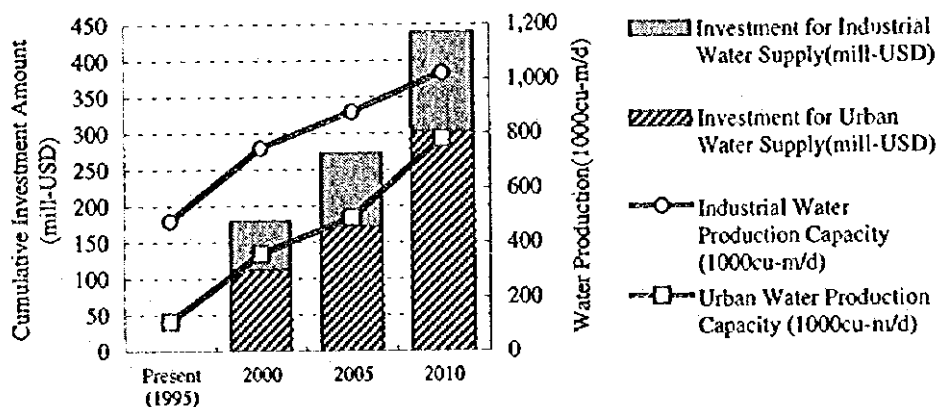
- Rehabilitation and expansion of existing water supply system in major urban centers in line with their urban development plans
- Promotion of community piped-water supply system in the urban areas, where individual water supply measures are dominant at present
- To cope with the requirements for industrial and tourism development projects, together with the development of water supply system by exploiting raw water sources in industrial and tourism zones, and
- Relocation of raw water intake places or development of new raw water sources by the construction of reservoirs in order to avoid sea water intrusion to drinking water.

Also, for currently isolated local areas without safe water supply in some mountain areas, introduction of micro-scale safe water supply system consisting of wells equipped with hand-pump, mini-sized pumps or packaged purification units and so on are necessary.

*¹ : Cumulative investment amount means the required total amount during the period from the present(1995) to the subject phase in this Report.

*² : Investment amounts are estimated based on the unit cost of 450 USD/cu-m.day for urban water supply and 300 USD/cu-m.day for industrial water supply.

Figure 4.5.9 Development and Investment Amount for Water Supply in the Study Area



Source : JICA Study Team

(2) Sewerage

Sewerage should basically serve for the improvement of living environment by treatment of toilet and gray waste water discharged from households, and waste water from commerce and industries. The existing sewerage in the study area does not function to handle waste water, while it simply discharge as part of storm water. Periodical inundation occurring in the study area is a definite constraining factor for the socio-economic development, and therefore, one essential thing for sustainable development is to facilitate storm water drainage to protect flood incidents.

To be more important in sewerage sector, huge pollution loads generated from urban and industrial activities will crucially necessitate the introduction of waste water treatment to the study area.

It is anticipated that the volume of waste water to be discharged from urban areas and industrial zones in the study area will amount to some 1,800,000 m³/day almost equal to the supplied water volume in 2010. Therefore, the generated pollution load in the study area will range from some 100 ton-BOD/day at present to 640 ton-BOD/day in 2010^{*1}. It is obvious that the natural and human environment in the study area will be considerably deteriorated, unless waste water treatment system is introduced.

Thus, the following development criteria for the sewerage sector together with expansion of storm water drainage are proposed based on the minimum requirement for the study area. The total pollution load to the environment in 2010 should be controlled under the present level with the introduction of waste water treatment employing a biological process for urban and industrial waste.

*1 : The Pollution load in terms of BOD is estimated based on: (1) 30 to 60 g/cap.d to be transited 1995 to 2010 in urban waste water, (2) 200 to 600 mg/l to be transited from 1995 to 2010 in industrial waste water.

Target of waste water disposal in 2010:

- Population coverage in urban waste : 93 % in urban area, and
- Treatment volume coverage in industrial waste : 95 %.

Target of storm water drainage in 2010:

- Drainage network density : 110 m/ha in urban area, and
- Drainage coverage : 100 % in urban area*1

Table 4.5.6 shows the numerical transition status on sewerage by phase towards 2010. It is projected that in the whole study area, the generated pollution load of 640 ton-BOD/day from urban areas and industrial zones will be reduced to some 95 ton-BOD/day in 2010 by adopting waste water treatment. As outlined in Figure 4.5.10, rough estimation of the cumulative investment amount*2 required for the project implementation will be approximately 1,200 million USD in 2010.

Table 4.5.6 Development Plan on Sewerage in the Study Area

Items	Phase			
	Present (1995)	2000	2005	2010
A. Urban Waste Water Disposal				
Population (x 1000)	4,774	5,355	5,922	6,480
Share of Urban Population (%)	22.6	24.0	27.6	33.1
Population Coverage (%)	0	50	85	93
Waste Water Discharge (cu-m/d)	116,000	357,100	491,020	780,700
Generated Pollution Load (ton-BOD/d)	32.4	51.4	81.8	129
Discharged Pollution Load to the environment (ton-BOD/d)	32.4	28.3	19.2	21.0
B. Industrial Waste Water Disposal				
Industry GDP (million USD)	52	90	198	387
Unit Demand (cu-m/d per GDP-1000USD)	6.7	7.0	3.7	2.2
Treatment Coverage (%)	0	50	80	95
Waste Water Discharge (cu-m/d)	349,700	630,300	738,100	851,900
Generated Pollution Load (ton-BOD/d)	69.9	221	354	511
Discharged Pollution Load to the Environment (ton-BOD/d)	69.9	121	99.2	74.1
(Urban Waste Water + Industrial Waste Water)				
Waste Water Discharge (cu-m/d)	465,700	987,400	1,229,120	1,632,600
Generated Pollution Load (ton-BOD/d)	102	272	436	640
Discharged Pollution Load to the Environment (ton-BOD/d)	102	149	118	95.1
C. Storm Water Drainage				
Urbanized Area (ha)	3,167	3,707	4,568	5,716
Area Coverage (%)	50	70	94	100
Drainage Density (m/ha)	55	77	103	110
Total Length of Drain Route (km)	172	286	472	629

Note: The figures on the urban waste water disposal are related to waste water living, commercial activities, etc. in urban areas including some parts of surrounding rural areas.

Source: JICA Study Team

Taking into account the present rudimentary situation in sewerage systems, the development direction in the study area is categorized as follows:

- In flood-prone areas, rehabilitation and expansion of the existing drainage system for storm water, and provision of pumping stations, if necessary, depending on the topographical conditions

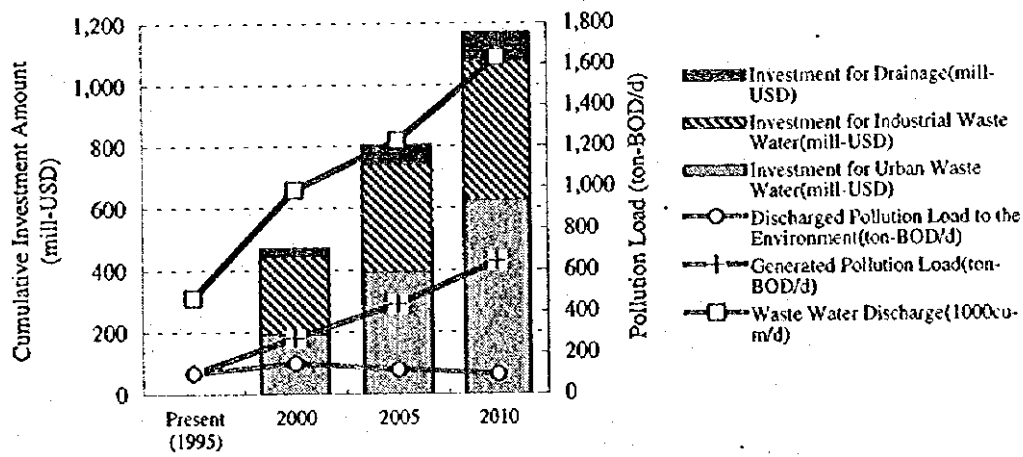
*1 : The increase of urbanized area is simply estimated based on the equation of;

$$(\text{Urban Area in Standard Year}) \times [(\text{Population in Subject Year}) / (\text{Population in Standard Year})]^{0.8}$$

*2 : The investment amounts of sewerage are estimated based on the unit cost of 800 USD/cu-m/d for urban waste water

- In core urban centers and the areas located upstream of environmentally vulnerable public water course, development of the sewerage system equipped with waste water purification facilities as well as storm water drainage, and
- In newly constructed large-scale development zones supporting industrial and/or commercial activities, development of the sewerage equipped with waste water purification facilities as well as storm water drainage.

Figure 4.5.10 Development and Investment Amount for Sewerage in the Study Area



Source : JICA Study Team^{Phase}

(3) Solid Waste Disposal

The present collected volume ratio of solid waste in the study area accounts for some 60 % of the total generated waste, and all of the collected waste are simply dumped in disposal sites with no proper treatment. To abate the growth of solid waste generation resulting from urbanization and upgrading of living standards, the introduction and development of a series of suitable facilities for collection, transportation, intermediate disposal and final disposal system are essential in the study area.

The generation of urban solid waste^{*1} in the study area is projected to reach some 1,800 ton/day in 2010 except for industrial wastes, and the availability of landfill sites will become even more difficult, since the cumulative volume required landfill site will reach about 4 million cubic-m in 2010. To mitigate such conditions, introduction of the following remedial measures is essential for the proper management of solid waste disposal in the study area:

- Collection and transportation system: Garbage collection vehicles, garbage relay station and haulage trucks
- Intermediate disposal system: Organic garbage composting facilities and incineration facilities, and
- Final disposal system: Sanitary landfill facilities equipped with leachate treatment system.

*1 : Urban solid waste stands for the waste discharged from households, offices, markets and other service sectors.

The major theme in solid waste disposal in the study area should focus on the expansion of collection service coverage and volume reduction of generated garbage.

Target of solid waste disposal in 2010:

- Collection service coverage: 100 % population in urban area, and
- Waste volume reduction^{*2} : 50 % by introduction of composting and incineration.

Table 4.5.7 shows the numerical progressive status on the solid waste disposal by phase towards 2010. It is projected that, in the whole study area, the final disposed solid waste amounts to some 950 ton/day in 2010, even though generated waste is assumed to be reduced by some 50 % by introduction of composting and incineration. As outlined in Figure 4.5.11 the rough estimation of cumulative investment amount^{*1} required for the development will reach approximately 290 million USD in 2010.

Table 4.5.7 Development Plan on Solid Waste Disposal in the Study Area

Parameters	Phase			
	Present (1995)	2000	2005	2010
Urban Population (1000 people)	1,079	1,286	1,637	2,147
Unit Living Waste Discharge (g/cap.d)	500	550	580	600
Ratio of Commercial Waste (%)	20.0	30.0	35.0	40.0
Generated Solid Waste Volume (ton/d)	647	919	1,282	1,803
Population Service Coverage (%)	64	81	92	100
Collected Waste Volume (ton/d)	411	741	1,174	1,803
Composted Waste Volume (ton/d)	0	74.1	235	541
Ratio of Composting (%)	0	10	20	30
Incinerated Waste Volume (ton/d)	0	0	117	361
Ratio of Incineration (%)	0	0	10	20
Generated Ash Volume (ton/d)	0	0	17.6	54.1
Total Land-fill Disposed Waste Volume (ton/d)	411	667	839	956
Overall Waste Volume Reduction Ratio (%)	0	10.0	28.5	47.0

Source: JICA Study Team

In the study area, where solid waste disposal still remains at a very rudimentary stage, the development direction is categorized as follows:

- In core urban centers and in newly developed zone for industrial and commercial activities, expansion of waste collection/transportation facilities and improvement of final disposal manner, taking into account the introduction of: (1) sanitary landfill with leachate treatment, (2) incineration of combustible and toxic/hazardous waste, and (3) composting of organic garbage.
- In large urban centers, expansion of facilities such as containers and vehicles necessary for waste collection services and waste haulage.

(4) Non-Physical Development Measures

In the development of the environmental sanitation sector of the study area, besides the physical development measures mentioned above, a series of coordinated non-structural development

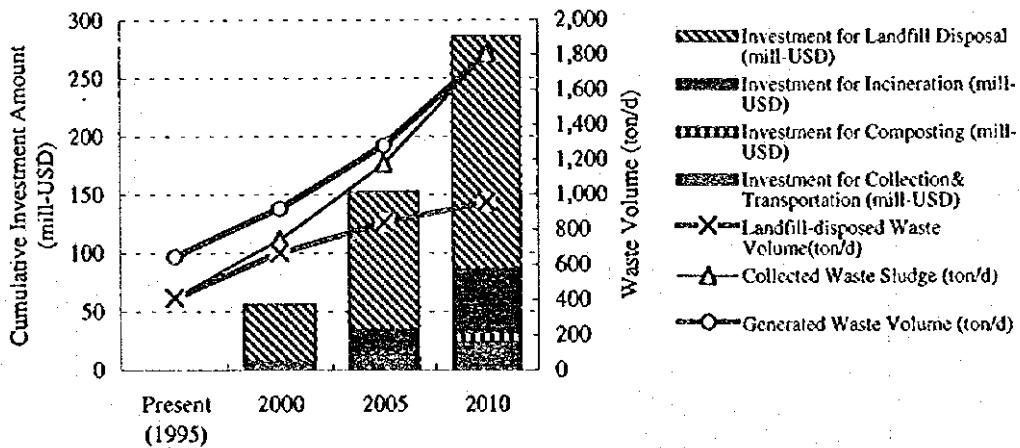
^{*2} : The waste volume reduction is defined by ; (Final disposed volume)/(Generated volume) x 100.

^{*1} : The investment amounts for solid waste disposal are estimated based on the unit costs; 5,000 USD/ton.d for collection, 12000 USD/ton.d for relay and transportation, 15,000 USD/ton.d for composting, 150,000 USD/ton.d for incineration and 50 USD/cu-m except land cost.

system and to foster proper utilization of facilities and relevant technologies.

- Intensification of environmental regulations to enforce environmental policy
- Formulation of a financial back-up system to encourage environmental protection measure in the private sectors,
- Reinforcement of management and operation capacity in environmental sanitation facilities
- Establishment of water-saving practice in water utilization in all sectors, especially in manufacturing industries, and
- Enhancement of public awareness on environment and health care.

Figure 4.5.11 Development and Investment Amount on Solid Waste Disposal in the Study area



Source : JICA Study Team Phase

2) Provincial Development Plan

(1) Quang Tri Province

In Quang Tri Province, the total population and the GDP in both industry and service sectors, are projected to reach some 800 thousand people and some 60 million USD in 2010, respectively. Such socio-economic development will require a large scale investment in all environmental sanitation subsectors as shown in Table 4.5.8, and the cumulative investment will amount to some 150 million USD until 2010, covering water supply facilities, sewerage and solid waste disposal facilities.

In light of the effective and efficient investment in development, Dong Ha and Quang Tri which contain large urban centers and newly industrial zones such as the Border Trade Zone and Nam Dong Ha-Ai Tu Estate, will become important areas for the implementation of environmental sanitation infrastructure.

Table 4.5.8 Projection on Environmental Sanitation Infrastructure in Quang Tri Province

Parameters	Phase			
	1995 (present)	2000	2005	2010
1. Socio-Economic Development Frame				
Urban Population (1000 people)	91	119	170	244
Rural Population (1000 people)	455	508	540	549
Industry Sector GDP (million-USD)	3.1	4.1	6.6	11.3
Service Sector GDP (million-USD)	11.2	22.9	35.6	51.6
2. Water Supply Facilities				
Produced Water in Urban Piped-Water Supply System (cu-m/d)	11,500	32,900	51,120	88,800
Produced Water in Industrial Water Supply System (cu-m/d)	27,700	33,400	33,400	35,800
3. Sewerage				
A. Waste Water Disposal Facilities				
Generated Pollution Load from Urban Waste Water (ton-BOD/d)	2.7	4.7	8.5	14.7
Generated Pollution Load from Industrial Waste Water (ton-BOD/d)	6.6	11.7	16.0	21.5
Discharged Pollution Load to the Environment (ton-BOD/d)	8.3	9.0	6.5	5.5
B. Storm Water Drainage				
Urbanized Area (ha)	524	646	864	1,153
Total Length of Drain Route (km)	2.0	38.8	86.4	126.8
4. Solid Waste Disposal Facilities				
Generated Waste Volume (ton/d)	54.7	84.7	133.4	205.2
Collected Waste Volume (ton/d)	8.2	42.4	100.1	205.2
Composted Waste Volume (ton/d)	0	4.1	19.3	61.6
Incinerated Waste Volume (ton/d)	0	0	9.6	41.0
Landfill-Disposed Waste Volume (ton/d)	8.2	38.1	71.5	108.7
5. Cumulative Investment Cost (mill-USD)		66	122	229

Note: The figures in this table is computed using the socio-economic development indicators explained in this section.

Source: JICA Study Team

(2) TT-Hue Province

In TT-Hue Province, the total population and the GDP in both industry and service sectors, are projected to reach some 1.4 million people and some 400 million USD in 2010, respectively. Such socio-economic development will require a large scale investment in all environmental sanitation subsectors as shown in Table 4.5.9, and the cumulative investment will amount to total some 500 million USD, covering water supply facilities, sewerage and solid waste disposal facilities until 2010.

In light of the effective and efficient investment in development, Hue City which contains a large urban center, prominent tourism zone and industrial zones such as the Chan May Port Zone and Phu Bai Estate, will become an important area for the implementation of environmental sanitation infrastructure.

(3) QN-Da Nang Province

In QN-Da Nang Province, the total population and the GDP in both industry and service sectors, are projected to reach some 2.6 million people with high urbanization ratio accounting for some 40% and some 270 million USD in 2010, respectively. Such socio-economic development will require a large scale investment in all environmental sanitation subsectors as shown in Table 4.5.10, and the cumulative investment will amount to some 800 million USD, covering water supply facilities, sewerage and solid waste disposal facilities until 2010.

In light of the effective and efficient investment in development, Da Nang City, Hoi An Town and Tam Ky which contain large urban centers and promising tourism zones, and industrial zones such as Da Nang EPZ, Hoa Khanh Estate and Dien Ngoc-Dien Nam Estate will become important areas for the implementation of environmental sanitation infrastructure.

Table 4.5.9 Projection on Environmental Sanitation Infrastructure in TT-Hue Province

Parameters	Phase			
	1995 (present)	2000	2005	2010
1. Socio-Economic Development Frame				
Urban Population (1000 people)	270	336	429	548
Rural Population (1000 people)	767	834	872	878
Industry Sector GDP (million-USD)	16.1	31.1	57.5	111.2
Service Sector GDP (million-USD)	31.1	49.6	121.2	296.1
2. Water Supply Facilities				
Produced Water in Urban Piped-Water Supply System (cu-m/d)	25,000	93,300	128,800	199,100
Produced Water in Industrial Water Supply System (cu-m/d)	157,600	275,800	306,400	350,800
3. Sewerage				
A. Waste Water Disposal Facilities				
Generated Pollution Load from Urban Waste Water (ton-BOD/d)	8.1	13.4	21.5	32.9
Generated Pollution Load from Industrial Waste Water (ton-BOD/d)	26.3	80.4	122.5	175.4
Discharged Pollution Load to the Environment (ton-BOD/d)	34.4	51.6	39.4	30.8
B. Storm Water Drainage				
Urbanized Area (ha)	1,190	1,420	1,720	2,090
Total Length of Drain Route (km)	43.4	84.9	172.3	230.3
4. Solid Waste Disposal Facilities				
Generated Waste Volume (ton/d)	162	249	336	460
Collected Waste Volume (ton/d)	64.7	168	303	460
Composted Waste Volume (ton/d)	0	17.0	61.0	138
Incinerated Waste Volume (ton/d)	0	0	30.3	92.0
Landfill-Disposed Waste Volume (ton/d)	64.7	151	216	244
5. Cumulative Investment Cost (mill-USD)		385	558	835

Note: The figures in this table is computed using the socio-economic development indicators explained in this section.

Source: JICA Study Team

Table 4.5.10 Projection on Environmental Sanitation Infrastructure in QN-Da Nang Province

Parameters	Phase			
	1995 (present)	2000	2005	2010
1. Socio-Economic Development Frame				
Urban Population (1000 people)	613	700	852	1,089
Rural Population (1000 people)	1,370	1,500	1,555	1,528
Industry Sector GDP (million-USD)	22.5	30.5	52.1	90.2
Service Sector GDP (million-USD)	44.0	58.9	103.9	183.0
2. Water Supply Facilities				
Produced Water in Urban Piped-Water Supply System (cu-m/d)	69,500	194,300	255,600	395,900
Produced Water in Industrial Water Supply System (cu-m/d)	133,500	241,400	330,500	399,900
3. Sewerage				
A. Waste Water Disposal Facilities				
Generated Pollution Load from Urban Waste Water (ton-BOD/d)	18.4	28.0	42.6	65.3
Generated Pollution Load from Industrial Waste Water (ton-BOD/d)	22.3	70.4	132.2	200.0
Discharged Pollution Load to the Environment (ton-BOD/d)	40.6	54.1	47.0	39.6
B. Storm Water Drainage				
Urbanized Area (ha)	1,140	1,270	1,480	1,800
Total Length of Drain Route (km)	119.3	139.3	163.1	198.4
4. Solid Waste Disposal Facilities				
Generated Waste Volume (ton/d)	368	500	667	915
Collected Waste Volume (ton/d)	294	450	634	915
Composted Waste Volume (ton/d)	0	45	127	274
Incinerated Waste Volume (ton/d)	0	0	63.4	183
Landfill-Disposed Waste Volume (ton/d)	294	405	453	485
5. Cumulative Investment Cost (mill-USD)		505	858	1,360

Note: The figures in this table is computed using the socio-economic development indicators explained in this section.

Source: JICA Study Team

(4) Quang Ngai Province

In Quang Ngai Province, the total population and the GDP in both industry and service sectors, are projected to reach some 1.6 million people, and some 240 million USD as much as 17 times growth in 2010, respectively. Such socio-economic development will require a large scale investment in all environmental sanitation subsectors as shown in Table 4.5.11, and the cumulative investment will amount to some 280 million USD, covering water supply facilities, sewerage and solid waste disposal facilities until 2010.

In light of the effective and efficient investment in development, Quang Ngai Town which contains a large urban center and future mega-scale Dung Quat industrial town will become important areas for the implementation for environmental sanitation infrastructure.

Table 4.5.11 Projection on Environmental Sanitation Infrastructure in Quang Ngai Province

Parameters	Phase			
	1995 (present)	2000	2005	2010
1. Socio-Economic Development Frame				
Urban Population (1000 people)	105	132	185	266
Rural Population (1000 people)	1,103	1,226	1,319	1,378
Industry Sector GDP (million-USD)	10.2	24.4	81.3	174.5
Service Sector GDP (million-USD)	11.4	16.5	33.1	66.6
2. Water Supply Facilities				
Produced Water in Urban Piped-Water Supply System (cu-m/d)	10,000	36,600	55,500	96,900
Produced Water in Industrial Water Supply System (cu-m/d)	95,400	199,200	209,900	228,700
3. Sewerage				
A. Waste Water Disposal Facilities				
Generated Pollution Load from Urban Waste Water (ton-BOD/d)	3.2	5.3	9.3	16.0
Generated Pollution Load from Industrial Waste Water (ton-BOD/d)	16.0	58.1	83.6	114.3
Discharged Pollution Load to the Environment (ton-BOD/d)	19.1	34.9	25.6	19.2
B. Storm Water Drainage				
Urbanized Area (ha)	316	379	498	666
Total Length of Drain Route (km)	7.8	22.8	49.8	73.3
4. Solid Waste Disposal Facilities				
Generated Waste Volume (ton/d)	63.1	94.2	145	224
Collected Waste Volume (ton/d)	44.1	80.1	138	224
Composted Waste Volume (ton/d)	0	8	28	67
Incinerated Waste Volume (ton/d)	0	0	14	45
Landfill-Disposed Waste Volume (ton/d)	44.1	72.1	98.4	119
5. Cumulative Investment Cost (mill-USD)		259	335	479

Note: The figures in this table is computed using the socio-economic development indicators explained in this section.

Source: JICA Study Team

4.6 WATER RESOURCES DEVELOPMENT

4.6.1 Water Demand

According to the progress of the development in each socio-economic sector, the water demand will rapidly increase as shown in Table 4.6.1 and Figure 4.6.1. Total water demand is estimated at 1,430 MCM in 1995, 2,654 MCM in 2010, of which irrigation water is 84 % in 1995 and industrial water and urban water uses are 13 % and 3 %, respectively. In the coming year 2010, the share of industry and urban water will change to 17 % to 13 % complying with the development of industrial corridor and increasing population by urbanization.

In order to meet the increasing water demand in each sector, development of water resources is needed as an urgent issue to be implemented. The amount of potential water resources existing

in each river basin exceeds by far water demand of each province in every target year. This means water could be supplied for each sector's use without any shortage.

4.6.2 Water Resources Development

The existing water use by means of major facilities amount only at 722 MCM per annum being equivalent to 50 % of the demand due to deterioration or incompleteness of hydraulic facilities. To deliver sufficient water to the beneficial areas in every development phase until the year of 2010, overall water resources development scheme is necessary to be formulated in accordance with the flow chart in Figure 4.2. Studies on water resources development projects will be carried out for every river basin in terms of water supply, flood control, protection of salt water intrusion and hydropower generation.

In the initial stage of development, rehabilitation project and new project in a short term period are implemented so as to produce quick-yielding and benefits. Among projects and programs listed in Sector Report Vol. 1 Chapter 3, medium and small scaled storage dam projects are ranked at a high priority in this stage, taking into consideration the existing severe shortage of irrigation water and mitigating floods. Dyke projects are also effective to protect salt intrusion and conserve water environment.

As a long term plan, multi-purpose dam/reservoir projects in major river basins are recommendable to be implemented from the aspects of an overall countermeasure, investment cost and implementation schedule. The following projects are needed to be identified by the master plan study on the comprehensive water resources management.

- Rao Quan multipurpose reservoir project of the Thach Hanh river in Q. Tri province
- Ta Trach multi-purpose reservoir project of the Huong river in Thua Thien Hue province
- Thu Bon river multi-purpose project in Q. N. Da Nang province.
- Nuoc Trong multi-purpose reservoir project of the Tra Khuc river in Q. Ngai province

Among the above projects, Ta Trach and Nuoc Trong projects are given priority for implementation so as to supply water for predicted developing areas by industrialization and urbanization.

Development schedule for water resources for the major river basins in each province is listed as in Figure 4.6.3.

4.6.3 Water Supply for Industrial Estate

Chan May area in Thua Thien Hue province will be developed as free trade and export processing zones until the 2005 year with the construction of Chan May deep sea port and form a new town as well as a tourism zone in Lang Co area. Those areas will require 23MCM and 44 MCM of water per annum in 2005 and 2010 respectively. In order to meet such demand water resources should be exploited with the progress of industrial estate and tourism zone. Although detailed topographical survey and geological investigation have not been done yet, Thuy Cam and Thuy Yen reservoirs would be available for supplying 10 MCM of water to the area. Deficient water amount will be supplemented by diverting 23 to 44 MCM of Truoi reservoir water to the Chan May area until the 2010 year or exploiting groundwater. In this issues, the optimum plan should be formulated on the basis of alternative studies.

Duong Quat industrial estate and new town in Quang Ngai province will need 11 MCM, 100 MCM, 153 MCM of water in 2000, 2005 and 2010. Basic ideas on water supply for the area are proposed depending upon developing phases to meet such increasing demand. As an initial stage, the existing Thack Nham irrigation canal and /or Tra Phoc diversion dam and pumping

station will delivery the water to the area. With the progress of industrial development, Nui Gang and Nuoc Trung reservoir projects will be implemented to supply the water for the full demand, considering the potential of water resources and advantages for the construction of reservoirs in the Tra Khuc river basin, comparing with those of the Tra Bong river basin. As mentioned in Sector Report Vol. 1 Chapter 3, a comprehensive water managment plan on the river basin should be established and an optimum scale of project facilities should be selected.

Table 4.6.1 Water Demand in Each Sector

(Unit : MCM)				
Item	1995	2000	2005	2010
Quang Tri Province				
Industry	12	15	15	16
Urban	5	14	22	39
Agriculture	180	287	293	301
Sub Total	197	316	330	356
T. T. Hue Province				
Industry	69	121	134	154
Urban	11	41	57	87
Agriculture	194	304	306	312
Sub Total	274	466	497	553
Q.N.Da Nang Province				
Industry	59	105	145	175
Urban	30	85	112	173
Agriculture	456	526	587	629
Sub Total	545	716	844	977
Quang Ngai Province				
Industry	42	87	92	100
Urban	4	16	24	42
Agriculture	368	609	618	626
Sub Total	414	712	734	768
The Whole Study Area				
Industry	182	328	386	445
Urban	50	156	215	341
Agriculture	1,198	1,726	1,804	1,868
Total	1,430	2,210	2,406	2,654

Figure 4.6.1 Water Demand in Each Sector

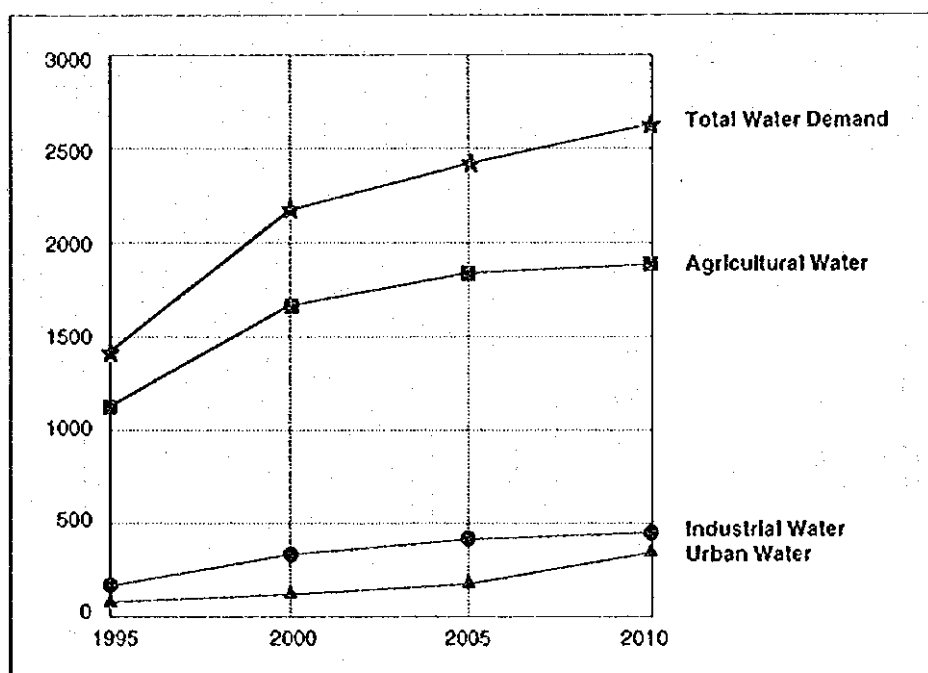


Figure 4.6.2 Water Resources Development Scheme

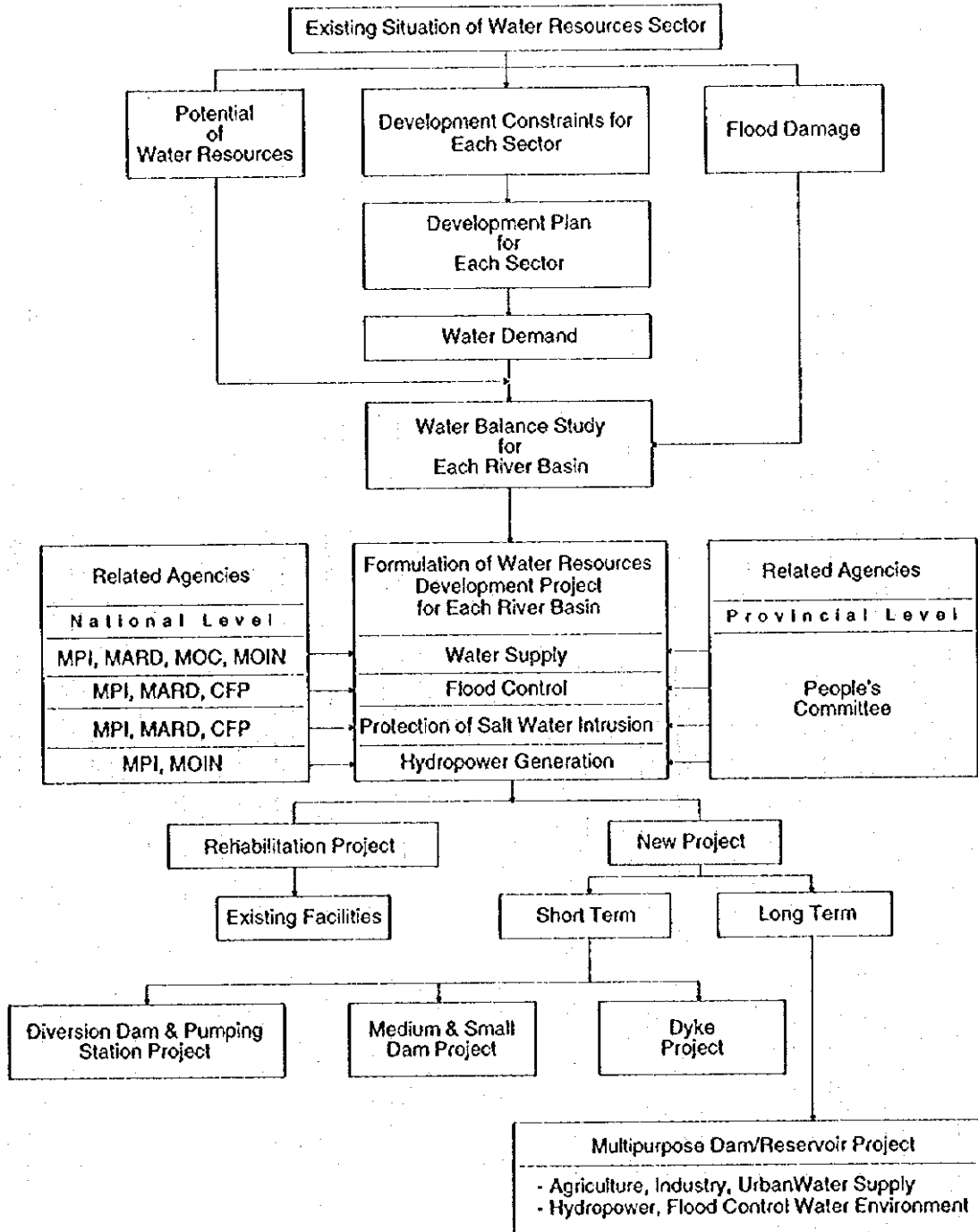


Figure 4.6.3 Development Schedule of Water Resources Sector

Development of River Basin	1996 - 2000					2001 - 2005					2006 - 2010				
	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
Quang Tri Province															
Ben Hai River Basin															
(R)- La Nga, Kinh Mon, Ha Thuong Reservoir															
(N)- Bao Dai Reservoir															
Thach Han River Basin															
(R)- Thach Han Irrigation System															
(N)- Ai Tu, Ben Da, Da Mai Medium & Small Res.															
(N)- Rao Quan Multi-Purpose Reservoir Dyke Project (R, N)															
Thua Thien-Hue Province															
Huong River Basin															
(N)- Thao Log Barrage															
(N)- Ta Trach Reservoir															
Other Basin															
(N)- Truoi Reservoir															
Dyke Project (R, N)															
Q. N. Da Nang Province															
Thu Bon River Basin															
(N)- An Trach Dam System															
(N)- Viet An Reservoir															
(N)- Dong Tien, Cay Thuog, Lo Dai, Duy Thanh Me & Small Reservoir															
(N)- Thu Bon Multipurpose Dyke Project (R, N)															
Quang Ngai Province															
Tra Bong River Basin															
(N)- Tra Phoc Diversion Dam & Pumping															
Tra Khuc River Basin															
(R)- Thach Nham System															
(N)- Nui Gang, Chop Vung Me & Small Reservoir															
(N)- Nuoc Trong Multipurpose Dyke Project															

Note: (R) stands for rehabilitation project.
(N) stands for new project.

4.7 SOCIAL SECTOR

In compliance with the government plans and policies for socio-economic development, poverty alleviation, eradication of illiteracy and provision of social services shall be the focuses of the social sector. The plans for poverty alleviation and provision of social services, including construction of various social infrastructure such as schools and clinics, necessarily select rural farmers as the target people, and the people and communes in the mountainous regions in particular, that is ethnic minorities, because these are the poorest people in terms of income and the people who enjoy the least degree of social services. Thus, development assistance should come to them first.

4.7.1 Approaches and Strategies for Formulating Plans

The plans for the above goals shall be formulated according to the following approaches and strategies.

1) Agricultural Development

Poverty alleviation of the farmers in the mountainous regions requires the expansion of production base and the change of farming systems: Production of more cash crops, diversification of crops, intensification of animal husbandry and VAC and tree plantation. There are only very limited choices other than by agriculture for the mountainous communities where no indigenous industries exist. Thus, agricultural development should be the key for rural development.

2) Think and Plan in Linkage

The problems and needs faced by the people and communes in the mountainous regions and ethnic minorities are not simple. Many problems are intertwined each other. Thus, their development should be considered in linkages of various problems and constraints, potentials and choices, and possible solutions.

3) Satisfaction of Basic Human Needs

The provision of social infrastructure and services to satisfy basic human needs is definitely very low in the mountainous regions. The provision of social infrastructure is basically the responsibility of the Government, but due to budget shortage such services are not sufficiently reaching the mountainous regions. Then, the strategy to satisfy these needs is to mobilize local resources and the use of people's participation.

4) Bottom-Up Approach and Participatory Approach

Rural development may be best achieved when development is contemplated and participated by the farmers themselves. Thus requests for development have to come from the bottom, the farmers, as they know best their wishes, problems, needs and resource availability. The "bottom-up" approach and people's participation from the stage of planning are essential for sustainable development.

5) Life Size Development and Sustainability

Commune level development should be planned in life size with minimum budget and appropriate technology, that is, unsuitably large size plans and facilities should be avoided. So that, projects do not require unnecessarily huge amount of budget, and development and projects can be sustainable.

6) Local Specific

Natural, social and economic conditions and the level of development are different from location to location, and from commune to commune. Accordingly, the development of each commune and different people be best considered in a different way. It should be recognized that no one commune is equal to others.

By the same token, the development of ethnic minorities should be considered and planned based on their existing conditions separately from general rural development, because the conditions that ethnic minorities are facing are significantly different from the situation of the Kinh or lowland residents.

7) Activate Economies in Local Towns

Acceleration of economic activities in communes and district towns shall eventually contribute to the expansion of agricultural production of farmers, because local towns and district towns are the limit of the poorest farmers to travel to sell their products.

Small-scale industries, such as processing in local towns shall secure the outlets of agricultural products, provide job opportunities, and can trigger further economic activities.

4.7.2 Major Development Plans

The plans are aimed at the achievement of the above goals by overcoming the constraints faced by the poor peoples and communes of mountainous regions. The underlying constraints causing the above conditions are "physical and social isolation" and "risks" burdened by crop failures, disasters and sickness; "lack of productive resources;" "lack of sustainability" and "inadequate participation". The plans are formulated also in consideration of the aforementioned approaches and strategies.

1) Poverty Alleviation

The existing conditions of poverty in the mountainous regions are attributable to two major factors. One is that the income of the poorest people is absolutely too low. The other is that these farmers are unable to secure enough food to feed themselves.

Accordingly, plans should be concentrated on the income generation and income diversification, and increasing of the productivity of food crops.

Incomes in rural areas are generated through the production of cash crops in almost all developing countries. Unless farmers produce some cash crops, they are unable to build up savings by only producing food crops. The production of diverse crops is also very important in order to disperse risks.

Farmers should be able to secure their own food. Thus, increasing the productivity of food crops should be also priority, but this may not be possible in the mountainous regions.

Lowland areas have higher potentials for increasing food productivity by the introduction of new varieties, new farming methods and by the improvement of production environment, because their natural and social conditions are generally more favorable for improvement.

However, potentials for increasing productivity of food crops are very low in the farm land of the mountainous areas because soil fertility is low and rice fields are located on steep mountain slopes. The construction of irrigation facilities is difficult and the effects of irrigation are limited.

Thus, it is more reasonable for mountainous regions to concentrate on the production of cash crops including industrial crops, fruits, and vegetables, and buy necessary food with the incomes generated by the production of cash crops.

- Income generation and income security through agricultural development
 - Production of cash crops - coffee, mulberry, rubber, black pepper, pineapple and so forth.
 - Production of fruit trees - banana, mango, citrus trees or whatever suitable to each area.
 - Production of vegetables
 - Intensification of VAC
 - Intensification of animal husbandry - cows, buffaloes, pigs, chickens and so forth

However, the situation of poverty of these people is such that they are unable to expand their production without some sort of financial assistance. Thus, some form of loan should be made available.

- Provision of financial assistance
 - Credit loans be made available through banks with reasonable grace period
 - Credit loans be made available through various associations
 - Assist through provision of in kind - materials, equipment, agricultural inputs
 - Establish a special fund for development of ethnic minorities, for example, within the "Vietnam Bank for the Poor."
- Provision of extension services
 - Extension service be expanded and intensified.
 - Better extension services for crop production, animal husbandry, fish culture, tree plantation and so forth be provided to mountainous regions.

The above plans are applicable to all provinces where lands are still available.

Lands are still available in the mountainous areas of the study area, and soil and climate are suitable for the above crops. Thus, expansion of production base is possible. However, some mechanism for providing financial assistance and strong extension services should be made available for ethnic minorities, because their production knowledge is limited and their farming practices are still very simple. Good and close assistance is particularly important for the first three years of the initiation of projects.

The plans for agricultural development are discussed in details in the agriculture sector of this report.

- Establishment of small industries

The production expansion and production of industrial crops shall only bring profits to the farmers when the products are marketed at reasonable prices. Thus stable outlets of the products are essential.

- Establishment of small industries in local towns for processing of agricultural products
- Establishment of cottage industries to commune centers - such as coffee husking, rice milling

There is a good potential for establishing cottage industries to each commune center such as coffee husking which will add values to the commodity, and simultaneously reduces the daily workloads of women who are burdened with heavy workload.

This topic is also discussed in more details in the sections of "Manufacturing Industry" and "Agriculture."

2) Construction and Improvement of Social Infrastructure and Provision of Services

Because the results of the agricultural and forestry projects can generally come out after a few to several years of the initiation, there should be some way to generate incomes during the initial years.

A short-term income generation to complementary to the above plans may come from the starting of public works by "money for work" or "food for work" method. Mountainous communities lack almost all kinds of social services and infrastructure, but as commune level social infrastructure do not need to be large scale facilities, they may be constructed by the people themselves with some financial and technical assistance.

If remuneration for work is not possible, some method should be established to assist them financially for first three years or more.

- Construction and improvement of necessary social infrastructure by participatory method
 - Construction and improvement of commune roads and bridges
 - Construction and improvement of primary schools
 - Construction and improvement of health clinics or provision of equipment and medicines
 - Construction of water supply - wells
 - Construction of irrigation to paddies and coffee or other cash crops
 - Provision of electricity - extension of cables or construction of mini hydro-stations

The construction of national roads is discussed in details in the section of "Road and Railway."

- Provision of services and materials

There are cases that schools and clinics have been constructed by the Government but necessary numbers of qualified teachers or necessary health workers are not assigned, or necessary materials and equipment are not provided. Those are need to be promptly provided by the Government.

- Sufficient number of qualified teachers to schools
- Sufficient numbers of qualified health workers to clinics
- Necessary equipment and materials, medicines to the above

- Training of villagers

Along with the provision of infrastructure, and services and materials, the training of villagers must come together for the operation and maintenance of the infrastructure or equipment and materials.

3) Capacity Building and Provision of Social Services

The education level and general knowledge of ethnic minorities are extremely low comparing with the people of the urban area and the rural inhabitants of lowland areas. Many people, especially women and elderly people have no formal education, or do not speak Vietnamese. They do not have the means, such as a radio, a television or newspapers, of receiving various information and education. Lack of education and knowledge is greatly exacerbating their ability to improve their economic and social conditions.

Women of ethnic minority groups particularly need basic education in order for them to be able to participate in social and political procedures. Another important feature of education to women is to reduce health problems including child-malnutrition that is so common in the mountainous regions or other problems such as goiters, bronchitis and tuberculosis.

- **Capacity Building**

Under the circumstances, the capacity building component for ethnic minorities and women should be given special attention and be largely strengthened.

The capacity building is also required for local government authorities who are not familiar with the concept of community development and participatory method, because to bring up the poorest people who have been not a part of major stream until recently, to a certain standard require earnest commitment of the Government.

The actual instruction and training shall be, first, the education and familiarization of the project concept to leaders of the province and district levels. Then, to commune level and village level chiefs and leaders. The education shall then be expanded to farmers. This shall need the assistance of various experts and NGO.

- Education on development and projects - participatory method, creative approach, project cycle management, planning, implementing, operating, monitoring, evaluating, and managing projects
- Training of government authorities and trainers
- Provision of out-of-school education to villagers in various fields - general basic knowledge, farming, health, diet and food preparation, simple bookkeeping, tree planting, animal husbandry, and simple carpentry, etc.
- Special education for women

4.7.3 Description of Proposed Priority Projects and Programs

The priority programs proposed for the Social Development Sector shall be two: One is an "Integrated Rural Community Development Program by People's Participation" with twenty pilot projects which comprise several projects of different types, and the other is a "Rural Communes' Health and Child-Care Program" that comprises two components.

1) Integrated Rural Community Development by People's Participation

In consideration of the above, an Integrated Rural Community Development Program shall be carried out by the application of a participatory approach. The basic idea of the participatory approach is that the main body of the project planning, implementation, management, operation, and maintenance is the people of the commune assisted and funded by external sources.

The program requires the assistance of and coordination with several government authorities such as Department of Agriculture and Rural Development, Department of Education and Training, Department of Public Health, Department of Industry, Department of Labor, War Invalids and Social Affairs, Department of Transport and Communications, Board for Ethnic Minorities and Mountainous Areas, Board for Protection and Care of Children, and so forth.

(1) Justification for Formulation of the Program

Major justifications for formulating an Integrated Rural Community Development Program by People's Participation are as follows.

a) The Poorest People

The focus of rural development should be placed on the ethnic minorities in the mountainous regions who are composing a majority of the poorest group. These people have also the least access to various resources, social infrastructure and social services. Ethnic minority groups are the people who most need assistance for development. Governments too are concerned about the economic development of these people because governments are well aware that

unless the living standards and economic situations of these people are improved, the national goal of alleviation of poverty cannot be achieved.

Thus, the selection of the communes in the mountainous region, particularly ethnic minorities as the target group for rural development, also meets with the government development policy and plan of socioeconomic sector.

It is estimated that presently approximately 240,000 ethnic minorities of several different groups of people live in the mountainous regions of four provinces. And, these people are economically the poorest and socially the least privileged people who have to be assisted.

b) Integrated Development Plan

The severity of poverty in the communities in the mountainous regions is so great and so vast that any simple project, such as a road construction project, irrigation project, school construction project separately cannot produce favorable results because various problems are linked and intertwined each other .

For instance, expansion and improvement of farm production require capital, production knowledge, land, fertilizer, labor, irrigation in some cases, market, means of transportation and access road, etc. These are all necessary to produce the expected results of expanding production, that is to obtain increased incomes from the production, because they are all linked. The present conditions of these poor people are that they have the least access to these resources.

Likewise, the low school attendance among ethnic minorities is linked to poverty of the people and lack of school facilities, or poor road conditions. The lack of school is caused by shortage of budget and poor roads.

Thus, the formulation of an integrated, comprehensive, or multi-sector program, such as the expansion of production basis accompanied by construction of various infrastructure and provision of public services and credit loans, is a "necessity" to bring about truly effective development.

c) A Commune As One Community

A commune is the smallest administrative unit in Viet Nam as previously described. For the purpose of convenience, the commune shall be considered as one community because this is an existing solid unit, and the size of a commune is suitable for a comprehensive program that shall require good coordination among community people, between many interest groups, and different organizations and government authorities.

Generally, commune in the mountainous of the study area consists of 15,000 to 17,000 people and roughly 310 households.

Larger than this size shall delay the progress of various procedures and coordination, but a unit smaller than a commune shall be too small to mobilize the participants.

d) People's Participation

People's participation is essential in carrying out a program for rural development, particularly with this plan, because to provide assistance through public work projects is one of the most important part of this program. However, the following other points have been simultaneously considered.

- Give income opportunities to the community people
- The people of the community know best about their problems and requirements
- People's awareness of own "development" is necessary and can be enhanced
- Available local resources have to be utilized
- The people of the community can learn the skills and knowledge of project planning, implementation and management

- The people of the communes are the beneficiaries
- By participating in the decision making, planning, or implementing, the people shall take responsibility for operation and maintenance of the facilities, and thus the projects shall be sustainable

There are a plenty of examples in the world that projects are left alone and facilities and equipment are rotting after the construction has completed and project teams left the site. Major reasons for these results are that the people were not consulted, not involved, or have not participated in the decision making for own matter, and they were not trained for operation and maintenance.

In order to bring effective results of the program and to sustain it, the participation of the expected beneficiaries in the program is imperative.

(2) Criterion for Site Selection

The pilot project sites be selected in consideration of the focuses of the social sector, which are aimed at poverty alleviation, eradication of illiteracy, reduction of child malnutrition and provision of social infrastructure and services. Thus, the criterion for selection shall be the communes where the needs for assistance is the greatest. That is where:

- the income of majority of the population of the commune is very low
- the number and proportion of ethnic minority people are great
- potentials for other industries than agriculture are low
- the rate of illiteracy among the people is high
- provision of social infrastructure and social services are low
- but communes are not too far from national highways and accessible by a vehicle
- certain degree of positive impacts of the projects can be expected
- local government authorities and commune people are eager
- good leadership exists

(3) Implementing body

The projects shall be implemented by the steering committees which shall be formed at central, provincial and district levels, by the support of the Ministry of Agriculture and Rural Development and its Department, as shown in Figure 4.7.1.

At the commune level, a Management Board shall be organized by representatives from the District, Chairman and Vice Chairmen of the People's Committee of the Commune, 1 representative from the Farmers' Union, 1 representative from Women's Union, 1 school teacher from the Commune, 1 female health staff, 2 to 3 village chiefs, and 5 to 6 village project leaders who shall be selected from villagers.

The total number of the Board Members should not exceed 15 people because a too large board shall not allow smooth and timely call of a meeting, and decision making procedures become difficult. More than half Board members should be ethnic minorities in the communes where the Kinh are the majority, and at least 2 to 3 members should be women regardless of their educational acquirement.

All Board members shall be trained at the initial stage of the project for the "Community Development course", and learn the goals, purposes, methods, operation, management of the project. The Board shall meet at least once per month.

Preferably, the Board members be provided with an appropriate amount of monthly remuneration.

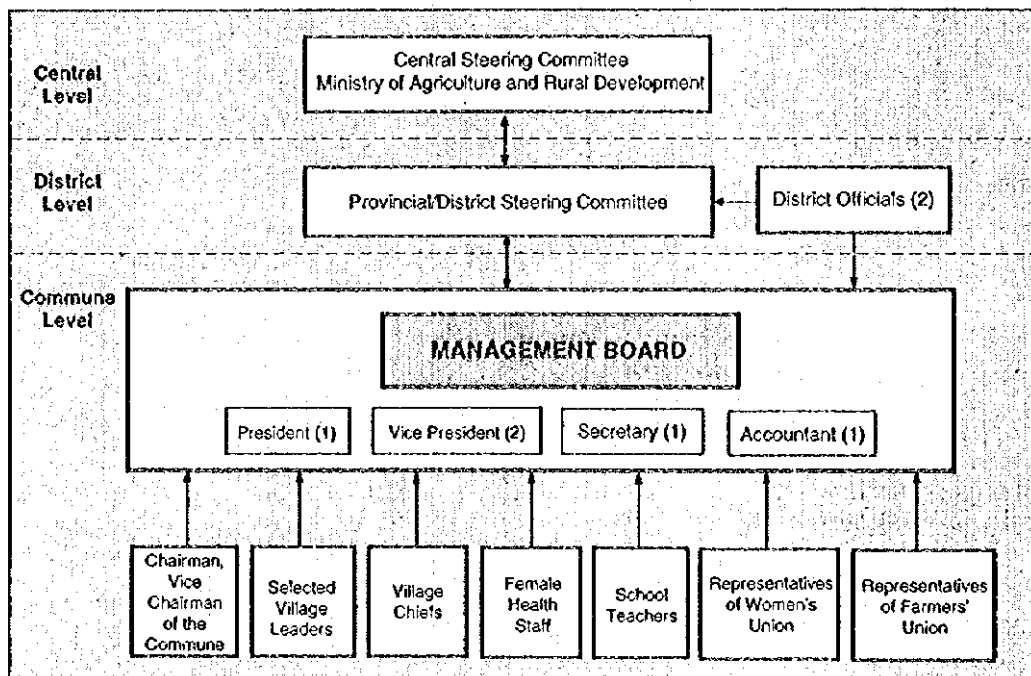
The Management Board shall require one president, two vice presidents, one secretary and one accountant to smoothly operate the Board.

The Board is the most important structure of all, because actual implementation of the project is the responsibilities of the Board. The Board shall formulate the projects, give them priorities, select sites, or select various assignments and required people upon receiving requests from village and villagers.

Preferably, the Board members be provided with an appropriate amount of monthly remuneration.

Alternatively, instead of the Central Steering Committee, the proposed Central Region Development Committee (CRDC) should centrally and collectively manage the entire RCD program due to its inter-provincial and site-specific nature. It is preferred that the existing Vietnam Bank and/or the Agricultural Bank will be involved as intermediate bank to provide loan facilities by obtaining original funds from international lending agencies in order to provide the poor people with soft loans.

Figure 4.7.1 Implementing Organization

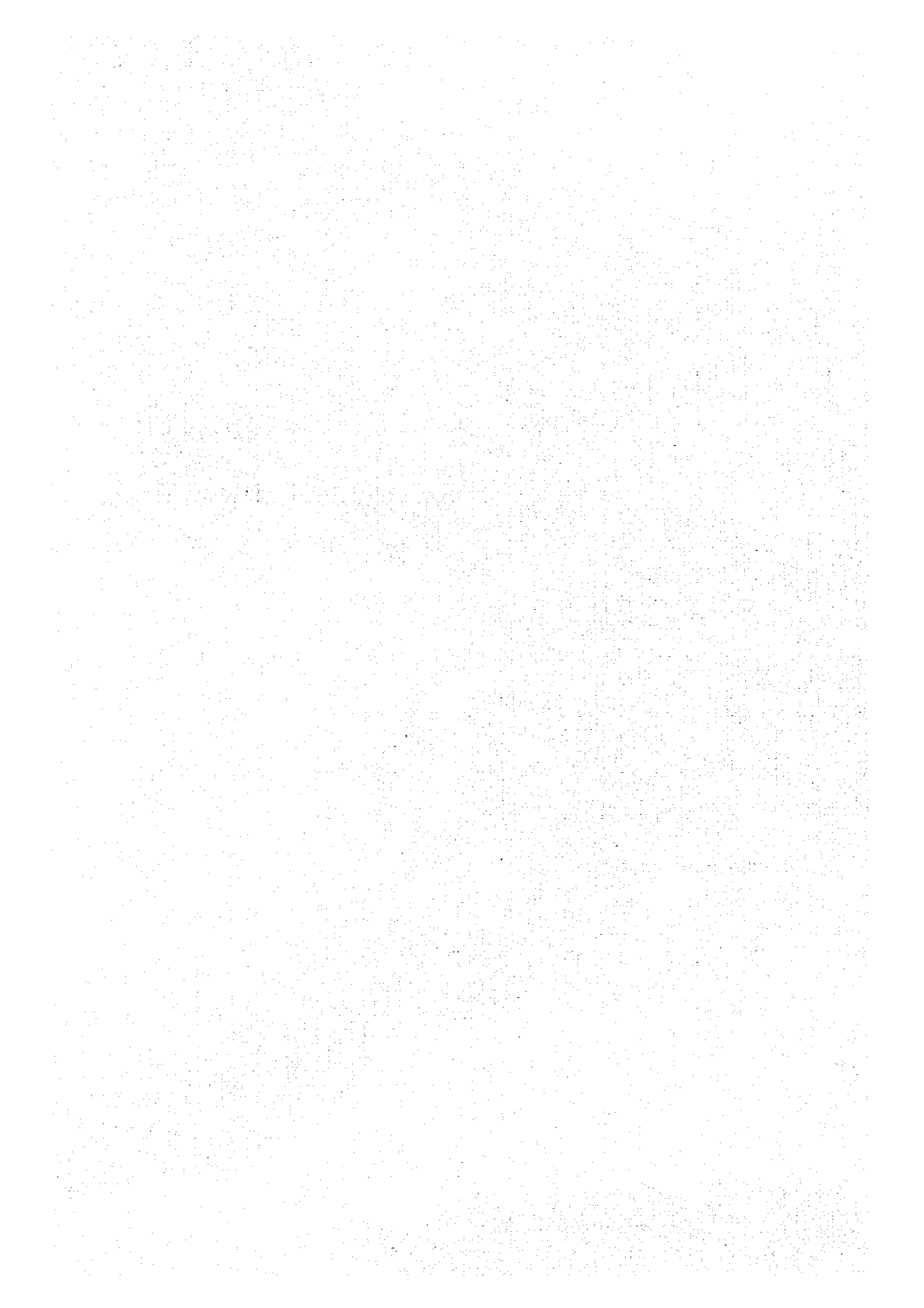


CHAPTER 5

DEVELOPMENT MANAGEMENT

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5.1 INSTITUTIONAL AND CAPACITY BUILDING

5.1.1 Institution Building

For successful implementation and sustainability of regional development projects/programs, Viet Nam needs to increase the autonomy of local governments by decentralizing authorities in appropriate areas to lower levels of governments and by strengthening local financial base. In addition, the implementation of integrated regional development plans would cut across administrative and political boundaries. Thus, there is need for restructuring of existing institution arrangement for more horizontal coordination and integration of plans between sectors and between provinces to ensure more effective implementation of projects/programs.

From this perspective, the study team proposes the establishment of new implementation institutions which intend to promote decentralization and to realize effective coordination and decision-making in view of the multi-provincial and multi-sectoral nature of regional development.

At the national level, a Central Steering Committee (CSC) should be established that assumes the functions of setting regional development policies, discussing and making necessary coordination on important issues in implementing the regional projects/programs. CSC is a high-level intersectoral group which may include the director-generals of ministries/agencies concerned and is chaired by MPI. CSC should also include the representative of CRDC in order to reflect local situation.

At the inter-provincial level, the Central Region Development Committee (CRDC) will be established to collectively control and manage the implementation of such projects and programs that will require inter-provincial coordination and particularly those financed by international lending agencies. CRDC should be an autonomous body authorized and empowered with the capacity of taking implementation initiatives to a large extent, except for dealing with matters that may require the approval of CSC.

CRDC will have a Project/Program Management Unit (PMU) that may be organized by responsible representatives from provincial governments and professional management consultants to play a central role for implementing inter-provincial projects/programs. The main functions of PMU will be:

- to coordinate the central and provincial governments and foreign donor agencies in preparing and implementing the inter-provincial projects/programs;
- to assess, revise and prepare the annual and multi-year inter-provincial development projects/programs, and submit them to the CSC;
- to take budgetary measures and identify fund sources; and
- to improve and strengthen institutional and financial capabilities;
- to monitor and evaluate the progress/results of inter-provincial projects/programs.

Thus, a multi-level management system may consists of a Central Steering Committee (CSC), a Central Region Development Committee (CRDC), provincial People's Committees, district and commune People's Committees. For this system to work, provincial governments should take initiative in planning and implementation, and MPI should execute its strong leadership over

other ministries and make efforts in inter-regional coordination. In order to overcome the difficulty in inter-departmental and inter-provincial coordination, there is great need for promoting close collaboration between national and provincial governments.

In addition to the above multi-level management system, the Central Region Development Projects/Programs require new implementation units that can effectively and efficiently implement and manage specific projects of the programs, such as Dung Quat Industrial Estate Development Project, Hue-Da Nang Inter-city Highway Project, Tourism Infrastructure Improvement and Tourism Promotion Zone Development Project.

For effective implementation, operation and maintenance of any regional development projects/programs, a critical factor is the commitment and policies of the central government that support project/programs objectives, especially their willingness to provide financial and personnel resources. Furthermore, the projects/programs need broad and deep support within the responsible organizations and from various political, bureaucratic, private, and local community groups.

5.1.2 Human Resource Development

The development of human resource is vital for the effective implementation and operation of any development project and program. Four principal groups are identified in the context of the Central Region Development Projects/Programs.

1) CRDC

Managerial leadership is key in developing sustainable programs. This encompasses responsibility for shaping policy and technological applications, setting goals, and mobilizing support from political leaders, complementary organizations, and beneficiaries, as well as directing internal administration.

In the short-term, recruitment of key senior managers and/or professional consultants in conjunction with a program of technical assistance would overcome the pressing need for the Committee to be effectively functioning from the outset. In this context, a Project Management Consultant can be used for the proper management of the Project in its entire cycle.

An organization's administrative capability should be matched with project objectives to enhance sustainability. CRDC's administrative capability for personnel and training, logistics and maintenance, information and feedback, and budget and finance will need to be developed to keep pace with program dynamics.

2) Local Governments

Decentralized decision-making requires an adequate planning and management capacity of local governments. Planning and management capacity at the regional and local levels can be basically improved by means of on-the-job-training in the process of projects/programs implementation. However, the learning process can be accelerated by providing training to improve skills of concerned agency staff and by strengthening capacity of relevant institutions to organize project-related management training courses.

It will be a priority task for CRDC as soon as possible after its creation to set up clear lines of communication between it and concerned agencies whose cooperation and assistance will be vital if the CRDC is to operate effectively. As part of this process, the training requirements of the agencies will need to be clearly identified and addressed.

Regarding project sustainability, special consideration should be placed on the provision of technical assistance to local governments to improve the efficiency of their internal resource mobilization through evaluation of property for taxation, recovery of user charges and cost of investment for shelter, monitoring and control of their internal operation with an appropriate information system, and through their accounting system.

3) Enterprises Involved in the Projects/Programs

Projects proposed in the master plan will require management and technical skills in its prospective workforce. CRDC should provide an opportunity and a possible mechanism for facilitating the development and funding of appropriate training inputs.

A common way adopted by many developing countries for upgrading human skills required by industries is to set up vocational training centers. However, many public training centers have failed to generate intended benefits. Because of the lack of sufficient fund, rigidity of planning and management and weak linkage to local enterprises, many face serious problems such as the shortage of skillful teachers, reduced quality of training, lack of spare parts and necessary equipment, reduced number of students, and even the difficulty of maintenance of the centers itself.

One way of overcoming these problems is to decentralize management authority from government offices to training centers, implementation units, so that the head of the center possesses sufficient autonomous power to decide how to manage the center, including the amount of the salaries of his/her staff, content of training courses, ways to strengthen financial base and to keep close relations with local enterprises. Another way of overcoming the problems is to establish a training center managed by local enterprises according to their needs with financial support by governments, or to give financial incentive to enterprises which provide training courses with both their own and other workforces. The long-term solution to the problems related to human resource development is, however, the improvement of formal basic education system.

4) Local Communities

For projects/programs for which the benefits are directly associated with local populations, their participation becomes critical to sustainability. In this kind of projects/programs, local participation in planning and implementation and in the key decisions affecting beneficiary welfare is a vital part of development activity. This may require a radical departure from traditional methods of project design and management, and will require strong and viable local institutions, especially at district and community levels.

In participatory projects/programs, formal and informal community leaders need to be trained in process of planning, implementing, monitoring, and evaluating upgrading projects and other self-help approaches. Technical Assistance to local institutions in the techniques of bookkeeping, inventory management, cost-accounting, and investment decision making may be some of the most important aid outside agencies can give. Technical assistance for maintenance tasks and routines may be also effective since sufficient evidence in developing countries shows that one of the inhibitions holding back local initiative on maintenance is a lack of confidence that sufficient technical expertise was available locally.

5.1.3 Financial Capacity Building

With respect to financing proposed projects/programs, allocation of more development budgets, credit facilities for loan acquisition, and bi-lateral / multi-lateral financial assistance will require favorable Government support. Also, project financing systems will be rationalized so that CRDC can reasonably disburse necessary funds specifically earmarked for the projects that rest with the responsibility of CRDC. This will require to establish reasonable financing mechanisms taking into account the share of responsibility between the central and provincial governments.

Sustainability requires a flow of funds to cover operations, maintenance, and depreciation of the investments. To achieve sustainable development programs, Viet Nam needs to improve local resource mobilization through cost-recovery provisions, commercial sales receipt, or direct appropriation of funds. A major impediment to sustainability has been the inability to achieve continued, regular funding of annual operating costs. The achievement and/or

improvement of financial autonomy and resource base of CRDC and local governments is the long-term solution to the problems related to project sustainability.

1) Financial Decentralization

Actions needed to improve the resource base and financial management of local governments include (1) increase in the share of provincial and local governments in the national revenue; (2) authorizing provincial and local governments, to levy additional taxes presently reserved for central or provincial governments; (3) providing technical assistance to provincial and local governments to improve the efficiency of their internal resource mobilization.

Cost recovery and recurrent cost financing are crucial for project replicability and sustainability. Some of the actions which could lead to the improvement of cost recovery include (1) reducing the level of rates of repayment; (2) assessing affordability level before a project is initiated; (3) making collection machinery more effective by the provision of necessary information to the participants, the identification of sanctions for defaulters, and simplification of collection procedures. In addition, the allocation of funds for maintenance of services and facilities is one of the most crucial issues and needs to be done at the stage of project design. Special funds should be allocated to local governments for the maintenance of existing facilities and services.

2) User Fees

Most developing countries fund program activities through the national budget. This is because, by controlling the resources, governments are able to direct investments according to their established priorities. When the government budget is enjoying a period of growth in real terms, this approach may work fairly well. During periods of budget stringency, however, the sustainability of programs can be seriously threatened. National budgets may not be the best source of funding, and there is need for finding alternative sources.

User fees can not only ease the financial burden on the budget of the Viet Nam government but also encourage greater delivery of services by providing incentive payments for extra duty by service providers (e.g., extension personnel or village health workers). Consumer demand is a critical element of user fee success. In many cases, the lack of financial support was related to priorities and willingness to pay rather than inability to pay. If services are perceived as useful and relevant, experience shows even the poor are willing and able to pay.

3) Private Sector Participation

Use of private enterprises to carry out development programs is another source of development funds. The profit motive makes the private firms more sensitive to consumer demand, improving prospects for a sustained flow of benefits. In the context of the Central Region Development Projects/Programs, arrangements will be required to induce private-sector participation in infrastructure development thus saving the public-sector spending insofar as practical. Issuance of bonds such as "Central Region Infrastructure Funds" in U.S. or other foreign markets will be a possible means of raising capital funds although the use of the funds will be limited to "revenue-producing projects". CRDC can manage the funds if guaranteed by the Government.

4) Local Village Contributions

Local village contributions can ease the financial burden that community development places on a developing country's national budget. Community financing schemes can take many forms, including voluntary contribution boxes, village-owned cooperatives, and allocations from community committees. However, other financing schemes are required for projects in communities whose residents live in such severe poverty that even token payments may be difficult or impossible to make.

User fees, private sector participation, and village contributions are desirable ways to shift some of the cost burden as well as establish the demand for services. In general, the

decentralization of development activity to local communities and private enterprises can strengthen commitment and help mobilize resources that otherwise would not be available.

5.2 ENVIRONMENTAL MANAGEMENT

The purpose of the environmental management is to enable the inhabitants to enjoy rich and healthy life. The major problems related to the environmental management are as follows:

- Creation and conservation of comfortable environment
- Improvement of living environment
- Creation of attractive environment
- Creation of disaster free environment

The sustainable development in study area cannot be achieved only by the environmental management to be by local governments, and hence, it implemented by this Central Region Development Committee alone. Therefore, the environmental management and protection in this study should be implemented in cooperation with the national framework on the environmental administration.

The following three fields are required to implement in the study area in cooperation with the Government:

- Land use zoning and planing
- Water resource management
- Environmental management and protection

5.2.1 Land Use Zoning and Planning

The land use zoning is one of the most important methods to establish comfortable environment. The following sections show the zoning and planing procedures by using the case study for the Chan May New City Development Plan.

For land use planning, the land use classification should be made at various levels. The general land use categories of whole country are designated in Viet Nam. They are agricultural, forestry, specified, inhabited and unused. Land administration departments of the central and local governments are responsible for legislative part of land use. Ministry of Construction and construction departments of local governments are responsible for land use planning especially in the urban and industrial land. However, general land use categories and specific land use plans for designated areas are not well co-ordinated. Land use guidelines at various levels are not applied to actual developments.

Once a land is developed for specific purpose the land use will remain in the same for long period. Co-ordinated and rational land use is significant to maintain good environment for land related activities. Following planning procedure should be taken.

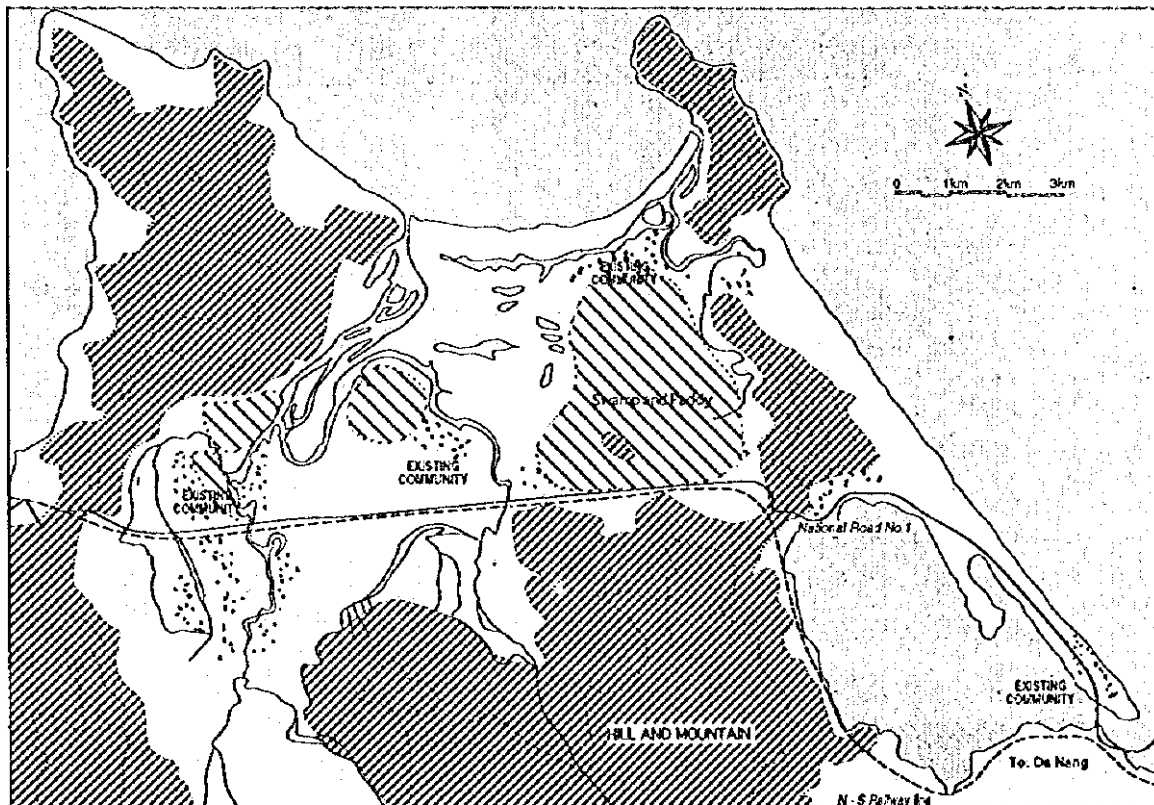
1) Land Classification

The designated land should be examined and classified into development land and protected land in general. As an example, existing land use of Chan May and Lang Co area is shown in Figure 5.2.1. This area is planned to be developed as new trade and industrial city in the future. Coastal sanddune along the coast, swamp and river area, paddy area, mountain area, plain area and existing inhabited area exist at present. The protected land is classified into two categories, namely, preservation area and conservation area. The development land is classified also into two categories of land use, namely, controlled area and development area.

- Preservation area is designated to keep the natural conditions as natural as possible, national park is generally in this category. Only reforestation land rehabilitation work

for disaster prevention and nature oriented activities are allowed in this area. Steep slopes in mountain area and environmentally valuable and sensitive areas are designated in these categories.

Figure 5.2.1 Existing Land Use



Source : JICA Study Team

- Conservation area is the area designated to conserve the natural, social and cultural environment. Industry, commercial and residential development are generally not allowed.
- Land use controlled area is the area to be developed with limited activities and types of development. Development with special attention on its natural environment or landscape is required.
- Development area is designated for general development such as industry, residential and commercial.

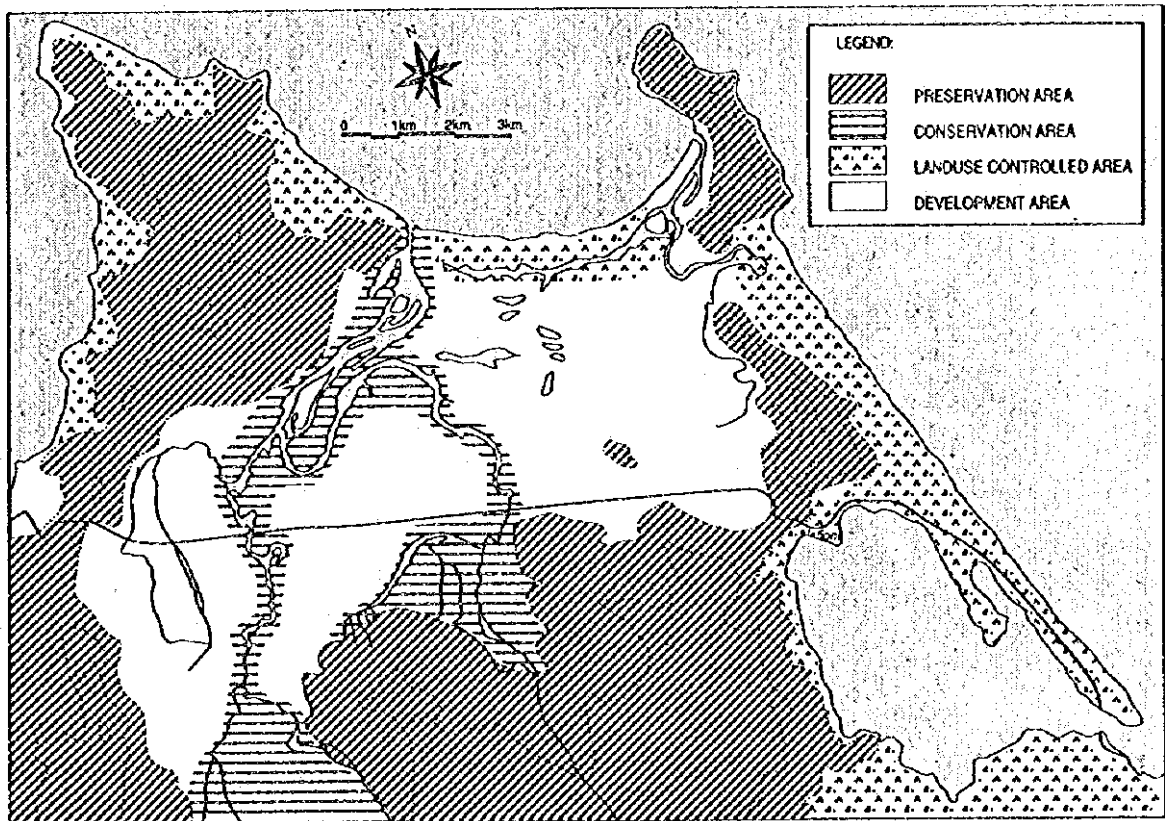
Figure 5.2.2 shows the land classification of the Chan May - Lang Co area. The land along the rivers including some paddy fields is designated as the conservation area. The coastal sand dune area is designated as the land use controlled area, because of the existence of high tourism and industry development potentials, which needs the prevention of coastal erosion and pollution.

2) Land Use Zoning for Development Area

The land use zoning in the development area especially in the urban area including industry zones should be planned to create the city not only functional but also harmonious with the natural environment. The zoning plan should be prepared in consideration of a long term development orientation. It should also be flexible to some extent; in other words, the designated zone should not be too small and too specific. The actual development will take place on a step by step basis, starting from planned nuclear parts of cities or existing

communities. Figure 5.2.3 shows an example of land use zoning of the development land in the Chan May New City. These indicate the guideline for desirable land utilization when Chan May is developed as a new city with port and Free Trade and Transit Zone (FTTZ) facilities. Systematic location of business and commercial zone, in consideration of the target growth of trade and commercial activities and its required area, and the appropriate location of residential zone will be a main concern.

Figure 5.2.2 Land Classification



Source : JICA Study Team

As the coastal sand dune is classified as the "Land Use Control Area", following land use zones are designated.

- Conservation zone for future development
- Park and recreational zone
- Port zone
- Tourism promotion zone (TPZ)

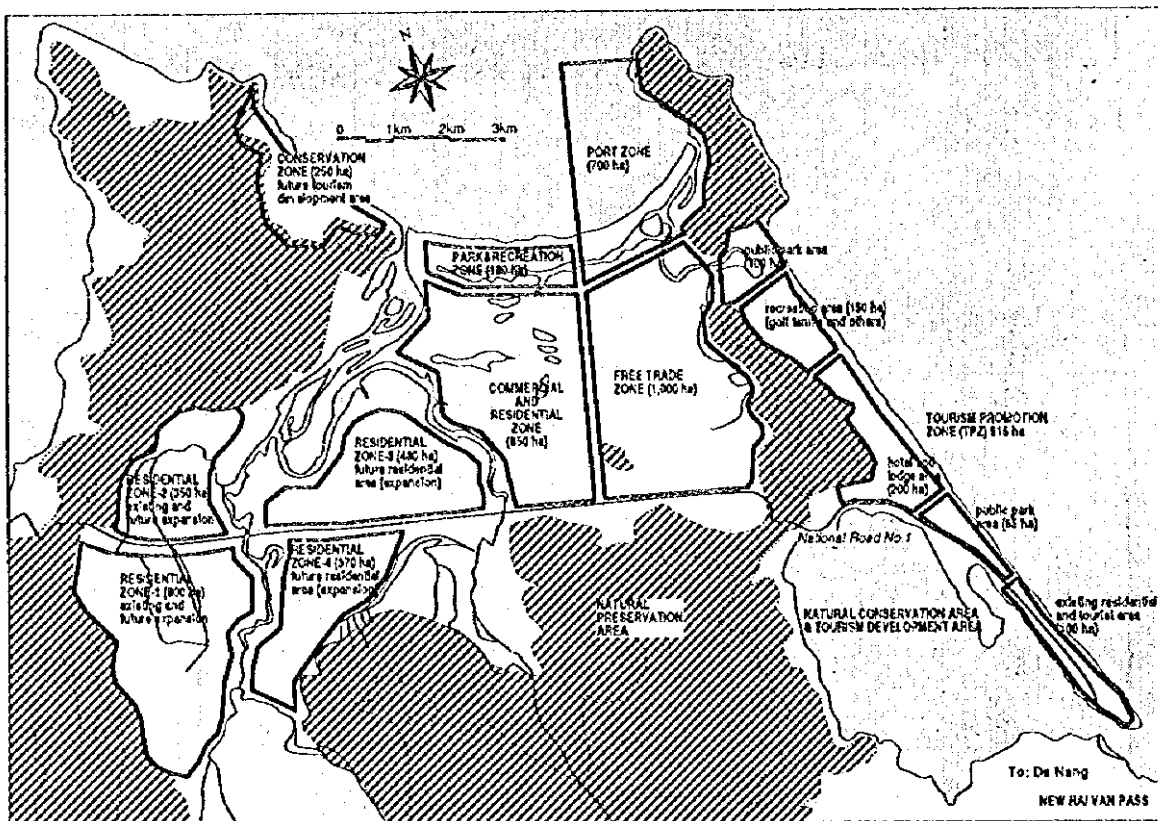
Environmentally sound development should be carried out in the port zone and the TPZ. The park and recreational zone will also function as the sand erosion protection area.

The low productive farm land together with existing communities area are classified as "Development Area", following land use zones are designated.

- Free Trade and Transit Zone (FTTZ)
- Commercial and residential zone
- Residential zone

Access to the Free Trade and Transit Zone should be controlled by fencing, and at the same time, provision of good accessibility is indispensable. Location and layout of the FTZ is significant factor for the development, therefore strict land use control is necessary. FTZ related business activities will locate in the commercial and residential zone, and detailed land use zoning plan should be provided in co-ordination with a FTZ development plan. Existing residential areas will be expanded in the future and new residential areas should be developed keeping pace with the progress of the urban population increase.

Figure 5.2.3 Example of Land Use Zoning

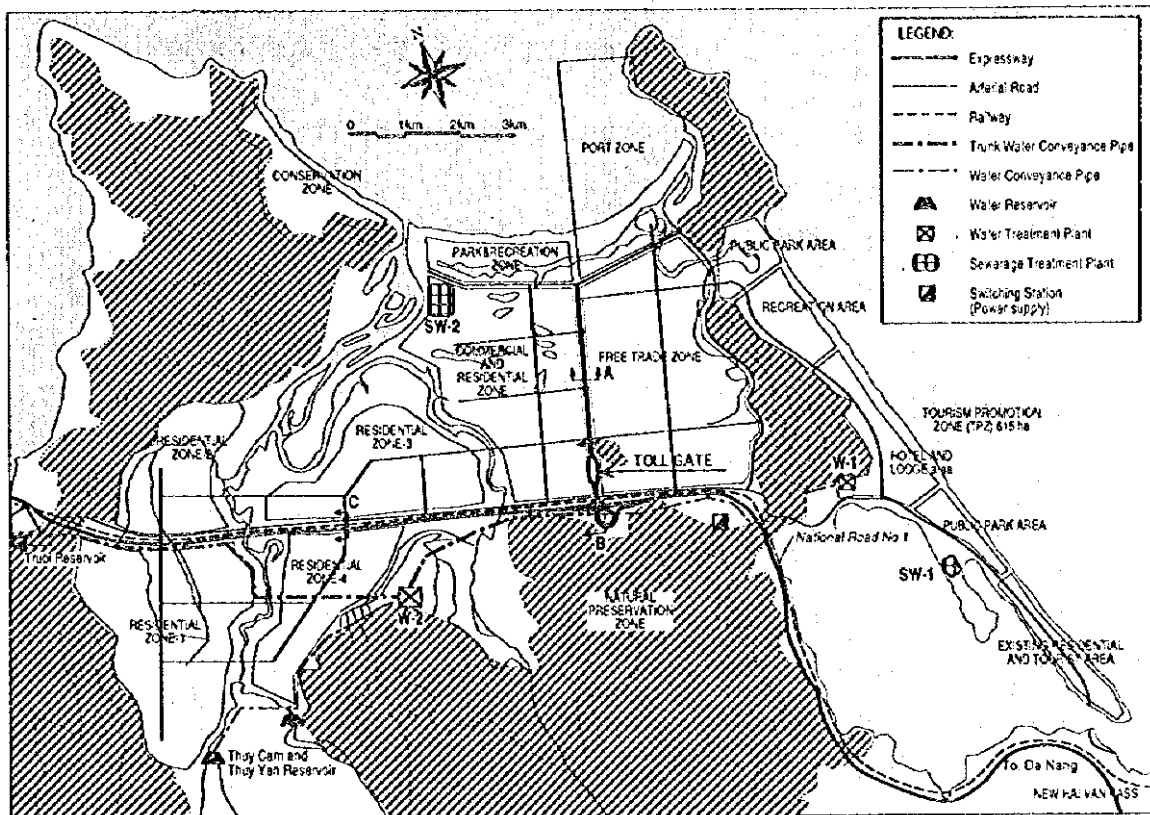


Source: JICA Study Team

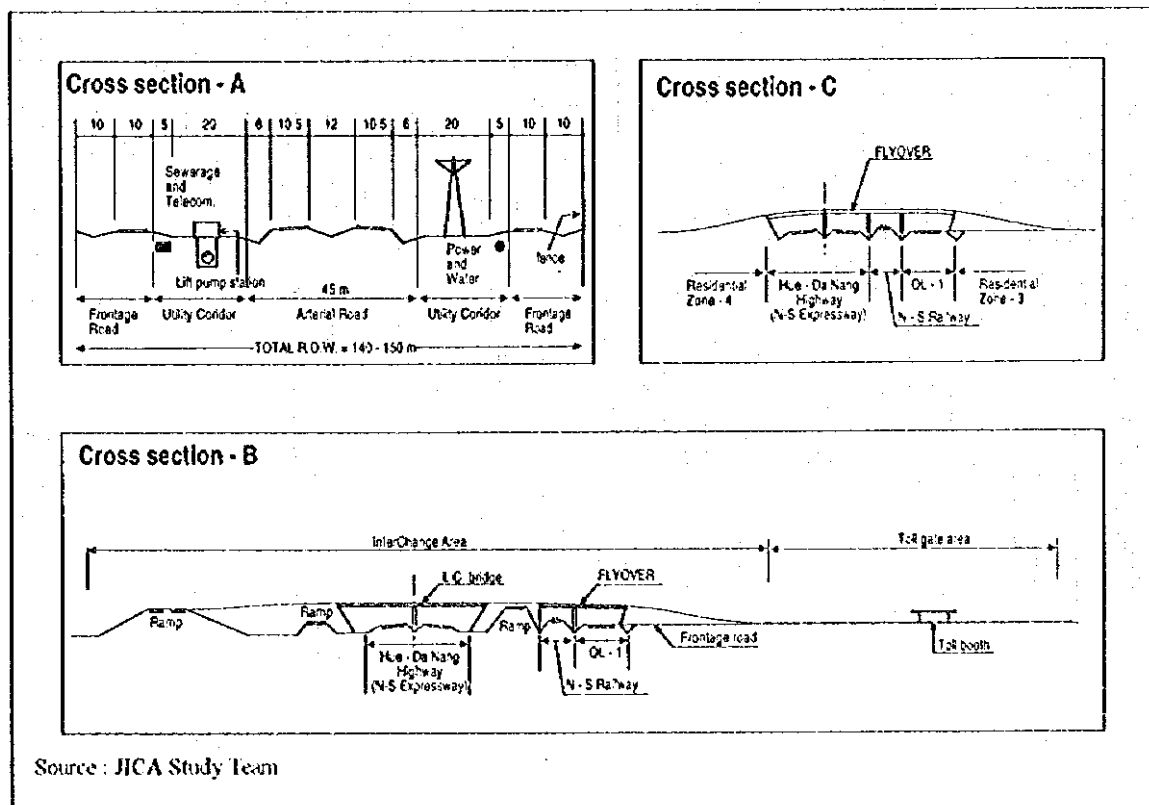
3) Transportation Network and Utilities

Land use is affected by or consistent with the movement of goods and services resulted from economic activities. Transportation network is the most significant factor to determine the land use in the development area. To guide and control the land use, provision of appropriate transport network and utilities are significant. Trunk network should be provided by the public or semi-public sector. Land use control and acquisition of land prior to the actual development are indispensable. Figure 5.2.4 shows the location of road network and utilities. The right-of-way for arterial roads and access roads to the expressway together with mains utilities should be acquired in the early stage of development. Mains of utilities locations should be determined and designated as the land for specific use. Resettlement of affected peoples should be considered in early stage, and provide incentives for resettlement and new resettlement areas as well.

Figure 5.2.4 Road Network and Utilities Location



ROAD NETWORK AND UTILITIES LOCATION



Source : JICA Study Team

CROSS SECTIONS OF SELECTED LOCATIONS

4) Urban Development Master Plan

Land use planning for development is a part of physical development planning. In the case of urban development, the following aspects are closely related and essential to realize the functional and rational land use.

- Legal and administrative institutions for urban development
- Agrarian laws and land administration
- Housing development policy and system
- Resettlement of existing neighbourhood
- Operation and maintenance of municipal infrastructure
- Financial and budgetary systems for urban development
- Investment incentives to induce foreign direct investment

Therefore, the formulation of an urban development master plan based on the above mentioned aspects are indispensable for orderly development, which leads to results the functional and rational land use. Figure 5.2.5 shows the planning procedure.

5.2.2 Water Resource Management

The following issues are required to be discussed:

- Comprehensive water control countermeasures
- Promotion of comprehensive water control measures
- Countermeasures for floods in the low-lying districts in the coastal area, and for watersheds in the mountain and hill area
- Adequate utilization of water resources

1) Comprehensive Water Control Counter by Measures

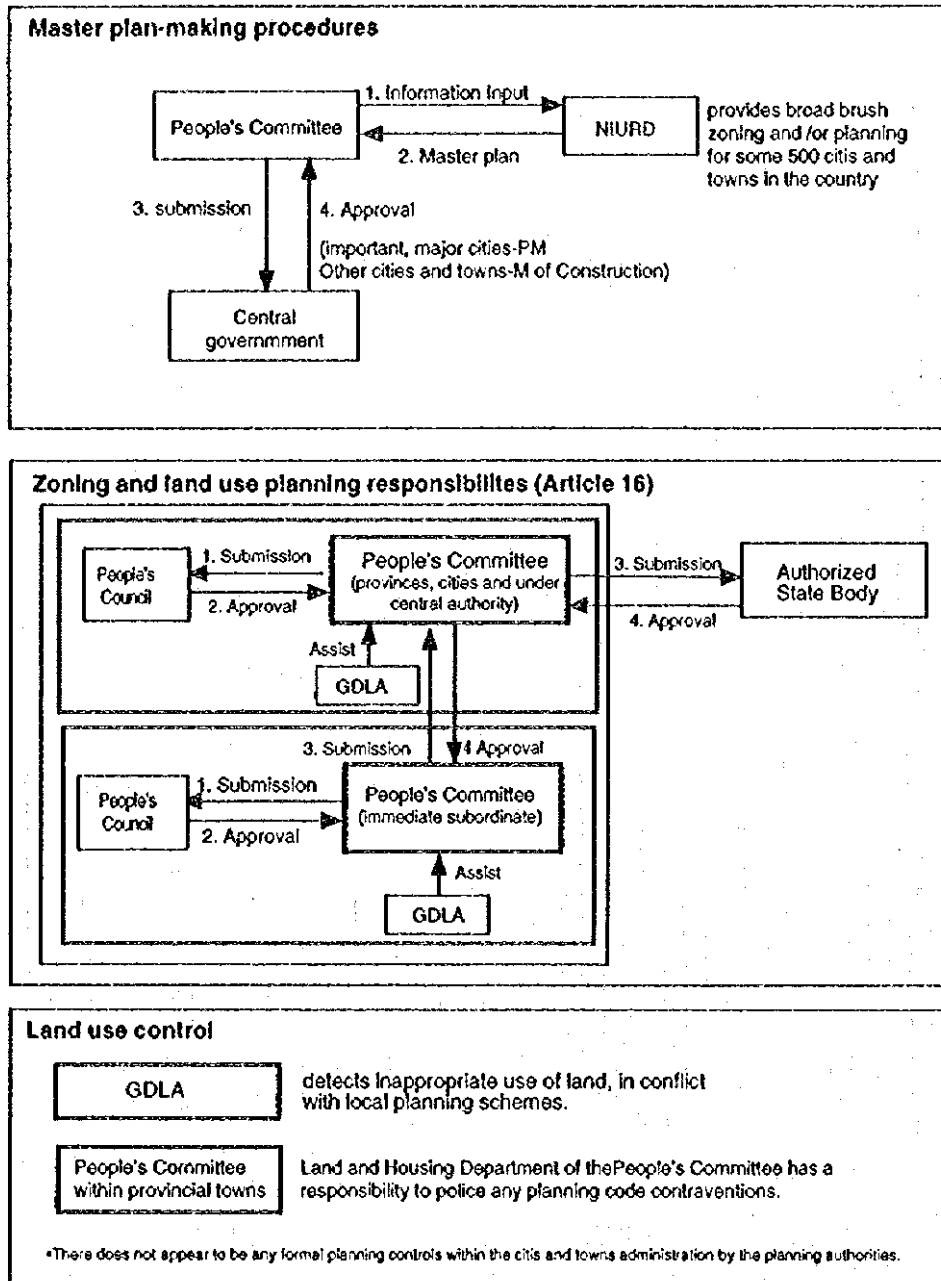
The areas free from danger of flood have to be built up by controlling the flow of rainwater into rivers over their wide basins, in addition to the framing of the rivers. It causes serious damages to many people when overflows occur due to high tidal waves in the coastal area will cause. The improvement of embankment and shore walls which protect floods and tidal waves will be expedited in the coastal area and rivers.

2) Promotion of Comprehensive Water Control Measures

The following countermeasures are required:

- Early completion of framing works of rivers will be implemented
- Improvement of river water control facilities such as constructing flood control reservoirs
- Countermeasures will be taken for storage and percolation of rainwater in order to control rapid overflow of water in the rivers
- Construction of water reservoirs in the case of a large-scale development such as Dung Quat and Chan May projects
- To minimize damages to low-lying areas with higher frequency of floods

Figure 5.2.5 Planning Procedure



Source : JICA Study Team

- a) Guidelines to be provided for appropriate land utilization based on the official flood records
- b) Redevelopment to be promoted using elevated floor-type buildings and man-made foundations

3) Countermeasures for Floods in the Low-lying Districts in the Coastal Area and Mountain and Hill Area

The following countermeasure are required:

- To construct the flood control facilities such as shore walls, which can withstand large-scale tidal waves
- To construct drainage systems to prevent flooding of the build-up areas
- To construct erosion control facilities to prevent landslides due to rainfall
- To construct the coastal safeguarding facilities to prevent the erosion of coastlines due to the attacks of typhoons and monsoons

4) Adequate Utilization of Water Resources

As a result of the improvement of the living standard of people in the study area, the expansion of sewerage facilities and treatment in the urbanization, and needs for the demand for water will gradually increase in the future. Therefore, adequate utilization of the water resources are required.

5.2.3 Environmental Management and Protection

The program for pollution control in urban and industrial areas will be required.

Environmental pollution will become a serious social problem in near future in the study area. Unless the environmental management be properly achieved. The causes of pollution are usually related to high urban population density, lack of improvement of urban facilities, rapid increase of vehicle traffic, and operations of factories and other pollution generating facilities. Therefore, the control regulations, monitoring and enforcement are necessary.

Moreover, approaches to remove pollution after it occurs will not be enough to solve it. Pollution must be prevented at sources, environment must be positively created on the basis of the natural and social conditions of the district concerned. For that purpose, it is important to carry out a comprehensive environment control, on the basis of environmental assessment and monitoring.

Therefore, the following environmental issues are required to be discussed:

- Pollution control countermeasures
- Promotion of comprehensive environment control
- Designation and approval of an environmental control plan
- Promotion of environmental assessment and monitoring
- Establishment of environmental information management system
- Natural environmental conservation

1) Pollution Control Countermeasures

The pollution control countermeasures for the following environmental items are required:

- Air pollutants and offensive odor
- Water pollutants
- Noise and vibration
- Soil contamination

(1) Countermeasures for air pollutants and offensive odor

The following countermeasures will be adopted for the prevention of air pollutants and offensive odor:

- Introduction of total control for attainment of environmental standards for air pollutants based on the sources of generation such as industrial plants
- Control of exhaust gas, improvement of road structure, promotion of traffic volume control on mobile sources of generation such as motor vehicles
- Monitoring of actual conditions of air pollutants
- Guidance for remedial actions at sources of generation
- Strict enforcement of regulations and standards

And the network of environmental monitoring will be established, and air pollutants control centers will be opened in cooperation with the Government.

(2) Countermeasures for water pollutants

The following countermeasures will be taken to purify the river water and to prevent eutrophication of lagoons:

- Improvement of sewerage system
- Establishment of water monitoring system
- Investigation of unknown harmful objects and compound contamination
- Complete guidance on drainage

Especially, the establishment of monitoring system for water quality in the study area is one of the most important issues. Therefore, the establishment or improvement of an environmental management center in the study area should be implemented.

(3) Countermeasures for noise and vibration

The following countermeasures will be taken to maintain quiet environment:

- Noise and vibration due to traffic such as motor vehicles, railway trains, and airplanes
 - a) Improvement of vehicular transport
 - b) Improvement of roadside environment
 - c) Land utilization suited to district by relocating urban facilities
- Noise and vibration due to factories, project constructions, and building construction
 - a) Introduction and enforcement of regulations and standards
 - b) Appropriate land utilization through mass relocation
 - c) Complete enforcement of regulations

(4) Countermeasures for soil contamination

Monitoring and guidance will be intensified, and efforts will be made to establish environmental standards regarding soil contamination caused by war damage and agricultural chemicals.

2) Promotion of Comprehensive Environment Control

In order to create a safe and comfortable environment, while measures will be taken to cope with the factors affecting the environment, comprehensive and long-ranging environmental control will also have to be carried out. Therefore, a training system for the staff in public organizations should be established in the environmental management center.

3) Designation and Approval of An Environmental Control Plan

Together with the establishment of a desirable local environmental image in harmony with the special characteristics of the area, an environmental control plan will be designed and approved, taking into consideration the conservation of limited environmental resources such as land, water, fauna and flora, etc.

4) Promotion of Environmental Assessment

In order to prevent the deterioration of environment from the beginning, environmental assessments concerning large-scale projects should be carried out. In addition, various government plans will be deliberately evaluated from the viewpoint of total environmental control. Therefore, the curriculum for the environmental impact assessment should be in training system at the environmental management center.

5) Establishment of Environmental Information Management System

An environmental information management system will be established through general supervision and utilization of the data concerning environmental factors such as pollution, nature, pollution, land use, etc. Therefore, the curriculum for the information management system should be set up in the training system of the environmental management center.

6) Natural Environmental Conservation

In the process of urbanization and industrialization, natural environment of the study area will be greatly reduced. The weakening of the land and water systems, which support the ecological system, because of changes in the land surface and loss of top soils due to land development, decline of the river and ground water level, deterioration of the quality of water, etc., will continue. As public spaces with the function of disaster prevention will become necessary places for aesthetics.

Conservation of remaining valuable natural surroundings and restoration of lost ones will be the future problems to be solved for the coexistence of city and nature. For that purpose, the previous richness of water and greenery of the study area must be regenerated, by improving its riverside and seaside environment while carrying out systematic improvement of various parks and green lands in harmony with peoples daily life zone as well as long ranging life zone.

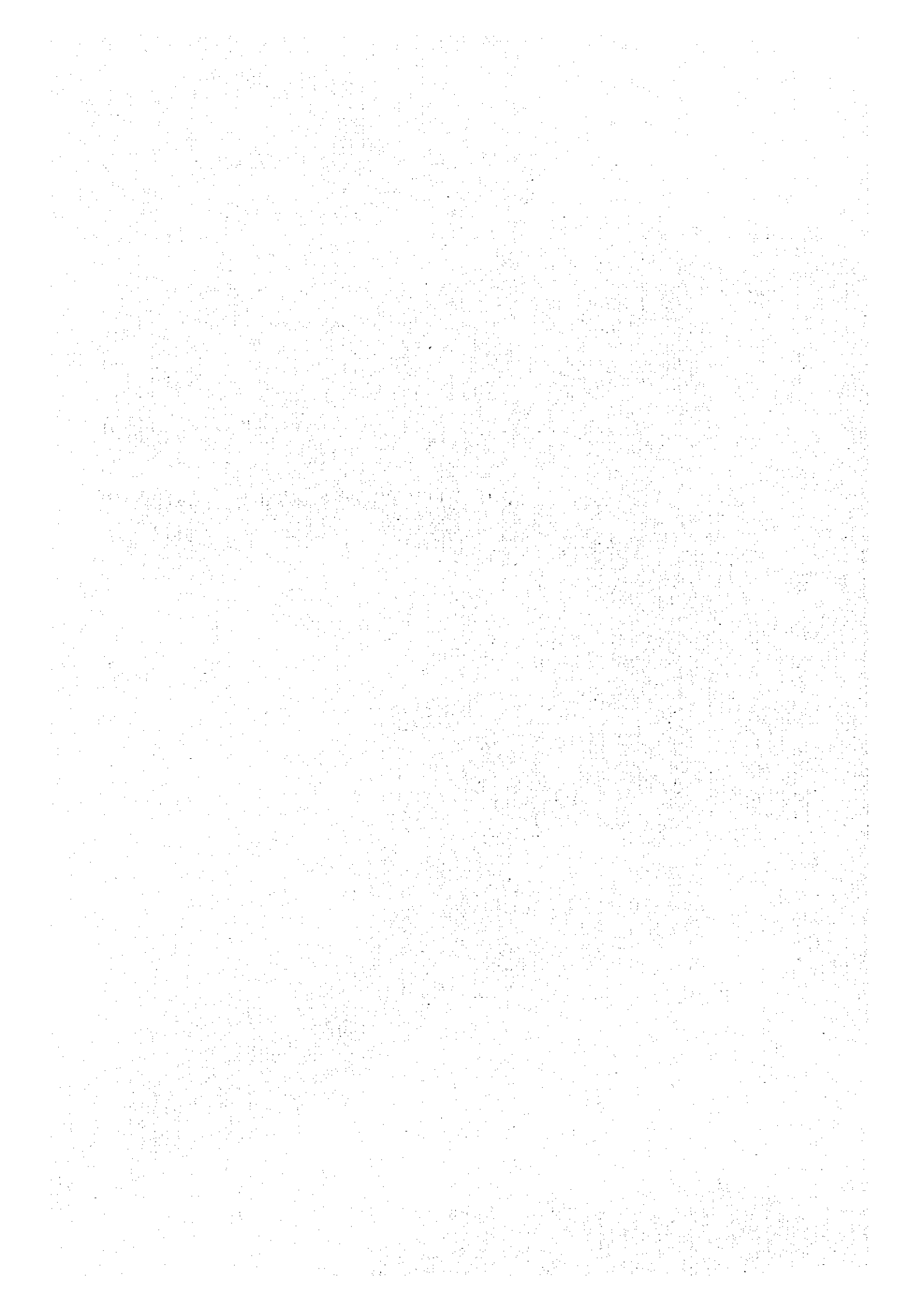
Therefore, the following countermeasures are required to be implemented:

- Conservation of the natural environment to be carried out with the aim of coexistence between city and nature.
- Conservation of areas with natural surroundings, control on land development, restoration of greenery, in accordance with the special character of the locality.
- Designation of wooded areas with significant natural characteristics as conservation districts and zones, under the control of public bodies.
- Preservation of the natural ecology through protection of wild birds and forests

- While carrying out the construction of comprehensive waste disposal site and highway, care will be taken to conserve the natural marine environment in harmony with the scenic beauty of the sea.
- Careful conservation of the natural marine environment, in harmony with the scenic beauty of the sea in case of the construction of public facilities and buildings such as comprehensive waste disposal site, highway and hotels
- Conservation, utilization and restoration of the natural environment of rivers for the restoration of waterfront

CHAPTER 6

PRIORITY PROJECTS AND PROGRAMS



CHAPTER 6 PRIORITY PROJECTS AND PROGRAMS

6.1 GENERAL INTRODUCTION

Undoubtedly, there may be hundreds of projects and programs to be implemented in the Central Region if they should include those not directly linked or not importantly influential to the socio-economic development of the Central Region. In selecting major projects and programs that should be implemented on a priority basis, due consideration should be given to the criteria, i.e., "development necessity to achieve goals and objectives" and "development viability limited by potentials and constraints". The factors that fall under the evaluation axes of necessity and viability are considered.

1) Necessity

- Extremely inadequate conditions that crucially hamper economic activities, and leaving as is would surely result in a serious constraint for the socio-economic development and/or serious damages on the life of people and properties;
- Existence of huge public and/or market demand, proper response to which will greatly contribute to the socio-economic development and/or the benefit of the people involved;
- Existence of growing social tension jeopardizing social stability, removal or resolution of which is quite essential for the socio-economic development;
- Mandatory or highly strategic requirement for building a solid foundation or fabric for the future socio-economic development; and
- Important preventive measures to avoid serious environmental problems.

2) Viability

- High probability of mobilizing necessary funds for project financing, including private sector participation in implementation;
- Manageable levels of social and financial implications that may arise from land acquisition and resettlement of inhabitants at site;
- Existence of people's awareness of the development with their objective support for implementation;
- Highly receptive by bi-lateral and multi-lateral agencies for undertaking as ODA projects and programs; and
- Not only avoidable of any serious environmental implication but also greatly contributable to environmental improvement.

6.2 MAJOR PROJECTS AND PROGRAMS

From the above selection criteria, the following are selected as major projects and programs amongst those as long-listed at the end of this Report. These major projects and programs are expected to be implemented and completed in their first or substantial part or parts by the year

2005, which will lay a foundation for the subsequent socio-economic development in the Central Region.

01 Highway No. 9 Improvement Project

The future perspective of the viable functions of a new East-West Trade Corridor of the GMS has not been fully worked out particularly from the economic aspect. However, recent growing economic circumstances freely moving across nation borders would arise the needs of the Corridor particularly when considering the increasing economic relations between Thailand and Viet Nam. Once a liberalized trade system be established among the countries concerned, Highway No.9 may possibly carry a large number of cargo traffic generated from FTZs in concerned countries and passenger traffic dominantly generated from tourism development in the Central Region. Although the project should keep pace with the improvement of connection highways and bridges (particularly over the Mekong River), Highway No.9 should be adequately improved upgrading to have design speeds of 60 kilometers per hour and loading capacity of 20 tones.

- Implementation Agency : Ministry of Transport & Communications

02 Quang Tri Border Trade Zone Project

In order to activate the international trade corridor along the new East-West Corridor, border trades should be more institutionalized in accordance with a multi-lateral agreement made among the countries concerned in the Greater Mekong Subregion (GMS). An Lao Bao Border Trade Zone will be developed in the proximity of the Quang Tri Province, which will have multiple functions including those for custom clearance facilities, bonding warehouse, storage facilities and relevant facilities relevant to the trade transaction. The project is in fact a revenue-producing project by leasing its floors to individual tenants for such operations as stated above.

- Implementation Agency : CRDC / Quang Tri Province

03 Dung Quat Industrial Development Project

Creation of a spearheading industrial development center in the Central Region is of strategic importance to harness overall socio-economic development of the Central Region, even though it might not be justified only on pure economic grounds. It is given to understand that the first refinery project in Dung Quat has been approved by the Government and negotiations with a prospective investor group is currently in progress. This de facto project should be realized to form the primary critical mass for a self-sufficient heavy industrial complex in the Central Region. The establishment of an implementing organization and construction of the industrial estate is required. The construction of the breakwater and adjoining berthing jetty facilities to facilitate unloading of massive construction equipment and materials for the refinery project will be the first stage of the construction.

- Implementation Agency : CRDC / Quang Ngai Province

04 Tourism Infrastructure Improvement and Tourism Promotion Zone (TPZ) Development Project

In order to foster the tourism development in the Central Region, institutional incentives should be provided for investment in the tourism sector, and at the same time, due care should be given to avoid any adverse effects that may arise from tourism development. For that purpose, tourism infrastructure improvement project should be carried out especially in the existing tourist destinations. The TPZ concept is applied to specifically designated tourism development areas, where basic infrastructure such as access roads, water supply, and sewerage system will be provided by public sector, resettlement programs will be duly implemented by the public sector and attractive investment incentives will be given to private sector investors.

For the first implementation phase, tourism infrastructure improvement in Hue Da Nang tourism corridor and two TPZ should be carried out. As the TPZ, (a) Hoi An Historical and Cultural Tourism Area in Quang Nam - Da Nang Province, and (b) Lang Co Tourist Area in Thua Tien Hue Province should be designated.

- Implementation Agency : CRDC / Da Nang Province / Hue Province

05 Da Nang International Airport Improvement Project

The City of Da Nang will continue to assume a gateway function of international and domestic air transportation in the Central Region. As the Central Region achieves accelerated growth particularly in manufacturing and tourism sectors, the number of business and tourist arrivals will be drastically increased in the near future, which will need to improve the existing terminal facilities. As a gateway of international tourist arrivals, Da Nang airport is expected to give a good impression as a tourist destination (favourable "sense of arrival" at a tourist place) with streamlined and hospitalized immigration and custom procedures.

- Implementation Agency : Civil Aviation Authority of Vietnam

06 Highland Industrial Crops and Reforestation Promotion Program

In order to increase per capita income of farmers and boost the regional consumption level, it is imperative to enhance the agricultural sector productivity in the Central Region, and hence, promotion of various industrial / cash crops farming and improving distribution systems in the post-harvest arena is quite essential if considering rather scarce availability of sown area for rice production per farmer in the Central Region. The program will promote industrial crops production in highland areas by developing suitable varieties, diffusing necessary technology, and providing financial and post-harvest assistance.

- Implementation Agency : Ministry of Agriculture & Rural Development

07 Water Resources and Agricultural Development Projects By Constructing Medium and Small Scale Reservoirs

Intensification and diversification of agricultural production in the coastal area is another issue to increase income of farmers. The project aims at intensive cropping in flat paddy area through the implementation of a water development system as a key to modernized agriculture. The project components consist of the optimum water use through an agreed rotation system among farmers, thus economizing irrigation water and maximizing crop output/ income within a project area, thus trying to meet increasing food demand.

- Implementation Agency : Ministry of Agriculture & Rural Development

08 Secondary Road Improvement Project

The principal objective of the project is to improve the local road network chiefly made up with Highways No. 14, 49, 14B, and 24 together with other district and commune roads linking to these network, which will serve for the people living in highland areas by securing reasonable accessibility to coastal areas, thus upgrading their living standards and stimulating their economic activities. Improvement of the Highways No. 14 has been recognized as one of the national project to be implemented by the Vietnamese Government. The Highway 49, 14B, and 24 will form the major connecting roads between Highway 14 and Highway 1. In other words, they connect hill and mountain area and coastal area.

- Implementation Agency : Ministry of Transport & Communications

09 New Hue - Da Nang Inter-city Highway Project

To remove a major constraint caused by the Hai Van Pass is imperative not only for the regional socio-economic development but also for the economic unification and integration of the country. In this context, the Government is considering the possibility of developing a new North-South Expressway linking Hanoi and HCMC in the future. Also, JICA study revealed that urban agglomeration will be essential for the economic development of the Central Region, and hence, the cities of Hue and Da Nang should be closely linked to formulate such urban agglomeration as may be referred to as the Hue - Da Nang Development Corridor. From the above two aspects, the project needs to be designed and constructed to form a part of the future N-S Expressway.

Accordingly, a high standard inter-city highway will be constructed to link with the New Hai Van Bypass and Tunnel in both sides of Hue and Da Nang, which will also form a part of the future North-South Expressway. The configuration and alignment will be carefully selected to ensure the future expansion to a 4-lane highway and to induce regional development activities particularly underlining the port, FTZ (or SEZ), and tourism development in the Chan May/Lang Co area.

- Implementation Agency : Ministry of Transport & Communications

10 Feasibility Study for the Port Development in the Central Region

The Chan May area in the province of Thua Thien Hue is endowed to build a new deep-sea port which will serve as a major commercial port that functions as a transshipment hub for handling cargoes generated through the new East-West Trade Corridor linking to the Greater Mekong Subregion (GMS). Whilst at present, the Da Nang port is assuming the commercial and industrial port functions in the Central Region, the proposed Chan May port should be well coordinated with the port of Da Nang by reasonably sharing port functions in the Central Region. It is envisaged that with the development of a new Hue - Da Nang Inter-city Highway with a new Hai Van Bypass and Tunnel, the proposed Chan May port can serve for both Hue and Da Nang cities with possible reduced time distance of some 30 minutes to the center of Da Nang City.

- Implementation Agency : CRDC / Hue Province

11 Master Plan Study for the Development of the Chan May New Industrial City

Associated with the Chan May port is a Free Trade Zone where mainly trade processing industries of both foreign and local origins will be selectively accommodated with attractive investment incentives. The FTZ should also accommodate supporting service industries such as banks, insurance companies, forwarders, hotels, exhibition center, and so on, so that it will also create a commerce and business zone. In the FTZ, semi-processed and intermediate products coming in and going out will be stored, assembled, processed, packed, labeled, and distributed for trade under a "bonded" condition with one-stop export / import formalities.

- Implementation Agency : Hue Province

12 Master Plan for Comprehensive Water Resource Management of the Huong River Basin

In order to reinstate the Central Region from the disaster-prone to safer and more environmentally sustainable region, the entire river basins of flood-prone rivers flowing in the Central Region should be properly managed in an integrated manner. Taking into consideration the severity of flood damages, environmental sensitivity of the basin, and existence of invaluable historical heritages in the basin, priority should be given to the Huong River basin as a pilot project. A master plan should be advanced due to its comprehensive nature including, but not necessarily limited to, (a) reforestation in water sheds, (b) construction of multi-purposed dams (power generation, irrigation, flood control, control of saline water intrusion, and water supply), (c) storm water drainage in urban areas, (d) water quality control and management, and (e) environmental conservation of the estuary lagoon. The master plan should include preliminary feasibility studies of selected priority projects for immediate implementation.

- Implementation Agency : Ministry of Agriculture & Rural Development

13 Hue Urban Environment Improvement Project

The city of Hue has constantly suffered from repeated floods due to an inadequate network of storm water drainage with the result of untreated domestic waste discharged to nearby channels and moats results in the gross contamination of water quality, thus deteriorating the living environment and damaging the tourist attractions. Also, serious damages of historical heritages particularly those existing in the Citadel. The project aims at improving storm water drainage including installation of pumping stations, waste water collection system, and a pilot waste water treatment plant for the Citadel area of approximately 500 hectares.

- Implementation Agency : Hue Province

14 Central Region Environmental Management Center Project

An Environmental Management Center (EMC) will be established in the city of Da Nang to monitor the environmental quality of air, water, soils, and natural fauna and flora, particularly underlining the water quality of the Central Region. The EMC will be properly equipped with laboratory and database facilities and have functions of training monitoring specialists. The project consists of providing facilities and equipment, and a training scheme for monitoring specialists provided by appropriate foreign specialists.

- Implementation Agency : Ministry of Science, Technology & Environment

15 Integrated Rural Community Development Program

Integrated rural community development program is aimed at improving the living standards of ethnic minorities living in highland areas. The program will include micro-watershed management, improvement of slope farming, rural electrification, upgrading of public health care and education, improvement of farm-to-market roads, and so on. 20 pilot programs will be initiated in the study area, and the program will be adjusted during the course of its implementation. Upon confirming its effectiveness, similar programs will be applied to other highland areas.

- Implementation Agency : Committee for Ethnic Minorities & Mountainous Areas / CRDC / Quang Tri Province