

The Corridor 21 Development

4.5 Residential Development Plan

4.5.1 Framework for Housing and Residential Development

On the base of the target household and the target resident employment in the M/P area mentioned previously, it could be converted to housing demand in the Hoa Lac and Xuan Mai Development Area. The estimated total housing demand by the year 2020 is 89,000 units, which are composed of 72,750 units for the Hoa Lac and 16,250 units for the Xuan Mai Area.

The targeted employment for manufacturing, construction, and service sectors are expected to settle in the proposed Village Improvement and Expansion Area due to their income level. The estimation of housing demand should take this expectation into consideration. The total additional incremental households in the M/P Area can be hypothetically divided into the two residential areas. The around 70% of the households will reside in the proposed New Residential Zone, and the remaining 30% of the households will reside in the proposed Village Improvement and Expansion Area.

In addition, the type of housing supply for the New Residential Area is proposed to be three types depending upon income levels, which are the high-income housing (detached house, villa and townhouse, and rowhouse), middle-income housing (condominium), and low-income housing (rental apartment). The share of these three types of housing are set as 15%, 35%, and 50% from the analysis of income level distribution respectively.

The required housing supply for the New Residential Zone is estimated 62,250 units in the M/P Area by the year 2020, which exclude the housing demand 26,750 units for Village Improvement and Expansion Area.

The framework for housing development by income group and phase is shown in Tables 4.5.1 and 4.5.2.

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Table 4.5.1 Framework for Housing Development by Income Group and Phase

Phase	Area	Housing Demand in New Residential Zone by Income Group (housing unit)				Housing Demand in Village Improvement &	Total (housing unit)
		High Income	Middle Income	Low Income	Sub-Total		
Phase-1A	Hoa Lac	1,030 (10)	3,090 (30)	6,180 (60)	10,300 70	4,450 30	14,750 100
	Xuan Mai	170 (10)	530 (30)	1,050 (60)	1,750 70	750 30	2,500 100
	Total	1,200 (10)	3,620 (30)	7,230 (60)	12,050 70	5,200 30	17,250 100
Phase-1B	Hoa Lac	1,030 (10)	3,090 (30)	6,180 (60)	10,300 70	4,450 30	14,750 100
	Xuan Mai	170 (10)	530 (30)	1,050 (60)	1,750 70	750 30	2,500 100
	Total	1,200 (10)	3,620 (30)	7,230 (70)	12,050 70	5,200 30	17,250 100
Phase-2	Hoa Lac	6,050 (20)	12,100 (40)	12,100 (40)	30,250 70	13,000 30	43,250 100
	Xuan Mai	790 (10)	3,160 (40)	3,950 (50)	7,900 70	3,350 30	11,250 100
	Total	6,840 (20)	15,260 (40)	16,050 (40)	38,150 70	16,350 30	54,500 100
Total	Hoa Lac	8,110 (16)	18,280 (36)	24,460 (48)	50,850 70	21,900 30	72,750 100
	Xuan Mai	1,130 (10)	4,220 (37)	6,050 (53)	11,400 70	4,850 30	16,250 100
	Total	9,240 (15)	22,500 (36)	30,510 (49)	62,250 70	26,750 30	89,000 100

Source: Study Team

Note: Upper rows show the number of housing unit. Lower rows show the share (%).

Table 4.5.2 Population Distribution to Two Types of Residential

Phase	Area	New Residential	Village Improvement &	Total
Phase-1A	Hoa Lac	41,200	17,800	59,000
	Xuan Mai	7,000	3,000	10,000
	Total	48,200	20,800	69,000
Phase-1B	Hoa Lac	41,200	17,800	59,000
	Xuan Mai	7,000	3,000	10,000
	Total	48,200	20,800	69,000
Phase-2	Hoa Lac	121,000	52,000	173,000
	Xuan Mai	31,600	13,400	45,000
	Total	152,600	65,400	218,000
Total	Hoa Lac	203,400	87,600	291,000
	Xuan Mai	45,600	19,400	65,000
	Total	249,000	107,000	356,000

Note: Four persons per household

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4.5.2 Residential Density and Land Requirement

(1) Planning Criterion and Housing Type

The distribution principle as to housing types for each income group is hypothetically set as follows:

High Income: Detached and Semi-detached House 30%, Row House 70%

Middle Income: Condominium 100%

Low Income: Rental Apartment 100%

In addition, planning criteria for each type of houses by phase is set as shown in Table 4.5.3. Since it is expected that the living standard of Vietnam will be changed over the twenty-year planning period, the per capita floor for condominium and rental apartment are up-graded on a step-by-step basis. As for the two types of housing built in the early phase, the building coverage ratio is set at a low level in order to make it possible to expand and/or rebuild houses when the living standard rises in the future.

Table 4.5.3 Planning Criterion for Housing Types

Period	Type of Housing	Per Capita Floor Area m ² /capita	Floor Area/ Housing Unit m ² /unit	Av. Land (semi gross area: SG)/Unit m ² /unit	Floor/Area Ratio (SG) %	Density of Housing Unit (SG) unit/ha	Population Density (SG) person/ha
Phase-1A	Detached, Semi Detached	25.0	100	400 (NET350)	25	25	100
	Rowhouse	25.0	100	250 (NET200)	40	40	160
	Condominium	17.5	70	100	70	100	400
	Rental Apartment	12.5	50	83	60	120	480
Phase-1B	Detached, Semi Detached	25.0	100	400 (NET350)	25	25	100
	Rowhouse	25.0	100	250 (NET200)	40	40	160
	Condominium	20.0	80	100	80	100	400
	Rental Apartment	15.0	60	86	70	117	467
Phase-2	Detached, Semi Detached	25.0	100	400 (NET350)	25	25	100
	Rowhouse	25.0	100	250 (NET200)	40	40	160
	Condominium	22.5	90	100	90	100	400
	Rental Apartment	20.0	80	80	100	125	500

Note: According to the Building Code of Vietnam, the standard of housing floor area issued in 1987 are: The number of person per household:

2 persons / 1 room,	the floor area: 28 m ² /unit	(14.0 m ² / person)
3 persons / 1 room,	the floor area: 34 m ² /unit	(11.3 m ² /person)
4-5 persons / 2 rooms,	the floor area: 46-48 m ² /unit	(10.4 m ² /person)
6-7 persons / 3 rooms,	the floor area: 6-58 m ² /unit	(8.8 m ² /person)
8- persons / 4 rooms,	the floor area: 0-72 m ² /unit	(-8.9 m ² /person).

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(2) Land Requirement for Residential Development

The land requirement for the gross and semi gross residential development area by type of housing and phase are estimated on the previous planning criteria and the following assumptions of the land use composition in the gross residential area.

Semi Gross Residential Area:	40%
Roads:	15%
River and Park/Open Space:	30%
Public/Community Facilities:	15%

The total required New Residential Zone to be developed is estimated approximately 1,870 ha (Hoa Lac: 1,560 ha, Xuan Mai: 310 ha). The population density in the New Residential Zone is about 133 persons/ha (249,000 persons/1,870 ha), and the average New Residential Zone per capita becomes 75.0 m²/person.

Table 4.5.4 Land Requirement for New Residential Zone

		Phase-1A		Phase-1B		Phase-2		Total	
		No. of Housing Planned (units)	Residential Area (semi (ha))	No. of Housing Planned (units)	Residential Area (SG) (ha)	No. of Housing Planned (units)	Residential Area (SG) (ha)	No. of Housing Planned (units)	Residential Area (SG) (ha)
Hoa Lac	Detached, Semi Detached	310	12.4	310	12.4	1,820	72.8	2,440	98
	Rowhouse	720	18.0	720	18.0	4,230	105.8	5,670	142
	Condominium	3,090	30.9	3,090	30.9	12,100	121.0	18,280	183
	Rental Apartment	6,180	51.3	6,180	53.1	12,100	96.8	24,460	201
	Total	10,300	112.6	10,300	114.4	30,250	396.4	50,850	623.4
	New Residential Zone (ha)	281.5		286.1		990.9		1,558.5	
Xuan Mai	Detached, Semi Detached	50	2.0	50	2.0	240	9.6	340	14
	Rowhouse	120	3.0	120	3.0	550	13.8	790	20
	Condominium	530	5.3	530	5.3	3,160	31.6	4,220	42
	Rental Apartment	1,050	8.7	1,050	9.0	3,950	31.6	6,050	49
	Total	1,750	19.0	1,750	19.3	7,900	86.6	11,400	124.9
	New Residential Zone (ha)	47.5		48.3		216.4		312.2	
Total	Detached, Semi Detached	360	14.4	360	14.4	2,060	82.4	2,780	111.2
	Rowhouse	840	21.0	840	21.0	4,780	119.5	6,460	161.5
	Condominium	3,620	36.2	3,620	36.2	15,260	152.6	22,500	225.0
	Rental Apartment	7,230	60.0	7,230	62.2	16,050	128.4	30,510	250.6
	Total	12,050	131.6	12,050	133.8	38,150	482.9	62,250	748.3
	New Residential Zone (ha)	329.0		334.4		1,207.3		1,870.7	

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VNU Area				HTTP Area			
	Phase-1A	Phase-1B	Phase-2		Phase-1A	Phase-1B	Phase-2
New Residential Zone	0	0	28,000	New Residential Zone Village	7,000	11,000	33,000
VNU Dormitory	32,000	43,000	65,000	Improvement and Expansion North Center/ Reserved Area/ Others	17,800	12,400	7,000
North Center/ Reserved Area/ Others	5,000	5,000	5,000	Total	43,800	54,400	105,000
Total	37,000	48,000	98,000				
Don Xuan Area				Phu Cat Area			
	Phase-1A	Phase-1B	Phase-2		Phase-1A	Phase-1B	Phase-2
New Residential Zone Village	20,200	43,000	85,400	New Residential Zone Village	14,000	29,600	57,000
Improvement and Expansion	10,000	26,000	51,600	Improvement and Expansion South Center/ Reserved Area	5,000	3,000	3,000
South Center	10,000	6,000	2,000	Total	19,000	32,600	63,000
Total	40,200	75,000	139,000				

Hoa Lac Area Sub-total

	Phase-1A	Phase-1B	Phase-2
New Residential Zone	41,200	83,600	203,400
VNU Dormitory	32,000	43,000	65,000
Village Improvement and Expansion Sub-Centers/ Reserved Areas/ Others	29,000	57,000	119,600
Total	135,000	205,000	400,000

Xuan Mai Area

	Phase-1A	Phase-1B	Phase-2
New Residential Zone Village	7,000	14,000	45,600
Improvement and Expansion	7,000	16,000	45,400
Xuan Mai Center/ Others	31,000	25,000	9,000
Total	45,000	55,000	100,000

Hoa Lac and Xuan Mai Area Total

	Phase-1A	Phase-1B	Phase-2
New Residential Zone	48,200	97,600	249,000
VNU Dormitory Village	32,000	43,000	65,000
Improvement and Expansion Zone Sub-Centers/ Reserved Areas/ Others	36,000	73,000	165,000
Total	180,000	260,000	500,000

Note: ● Population in Sub-Center/Reserved Areas/ Others are included in the population of Village Improvement and Expansion Zone based on the Socio Economic Framework and Residential Framework.

Figure 4.5.1 The Estimated Population of Each Area

4.5.3 Community Plan for the Residential Area

(1) Neighborhood Unit

A residential development should be planned in the well organized neighborhood unit, which is a daily life zone with the required community and public facilities. In the study, the proposed neighborhood unit corresponds to a primary school zone, which is within a walk distance and a daily life zone. A road network system and design on the neighborhood planning should consider to avoid a through traffic coming into the area, and also, systematic road network should provide and guide a smooth flow for a generated traffic.

There are many existing villages in the Hoa Lac and Xuan Mai Area. There are also many stores and houses along NR21A. Although the basic policy for the Development is to maintain agglomerated existing villages as much as possible, scattered and spotted small agricultural settlements have to be moved to planned substitute residential areas to be developed in the M/P Area. Therefore, there are proposed the two types of neighborhood unit: Type 1 and 2. Type 1 is a neighborhood unit in the proposed New Residential Zone, which does not include any existing villages. Type 2 is the one that includes existing villages. As shown in Table 4.7.2, the distributed population to Type 1 neighborhood units is 249,000, which locate in the New Residential Area. For Type 2 is 186,000 neighborhood units, which locate in the proposed Village Improvement and Expansion area. About 79,000 persons out of 186,000 are the existing population, and the rest are new residents.

Neighborhood units should be as compact as possible, so that the residents can be easily communicate each other and adjust themselves with the new living environment. Furthermore, an arterial road surrounding two neighborhood units (sharing one lower secondary school) should be constructed.

Population of a neighborhood unit is approximately 7,000. The average area of a neighborhood unit is about 50 ha. A high-density residential area adjacent to the Urban Center where many apartments are built is about 40 ha per neighborhood unit. In the proposed Villages Improvement and Expansion Zone (Type 2A), a detached and semi detached house will share a majority, which will become low-density residential area approximately 60 ha of neighborhood units.

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(2) Housing Development Plan within a Neighborhood Unit

The housing development in a neighborhood unit should be planned on the conditions of dwelling unit density requirement, types of housing, and site conditions and location. In the case of an apartment type housing, a cluster of apartments, consisting of the several numbers of apartments, is the smallest community. 100 to 150 dwelling units compose a smallest community unit, which is called a Dwelling Cluster with community facilities of a meeting room and a play ground for children. Several Dwelling Clusters of apartments create a sub-neighborhood. In a sub-neighborhood, a kindergarten, small parks, and small-scale commercial facilities can be established. Two to three sub-neighborhoods create a neighborhood unit. In the case of detached housing area, several to tens of houses sharing a service road and create a Dwelling Cluster as the smallest community unit.

As to the density and housing layout in a neighborhood, condominium and apartment types of housing, which is relatively high-density land use housing, is laid out close to a neighborhood center, parks and open space, and other community facilities. The surrounding area of community and public facilities should be used for high-density type where the majority residents have easy access to the facilities necessary for their daily life. On a sloped area, a relatively large residential plot or building types of housing such as apartment and detached housing are suitable to locate, but can be adjusted the slope within a building and site area.

4.5.4 Measures for Existing Villages and Communities

There exist a number of villages and communities in the Village Improvement and Expansion Zone (hereinafter called "VIEZ"). Among them, those agglomerated in relatively large scale are proposed to maintain as much as possible. Accordingly, two different types of neighborhood development are conceived, i.e. "neighborhood type-1: in the proposed New Residential Zone" and "neighborhood type-2: in VIEZ".

Type 2 neighborhood units (hereinafter called N.U.) are further divided into two types from the existing condition of settlement development: Type-2A and 2B. Of the proposed VIEZ, a small part of the land is used by existing villages, which is categorized Type-2A. Type-2B is the VIEZ, where most of the areas are occupied by existing villages. The proposed N.U. in VIEZ are 27 in total, in which Type-2A is 7 or around 25 % of the total. In Xuan Mai Area, Type-2A is not identified, all of 8 N.U. are Type-2B. In both types, the environment of existing villages, including housing and roads are proposed to maintain as it is as much as possible. In the case that existing major street in village is narrow, the

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roads should be improved and networked with the road network of M/P. In addition, water supply and sewerage systems should be also improved to upgrade their living environment. The present public and community facilities should be maintained as much as possible, and also, required public and community facilities to upgrade the social environment are to be added as much as possible.

It is expected that individuals or private housing organizations, which have a right to use land, build detached houses and row houses for low income people in the proposed N.U. in the designated VIEZ. Ha Tay Province and municipal governments should take an initiative to promote the above private housing development. It could create and provide opportunities of housing and real estate business for the local communities.

Type-2 neighborhood units are generally assessed to be an unsuitable land for a public housing supply system. Public housing institution need to be directly involved in implementing a large scale housing supply project in New Residential Zone, except for VIEZ. At the same time, private sector should be an engine of urban development, by means of "participatory approach,".

In planning and implementation for Type-2 neighborhood development, care should be invited to conserving the existing community space together with surrounding natural environment so that a sense of the community should be maintained and inherited among the inhabitants. When a need arises to resettle inhabitants, the substitute land for resettlement should be preferably guided to accommodate in Type-2 neighborhoods, although their wishes and requirements should be carefully considered.

Table 4.5.5 Distribution of Neighborhoods by Type and Area

Area		Type-1	Type-2			Total
			Type-2A	Type-2B	Sub-total	
Hoa Lac	North	6*	3	9	12	18*
	Central	18*	2	-	2	20*
	South	7	2	3	5	12
	Sub-Total	31	7	12	19	50
Xuan Mai		6	-	8	8	14
Total		37	7	20	27	64

Source: Study Team

Note: * The figures dose not include reserved four neighborhood units in HHTP/VNU Areas.

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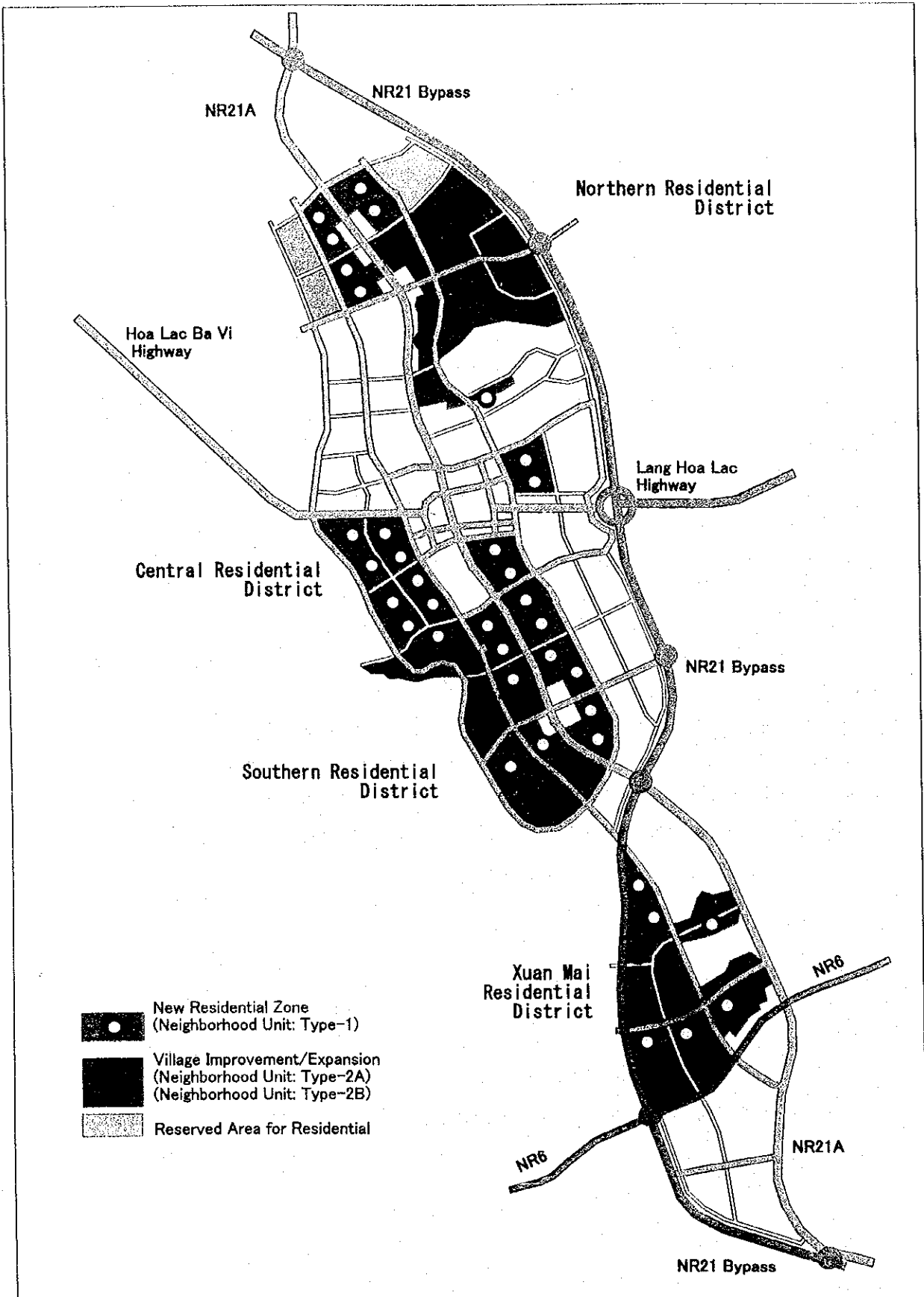


Figure 4.5.2 Distribution of Neighborhood Type

4.5.5 Community and Public Facility Plan

For the New Town, community and public facilities and services are an indispensable supporting functions for daily life activities of residents and urban communities. A required community and public facilities to support various urban and daily life activities are compiled as follows. Parks and open space are described in Section 4.7 of this Report.

(1) Community and Public Facility for Neighborhood Units

Public facilities closely related to daily life such as facilities for education, communication, medical and health, commercial, and so on should be distributed in a neighborhood center, to which people have easy access. The detailed distribution of facilities is described by each sector as shown in Tables 4.5.6 to 4.5.10.

(2) Public Facility Plan for Residential Districts/Sub-Centers

Examples of public facilities serving for more regional or large community than a neighborhood unit are educational facilities such as secondary schools, vocational training school and center, college, and university as well as medical facilities such as hospital and specialized clinics. Commercial and business facilities, hotels, libraries, art museums, theatres, police stations, fire stations, district government office, and sports facilities are also public facilities. Although these facilities are distributed in accordance with scale of service area and population, facilities that many people use should be located in a district center and its surrounding areas, to which people have convenient transportation access.

(3) Required Community and Public Facilities and Planning Standards

The required public facilities for the proposed neighborhood units in the New Residential Zone by each category are estimated on frameworks and planning standard, which is based on the *Building Code of Vietnam*. The results are compiled in Tables 4.5.6 to 4.5.10.

Table 4.5.6 Planning Standard for Educational Facilities

Source: Building Code of Vietnam

Type	No. of Student /1,000 pop.	Site Area m ² /student	Floor Area m ² /student
Nursery School	60 - 70	20 - 30	-
Primary School (1-5)	100 - 130	18 - 22	10
Jr. High School (6-9)	80 - 100	20 - 25	12
High School (10-12)	20 - 30	30 - 35	15

Note: Residential area whose population is over 20,000 should found a high school.

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Table 4.5.7 Required Educational Facilities by Phase
Phase-1A : Population 48,200 and 7 Neighborhood Units

Type	No. of schools	No. of students	Site Area	Floor Area
			ha	m ²
Nursery School	7	450	1.2	
		3,130	9.6	
Primary School (1-5)	7	790	1.6	8,200
		5,540	12.8	65,600
Lower Secondary School (6-9)	4	1,150	2.9	15,360
		4,580	11.6	61,440
Upper Secondary School (10-12)	1	1,210	3.5	16,050
		1,210	3.5	16,050
Total			37.5	

Phase-1B : Population 96,400 and 14 Neighborhood Units

Type	No. of schools	No. of students	Site Area	Floor Area
			ha	m ²
Nursery School	14	450	1.2	
		6,270	16.8	
Primary School (1-5)	14	790	1.6	8,200
		11,090	22.4	114,800
Lower Secondary School (6-9)	7	1,310	2.9	15,360
		9,160	20.3	107,520
Upper Secondary School (10-12)	2	1,210	3.5	16,050
		2,410	7.0	32,100
Total			66.5	

Phase-2 : Population 249,000 and 36 Neighborhood Units

Type	No. of schools	No. of students	Site Area	Floor Area
			ha	m ²
Nursery School	36	450	1.2	
		16,190	43.2	
Primary School (1-5)	36	800	1.6	8,200
		28,640	57.6	295,200
Lower Secondary School (6-9)	18	1,310	2.9	15,360
		23,660	52.2	276,480
Upper Secondary School (10-12)	6	1,040	3.5	16,050
		6,230	21.0	96,300
Total			174.0	

Note: Upper rows show per school, and lower rows show the total.

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Table 4.5.8 Required Medical and Health Facilities by Phase

Facility	Distribution Standard	Site Area Standard	Required No. and Size of Facility Planning		
			Phase 1A	Phase 1B	Phase 2
	(Building Code of VN)		48,200 pop. (7 neighborhood)	96,400 pop. (14 neighborhood)	249,000 pop. (36 neighborhood)
Public Health Station	One station /1,000 persons	500 m ² /one station	48	96	250
			2.4	4.8	12.5
Clinical Examination Center	One center /1,000 persons	3,500-4,200 m ² /one station	7	14	36
			2.8	5.6	14.4
Polyclinic	4-5 beds /1,000 persons	1.0-4.5 ha/polyclinic (50-500 beds)	200 beds*1	400 bdes*1	400 beds*3
			2.5	4.5	13.5
Maternity	0.5-0.6 bed /1,000 persons	30-50 m ² /bed	30 beds*1	60 beds*1	150 beds*1
			0.2	0.4	0.8

Note: Upper rows show the number of stations (or centers), and lower rows show the site area (ha).

Table 4.5.9 Required Sports Facilities by Phase

Facility	Distribution Standard	Site Area Standard	Required No. and Size of Facility Planning		
			Phase 1A	Phase 1B	Phase 2
	(Building Code of VN)		48,200 pop. (7 neighborhood)	96,400 pop. (14 neighborhood)	249,000 pop. (36 neighborhood)
Training Ground	Residential unit	0.5-1.0 m ² /person	0.8*7 grounds	0.8*14 grounds	0.8*36 grounds
		0.3-0.9 ha/ground	5.6	11.2	28.8
Basic Athletic Ground	Urban area	0.6-1.0 m ² /person	2.0*2 grounds	2.0*4 grounds	2.0*9 grounds
		1.0-2.0 ha/ground	4.0	8.0	18.0
Stadium	Urban area	0.8-1.0 m ² /person	4.0*1 stadium	4.0*2 stadiums	4.0*4 stadiums
		2.5-4.0 ha/stadium	4.0	8.0	16.0
Sport Gymnastics Center	Urban area	0.8-1.0 m ² /person	10.0*1 center	10.0*2 center	10.0*3 center
		5.0-16.0 ha/center	10.0	20.0	30.0

Note: Upper rows show the number of grounds (or centers), and lower rows show site area (ha).

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Table 4.5.10 Required Cultural Facilities by Phase

Facility	Distribution Standard	Site Area Standard	Required No. and Size of Facility Planning		
			Phase 1A	Phase 1B	Phase 2
			48,200 pop. (7 neighborhood)	96,400 pop. (14 neighborhood)	249,000 pop. (36 neighborhood)
	(Building Code of VN)				
Library	Urban area	0.5 ha/library	5.0*1 library 0.5*1 library	5.0*1 library 0.5*1 library	5.0*1 library 0.5*3 library
			5.5	5.5	6.5
Museum	Urban area	1 - 1.5 ha/museum	1.5*1 museum 5.0*1 museum	1.5*1 museum 5.0*1 museum	1.5*1 museum 5.0*1 museum
			6.5	6.5	6.5
Fair /Exposition	Urban area	1 - 1.5 ha/fair	1.5*1 fair	1.5*1 fair	1.5*1 fair 1.0*3 fair
			1.5	1.5	4.5
Theater	Urban area	5 - 8 visitors /1,000 persons	1.0*1 theater	1.0*2 theaters	1.0*6 theaters
		1 - 1.5 ha /theater	1.0	2.0	6.0
Cultural Palace	Urban area	8 - 10 visitors /1,000 persons	2.0*1 palace	2.0*1 palace	2.0*1 palace 1.0*3 palace
		0.5 - 1 ha/palace	2.0	2.0	5.0
Circus	Urban area	3 - 4 visitors /1,000 persons	1.0*1 circus	1.0*1 circus	1.0*1 circus
		0.7 - 1 ha/circus	1.0	1.0	1.0
Young Pioneer Palace	Urban area	2 - 3 visitors/1,000 persons		1.5*1 palace	1.5*1 palace
		1 - 1.5 ha/palace		1.5	1.5

Note: Upper rows show the number, and lower rows show site area (ha). The central library of the VNU is located in the Urban Center. At the same time, a library is allocated in each of three district centers: Hoa Lac North, Hoa Lac South, and Xuan Mai. Museum: Museum of Science of the VNU is 5.0 ha. Art museum is 1.5 ha.

4.6 Transportation Network Plan

4.6.1 Road Network

The regional and urban arterial roads development for the Hoa Lac and Xuan Mai should be well coordinated with their functions on the road network system. The proposed road network system for the M/P Area is shown in Figure 4.6.1.

(1) Regional Roads

The proposed three major regional roads are indispensable for linking and harmonious development on the Hoa Lac and Xuan Mai Urban Development Project with the C21 and HMA development. The Lang-Hoa Lac Highway and NR6, which are regional roads running to the east-west direction, link the Hoa Lac and the central Hanoi and

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Xuan Mai to Hanoi through Ha Dong. The both of regional highways are the major radial roads of the road network system of the HMA. The other one is NR21 Bypass, which should substitute the present regional road function of NR21A. It should take a function linking with the four major urban developments in the C21 Development. In Phase-3, this Bypass will share a western part Outer Ring Road function of HMA.

1) Lang-Hoa Lac Highway

The Lang-Hoa Lac Highway is one of the most important roads in the Hoa Lac and Xuan Mai Development Project. Future traffic volume is expected to be quite heavy, which will be generated from around 10,000 commuters from Hanoi in Phase-1, increased 20,000 commuters to Hanoi and more heavy weekend tourists to Don Mo in Phase-2. To mitigate the future road conditions, a main issue of this Project is to create a city, which gives a high priority to public transportation. The exclusive or priority bus lane system with express bus operations make it possible to quickly and conveniently connect the Hoa Lac and Xuan Mai Area and Hanoi in Phase-1. To introduce the exclusive bus lane system, the present 2-lane highway should be expanded to 4 lanes in Phase-1A. Along the highway, the ROW for MRT should be reserved for Phase-2 development of a railway transit system, which would be required to cater a increased passenger traffic demand, exceeding the capacity of a bus system. The geometric design for the Lang-Hoa Lac Highway in the urban area, especially in the Urban Center, should be changed to adapt to the Urban Arterial Road Function called the "Hoa Lac Boulevard." The expansion from the junction with NR21A to Mt. Ba Vi through Don Mo Cultural Village section, which is temporally called Hoa Lac-Ba Vi Highway, should be carefully considered to avoid a heavy through traffic coming into the Urban Center by the Lang-Hoa Lac and Hoa Lac-Ba Vi Highways. Given the direct connection of Hoa Lac-Ba Vi Highway, it may cause not only through traffic issues, but also cause a competitive road function with NR21 Bypass. The proposed typical road cross section for inside and outside the M/P Area are shown in Figure 4.6.1. The proposed road network and system for the Urban Center Area are compiled in Chapter 5.

2) NR21 Bypass

NR21 Bypass is located along the east boundary of the Hoa Lac Area and the west boundary of the Xuan Mai Development Area by the year 2020. In case of a serious flood of the Red River, the Tich River basin was used for water route and flooding plain to avoid an inundation in the central Hanoi. The formation height of the

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Bypass should be set higher than 11 m above mean sea level to maintain the road functions even in the flooding condition, which is resulted from the past flooding records.

NR21 Bypass is proposed to be an exclusive four-wheel vehicle road for traffic passing through Hoa Lac and directly going to the Dong Mo Lake, Ba Vi Mountain, Xuan Mai, and Son Tay. NR21 Bypass is also an important road for a heavy goods vehicle traffic of industrial products, raw materials, and construction materials, which are mainly generated from HHTP, Phu Cat, and Xuan Mai Industrial Zone. The construction of this Bypass depends on the traffic demand, and it is estimated that the construction could start after the year 2010. All of the identified 7 intersections with other roads are proposed to be grade-separated. The junction of the Bypass and the Lang-Hoa Lac Highway should be grade-separated.

3) NR6

NR6 is currently taking the function of a spine for the Ha Tay Province and a major regional radial function for HMA, which is linking the central Hanoi and Xuan Mai through Ha Dong. The up-grading project for the existing 2 lanes highway of NR6 is implementing from Hanoi side to Ha Dong. It would be required to expand from Ha Dong to Xuan Mai section, which should be more than 4 lanes regional trunk road to support a industrial development especially construction materials and related goods production in Xuan Mai, Mieu Mon and surrounding area. And it is currently supporting a more regional socio-economic activities in Hoa Binh and inland areas. The transportation node function of NR6 and NR21A has been providing the development potentials of regional manufacturing industries, trade, and goods distribution center in Xuan Mai. Improvement and upgrading of NR6 and NR21 project will be required to enhance those regional industries in Xuan Mai of which urban functions are incorporated in the M/P. The MOC master plan proposed NR6 Xuan Mai bypass on the south of the existing alignment. However, the eastern half of the section of the proposed bypass passes through flood plain, which is identified for unsuitable urban development area. In the M/P, NR6 bypass development is not required up to the year 2020, it may be required in Phase-3 to reinforce the industrial development on the southern area of Xuan Mai and Mieu Mon.

(2) Grid Pattern Urban Arterial Road in the M/P Area

In the M/P Area, NR21A and other 2 to 4 urban arterial roads are the north-south axis to reinforce the narrow development area of Hoa Lac and Xuan Mai. The Lang-Hoa Lac, Hoa Lac-Ba Vi, NR6, and the other roads are the east-west urban arterial roads to connect the north-south axis. The north-south and east-west urban arterial road structure forms the Grid Pattern Network having around 0.5 km to 1 km grid but not necessarily in a regular grid shape. The Grid Pattern Network coordinates with the existing land terrain, distribution of urban function, and future traffic demand. The 50 to 100 ha cell of Grid Pattern has certain advantages, which can easily adapt and respond to development demand arising from the staged development strategy as well as social changes and economic needs in the future.

1) NR21A as Urban Spine with Boulevard Atmosphere

NR21A should take not only the north-south main urban arterial road function linking the Urban Center and North Center, South Center, Xuan Mai Center and Son Tay, but also provide urban amenity and symbolize the area as a main Boulevard for residents and visitors in the M/P Area.

NR21A crosses many east-west arterial roads and urban collector roads, which three types of intersection. The intersection with the Lang-Hoa Lac in the Urban Center should apply a flyover for NR21A. The intersections with other urban arterial roads could apply a signalized at-grade intersection, and the other intersections with urban collector roads should be an access controlled grade intersection, which allows only right turn with restricted left-turn operation and traffic on collector roads may also be restricted to pass through NR21A. The two central lanes of NR21A are proposed to allocate for exclusive or priority bus lanes, which could increase a share of public transport mode by a convenient bus transport means for citizen and visitors. It will contribute to establishing an "Eco-City" concept for C21 from the view points of saving energy and reducing environmental pollution and emission gas. After Phase-2, the bus lanes would be reutilized for LRT to cater an increased passenger traffic demand of both intra and inter Hoa Lac New Town.

The both side of bus lanes are also proposed for vehicle carriage lanes, motorcycle lanes, bicycle lanes, and pedestrians which should be separated to keep a smooth and safe traffic with medians. The width and lanes of NR21A should be set based on the traffic demand as well as the distributed urban functions and land use along side. From the above, NR21A should be divided into 4 typical sections such as the Urban

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Center (80 m width), Hoa Lac South (70 m), Hoa Lac North (59 m) and Xuan Mai (55 m) sections. Landscaping with street trees/shrubs, lighting, guide/traffic signboards, pavement of pedestrian path/plaza are required to create urban amenities and image to symbolize the surrounding urban area and Hoa Lac/Xuan Mai as a whole in each road section. The proposed typical road cross sections are compiled in Figure 4.6.2.

2) Lang-Hoa Lac Highway and Hoa Lac-Ba Vi Highway

The pressure of future traffic demand on the both highways is forecasted so high. Part of the forecasted traffic demand are proposed to shift to NR21 Bypass, which has the capacity to redistribute the traffic demand to north and south, along the east fringe of the Hoa Lac Urban Development Area. To support for the above concept, connection of the both highways in the urban area should be carefully planned and designed.

For the Urban Center, an Inner and Outer Motor Box system (same as a ring road function) is proposed to secure smooth access and properly control through traffic in the urban center. In addition, the both the highways functions outside the proposed the Inner Motor Box should be changed to urban arteries of 90 m width, which include 30 m ROW for MRT (open cut). And inside the Inner Motor Box, they should be narrowed to 70 m width, which is composed of ROW for MRT, bus lanes, and pedestrian paths with plazas. Private two and four-wheel vehicles are restricted in the section. On the above transportation network development, the Urban Center, which is divided into 4 surrounding areas, can be easily integrated at the ground level.

3) NR6 within the Urban Area

NR6 within the Xuan Mai Urban Area should take a regional road function as well as additional urban arterial road function, which is proposed to upgrade 50 m width road of divided 6 lanes carriage way, divided motorcycle lanes, and wide pedestrian paths. The Xuan Mai Center area is proposed along the eastern half of the section of NR6 within the urban area should be carefully planned to create an urban amenity and a sense of arrivals to Xuan Mai.

4) Other Arterial Roads

The other two to four urban arterial roads running the north-south direction are proposed to support NR21A and to provide around 1 km interval of the urban road network within the Hoa Lac Urban Area. For the east-west direction, five urban

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arterial roads are proposed to support the Lang-Hoa Lac and the Hoa Lac-Ba Vi Highway around 1-1.5 km interval and to create a grid road network in the Hoa Lac Urban Area.

In the Xuan Mai Area, the same concept as the Hoa Lac Area, three urban arterial roads (including NR6) running the east-west direction between NR21A and NR21 Bypass, and additional urban arterial roads running the north-south direction are also created to form a grid road network.

For the Urban Center, urban arterial road network in the area should be densely formed to support the distributed major urban functions, which may generate more traffic demand as compared to the other areas. The detailed proposal is compiled in Chapter 5.

The land parcel divided by the grid road network is almost equal to the area of two neighborhood units. The road network within HHTP zone follows the HHTP Development Plan by MOSTE (based on the JICA study), which has been approved by the Government

(3) Urban Collector Road and Service Road

The urban collector roads are provided to support the grid pattern urban arterial road network. The proposed road network supported by collector roads creates 50 ha land parcels, which will be of appropriate scale in terms of the development unit for residential and urban functions in the future.

Service roads are planned to provide good accessibility for urban facilities and residential plots in neighborhood units, which are surrounded by arterial roads and/or collector roads. Service roads are laid out in coordination with the proposed land use in each area.

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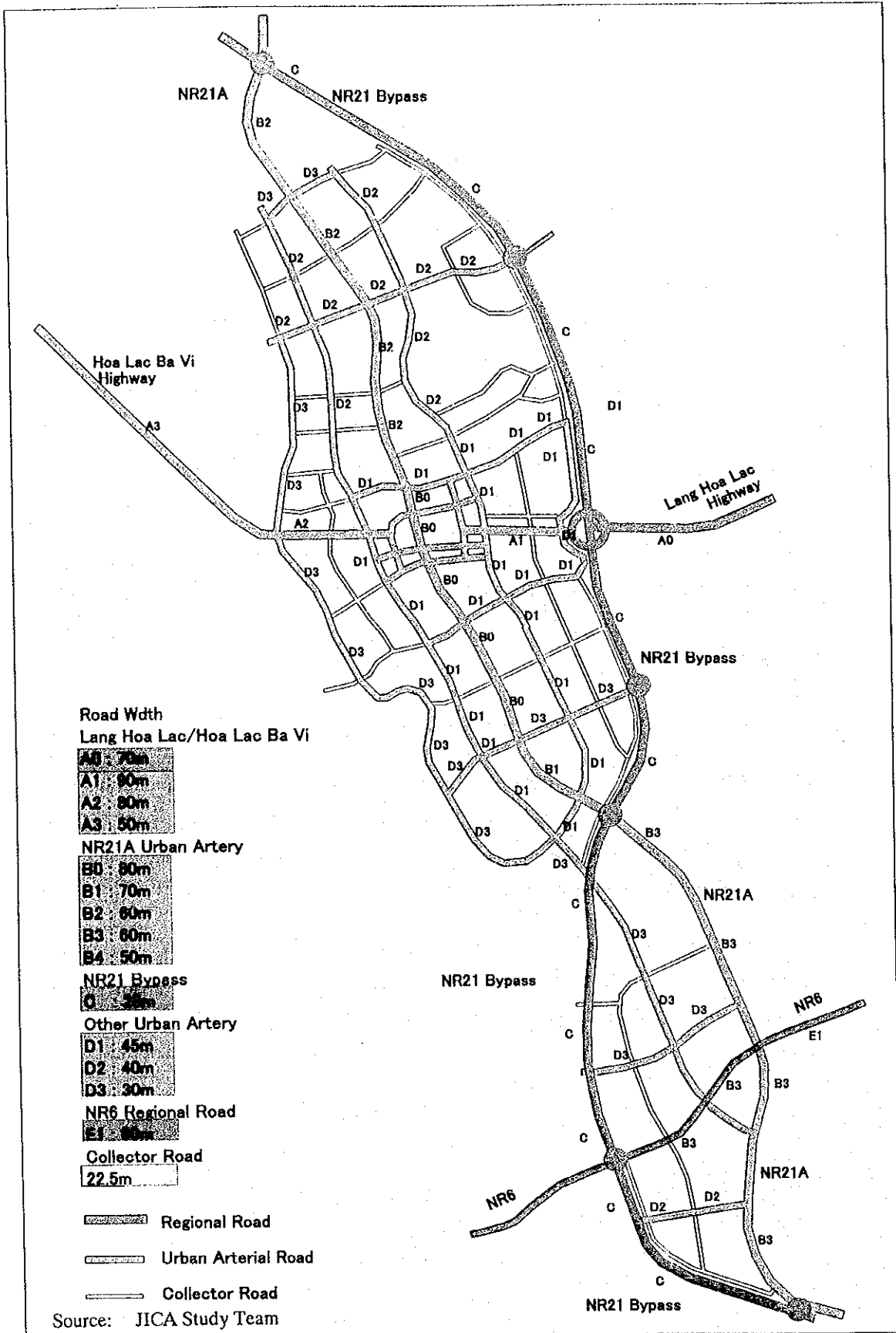


Figure 4.6.1 Road Network of the Master Plan Area

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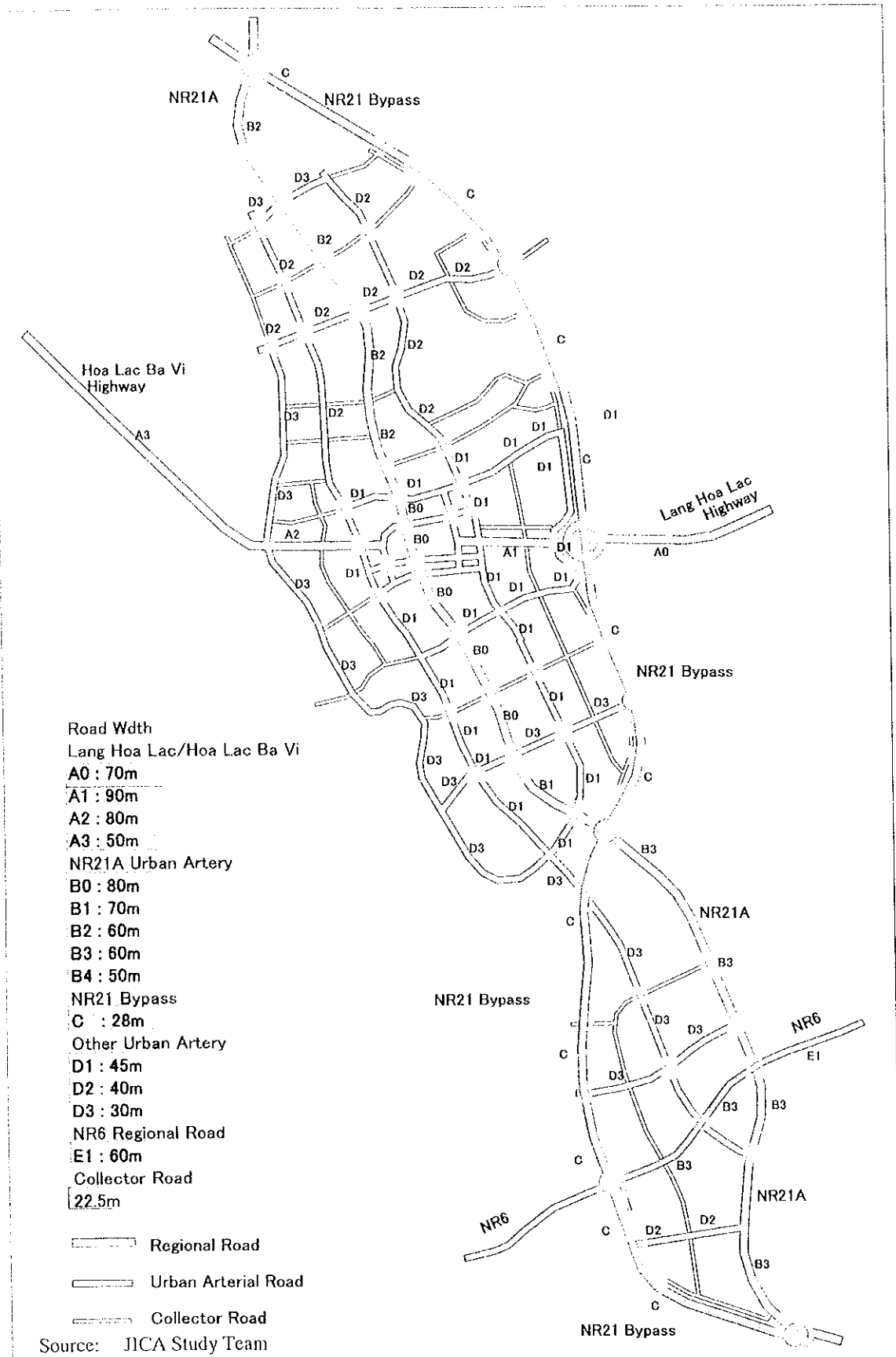
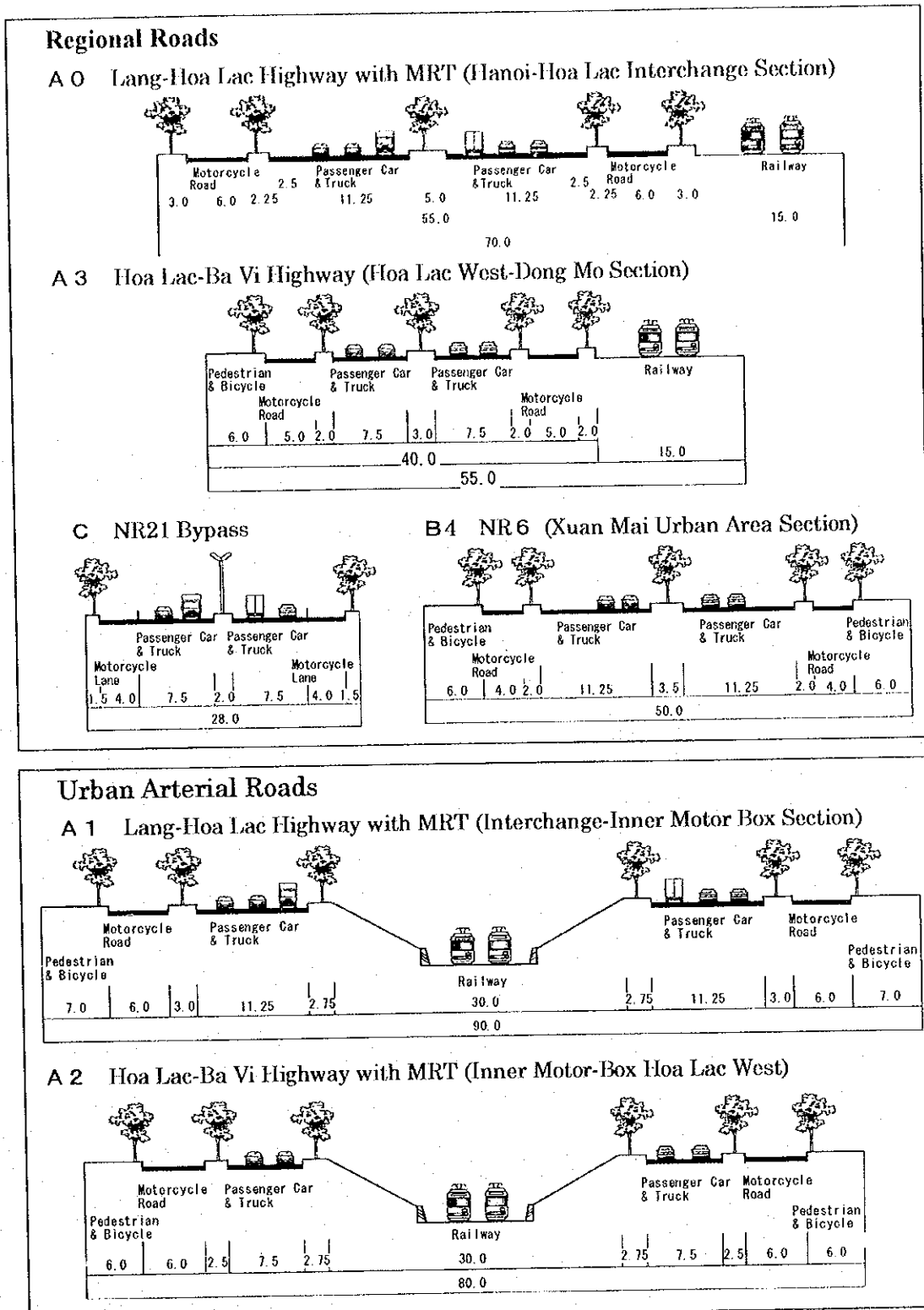


Figure 4.6.1 Road Network of the Master Plan Area

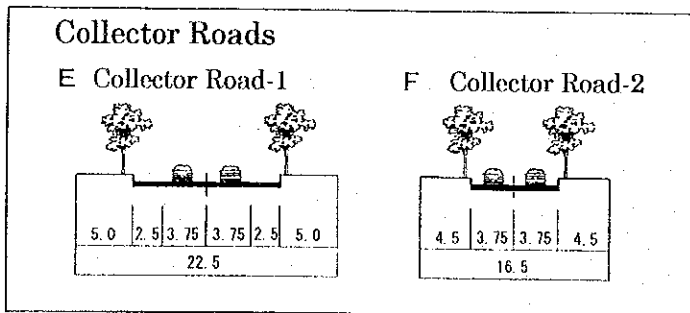
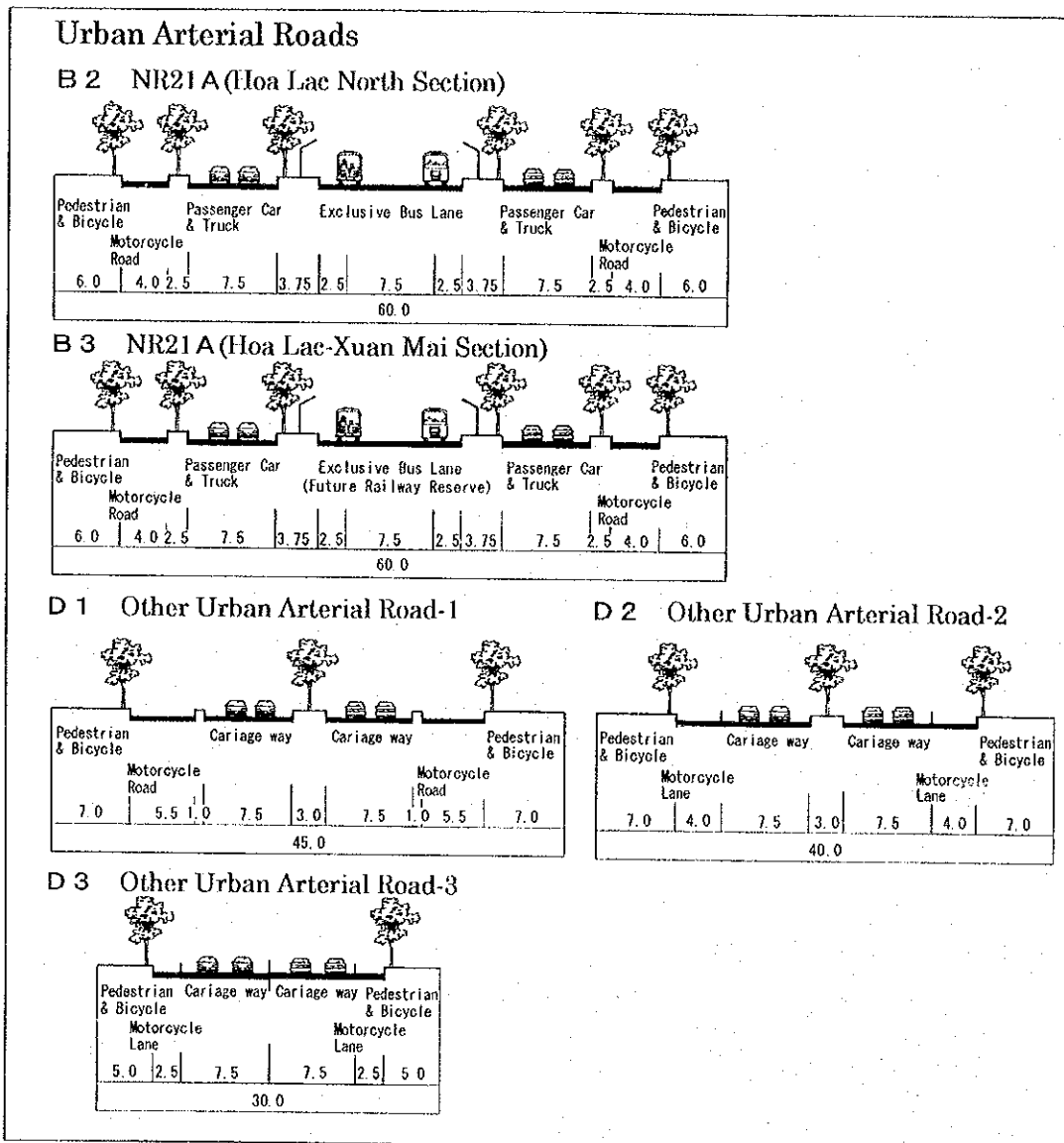


Source: JICA Study Team

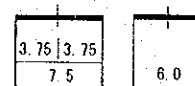
Note: Code NO. implies the road section referred to the next figure of "Typical Road Section"

Figure 4.6.2 (1) Typical Cross Sections for Roads

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Service Roads



Source: JICA Study Team

Note: Code NO. implies the road section referred to the next figure of "Typical Road Section"

Figure 4.6.2 (2) Typical Cross Sections for Roads

4.6.2 Transportation Facilities Development Plan

(1) Planning Approach

The transportation facilities development plan of the M/P Area is established on the following planning approaches.

1) Reserved ROW to Adapt to the Future Traffic Demand and Apply the Staged Development Method

It is expected that as Vietnamese economy develops in the next 10 to 20 years, motorization would be an unavoidable phenomenon. Regarding the negative environmental impacts resulted from motorization at both global and urban environment levels, it is extremely important to deliberately control rapid motorization. Whereas, it is essential to reserve enough ROW to adapt to the future traffic demand from the Hoa Lac and Xuan Mai Urban Development Project. However, in consideration of Vietnamese traffic situation such as a low vehicle ownership ratio, full scale road development including a reserved ROW from the early development phase should be avoided for minimization of the initial investment. Especially, at the time of the economic difficulty, the construction of roads and urban infrastructure should be minimized until the situation comes to permit a fully-fledged urban development. Therefore, only appropriate ROW for the future transportation demand should be reserved in the first phase. At the same time, the reserved ROW in the first phase should be gradually developed and expanded stage by stage over the future.

The planning policy for the road development in Phase-1A and 1B is to minimize the arterial road lengths to create a compact city. In addition, the minimum lanes and widths of the reserved ROW should be planned and constructed in Phase-1A and 1B in accordance with the future traffic demand.

2) Public Transport Oriented Approach

One of the key planning issues on the M/P is, "how to realize the public transport oriented new urban development." A public transport oriented development will be increasingly difficult, when a society is already motorized. It is well understood from the experience of major urban developments in the 20th century. Therefore, in the first phase New Town development, the following counter motorization measures,

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adoption of public transportation systems, and road network systems are proposed by the M/P Study.

- To establish a convenient public transportation system in the first phase of the New Town development, and
- To deliberately control increasing private vehicles and motorcycle traffic.

For improvement of public transportation, an express bus system connecting between Hanoi and Hoa Lac should be introduced to provide a convenient public transport mean from the Phase-1A New Town development. This bus system could be capable of handling 15,000-passenger traffic per hour by providing exclusive bus lanes, bus terminals, and articulated buses. By adopting the bus system, the introduction of railways, which require huge investment cost, could be postponed to Phase-2. The express bus system is compiled in detail in Chapter 6.

Moreover, intra city bus services should be established as an effective and convenient system by applying the following measures. It will be used by citizens and visitors.

- Establishment of exclusive and priority bus lanes for the trunk city bus system along NR21A with convenient bus stops and feeder bus service systems.
- Development of separated bus lanes from other vehicle traffic on NR21A can create a scheduled bus operation and express bus service.
- The above two measures can increase the modal share of bus system in the New Town.

On the other road network, the following measures to control private vehicle traffic are also proposed to make citizens and visitors transfer to use public bus services.

- Although the road network of the New Town is planned to be a grid pattern eventually, part of the road network could be intentionally left incomplete with many detours in Phases 1A and 1B.
- In order to introduce a transit mall system, access control sections for private vehicle traffic should be provided to ease bus operations and to encourage people to use buses.
- In order to implement the above, strict traffic control with regulations are inevitable.
- The above makes the use of motorcycles and four-wheel vehicles inconvenient.

3) Road System to Adapt Vietnamese Transportation Condition

The characteristics of Vietnamese transportation is that the rate of motorcycle ownership is remarkably high compared to that in other Asian countries. In general, carriage ways shared by motorcycles, bicycles, and four-wheel vehicles causes many traffic problems such as congestion, slow-down of travel speeds, and increase in traffic accident. In order to solve these problems in the New Town development, physically separated lane system for four-wheel vehicle, motorcycle, bicycle lanes by medians are proposed in the M/P.

Table 4.6.1 Transportation Characteristics in Asian Countries

	Hanoi	Manila	Jakarta	Bangkok	Scoul	Singa-pore	Hong Kong	Tokyo
Urban Density (persons/ha)	26 (171)	198	171	149	245	87	301	71
GRP per Capita (US\$)	800	1,099	1,508	3,826	5,942	12,939	14,101	36,365
Cars/1000persons	33	66	75	199	66	101	43	225
Motorcyle/1000 persons	250	6	98	124	22	45	4	36
Public Transport % of passenger km	3	62	46	33	54	47	82	63
Speed of Public Transport (km/h)		17	15	9	26	26	28	39

Note: A parenthesis shows population density of the urban area (67 km², 1,150,000 persons).

(2) Development Phasing for Road Network

The road development plan for Phases 1A and 1B in the Hoa Lac and Xuan Mai Area is shown in Figures 4.6.3 and 4.6.4. The public transport oriented planning approach for road network development especially in Phase-1 is to minimize a road development length of urban arterial roads, to incomplete a grid road pattern, and to introduce a transit mall in particular sections.

Along the line, the north-south urban arterial roads development excluding NR21A should be minimized along with particular sections selected for transit malls. From the above road development in Phase-1, advantages and disadvantages for public and private vehicles transportation will be clearly understood by the phenomenon as follows:

- Private vehicle traffic of the north-south direction is limited only NR21A. Thus, a private vehicle should take many inconvenient detours to get its destination,
- Public buses can use the grid pattern road network including transit mall sections for their service, which create more convenient bus service network compared to

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private vehicle traffic. Also, bicycles can use the same of the above. In addition, the exclusive bicycle network will be provided in the open space network, which will be one of the most convenient transport modes in the M/P Area (although the area contains ups and downs).

- This kind of a road network can be called a public transit oriented pattern.

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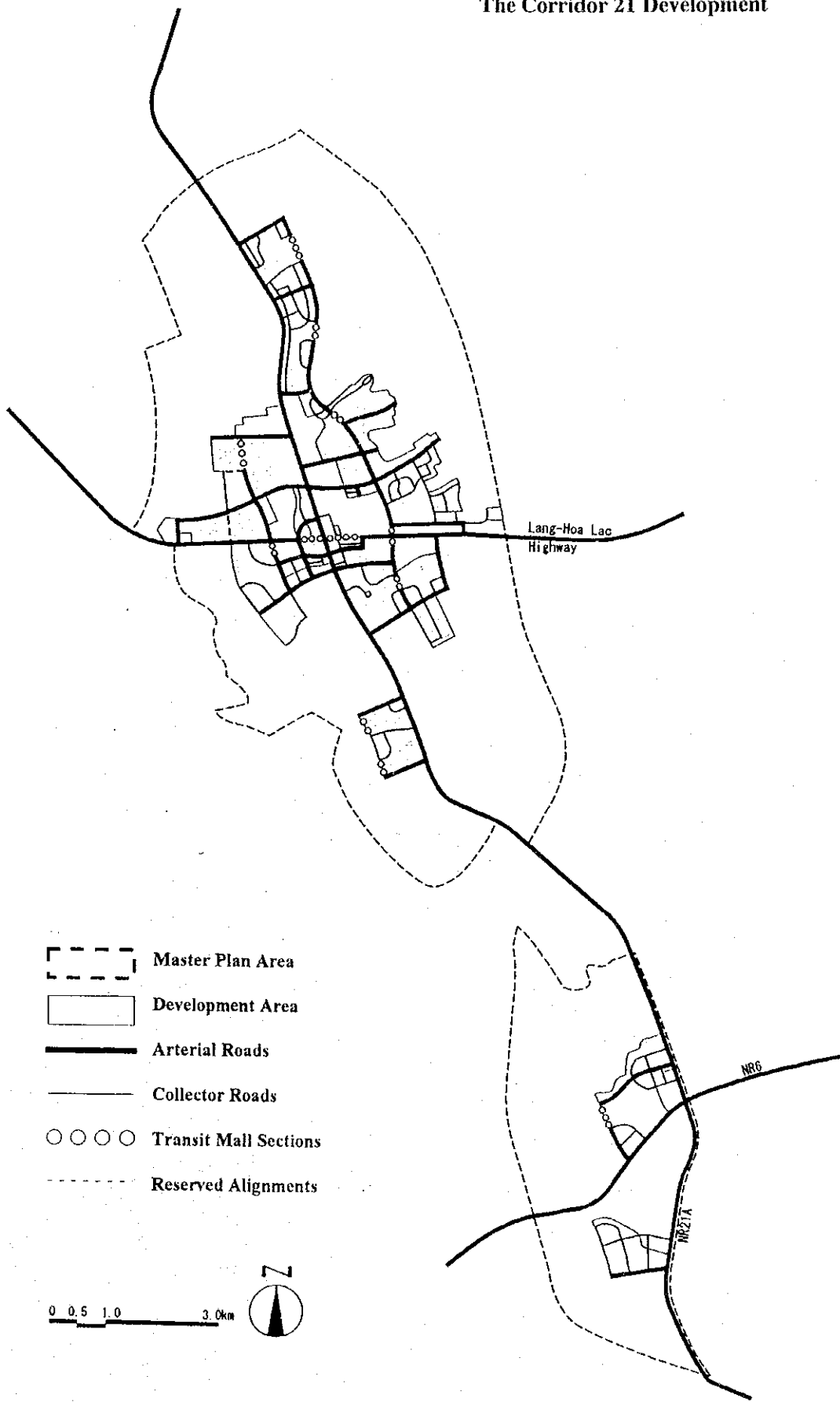


Figure 4.6.3 Road Development Plan by Phase-1A

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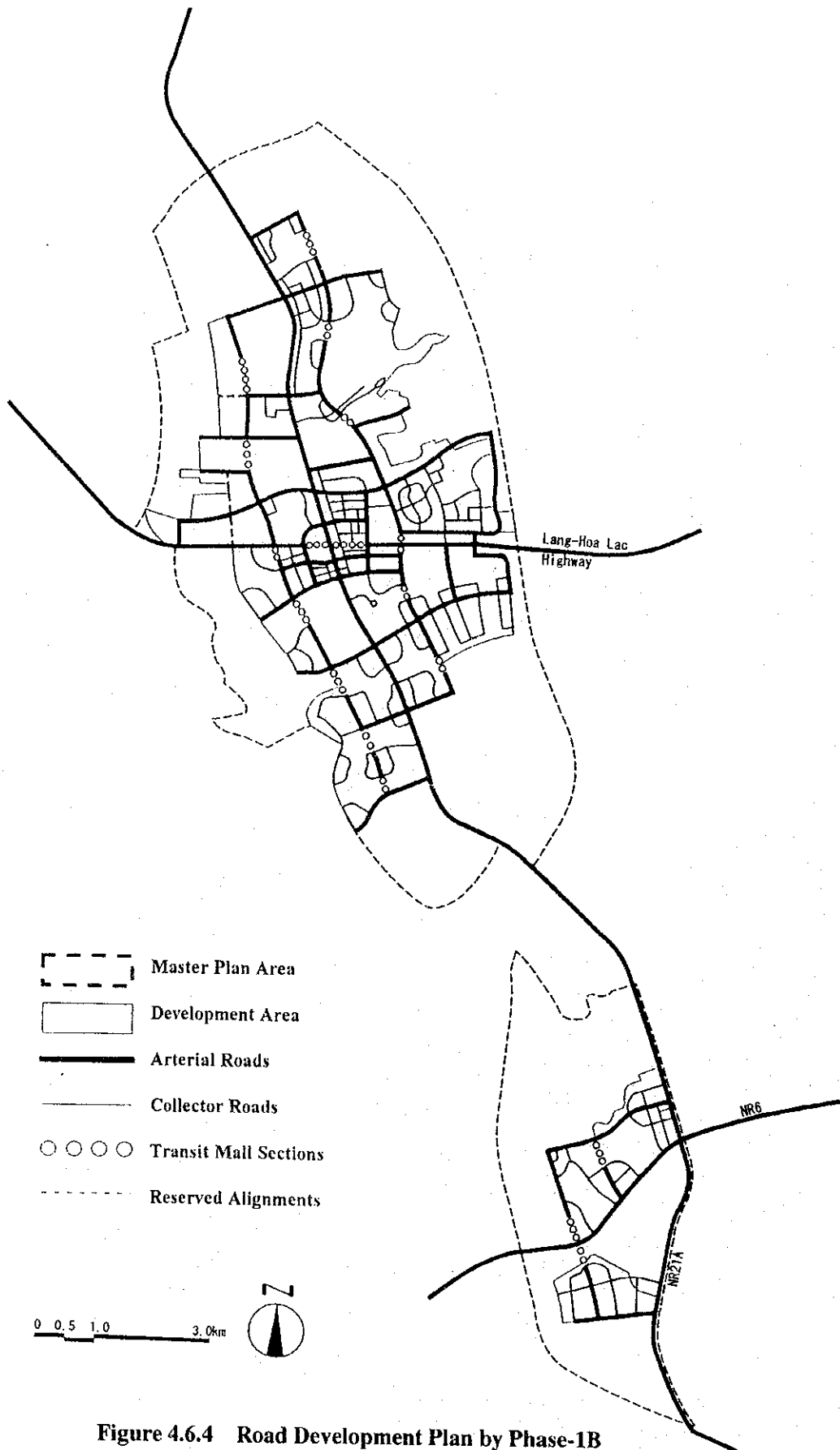


Figure 4.6.4 Road Development Plan by Phase-1B

(3) Alternative Road Network

If this policy is successful in controlling the private vehicle traffic and creating a society, which gives high priority to public transport in Phase-1, this transportation network concept can be continuously applied to even after Phase-1.

The following two figures show the alternative road network plan, which are based on the obvious concept as follows:

- Basic Grid Road Network Plan (this plan is a base to the second)
- Public Transit Oriented Road Network Plan

The Grid Pattern road system and the public oriented road system are compared in Table 4.6.2 in term of their advantages and disadvantages. Which system can better suit for urban traffic management will be basically depend on the future traffic situation and demand. Transportation policy should wisely opt the optimum system based on a trade-off analysis between real constraints and development goals.

Table 4.6.2 Comparison of Road Network

Item	Grid Pattern	Transit Oriented Patter
Public Bus Traffic	<ul style="list-style-type: none"> • Convenient for private vehicles, thus relatively reducing the modal split of public transport 	<ul style="list-style-type: none"> • Convenient for public transport as access controlled private vehicle, thus inducing the use of public transport
Private Vehicle Traffic	<ul style="list-style-type: none"> • Convenient for private vehicles to secure their choice and convenience of shortest pass to all destinations, thus promoting the private vehicle traffics • High transportation capacity to increase future traffic demand 	<ul style="list-style-type: none"> • Not convenient accessibility for private due to incomplete network • Concentrated private vehicle in NR 21A, resulting in inevitable traffic congestion on NR21A when the city grows and traffic volume increases
Pedestrian and Bicycle traffic	<ul style="list-style-type: none"> • Not significant effects on pedestrians and bicycles 	<ul style="list-style-type: none"> • Encouragement of the use of bicycles depending on layout of transit malls.
Environmental Effects	<ul style="list-style-type: none"> • Increased private vehicle traffics create negative impact for urban environment 	<ul style="list-style-type: none"> • Controlled private vehicle traffic encouraging the public transport use, environmentally friendly "Eco-City" will be created.
Traffic Control	<ul style="list-style-type: none"> • No required strict traffic control and management measure 	<ul style="list-style-type: none"> • Without the strict traffic control, this pattern would not be realistic

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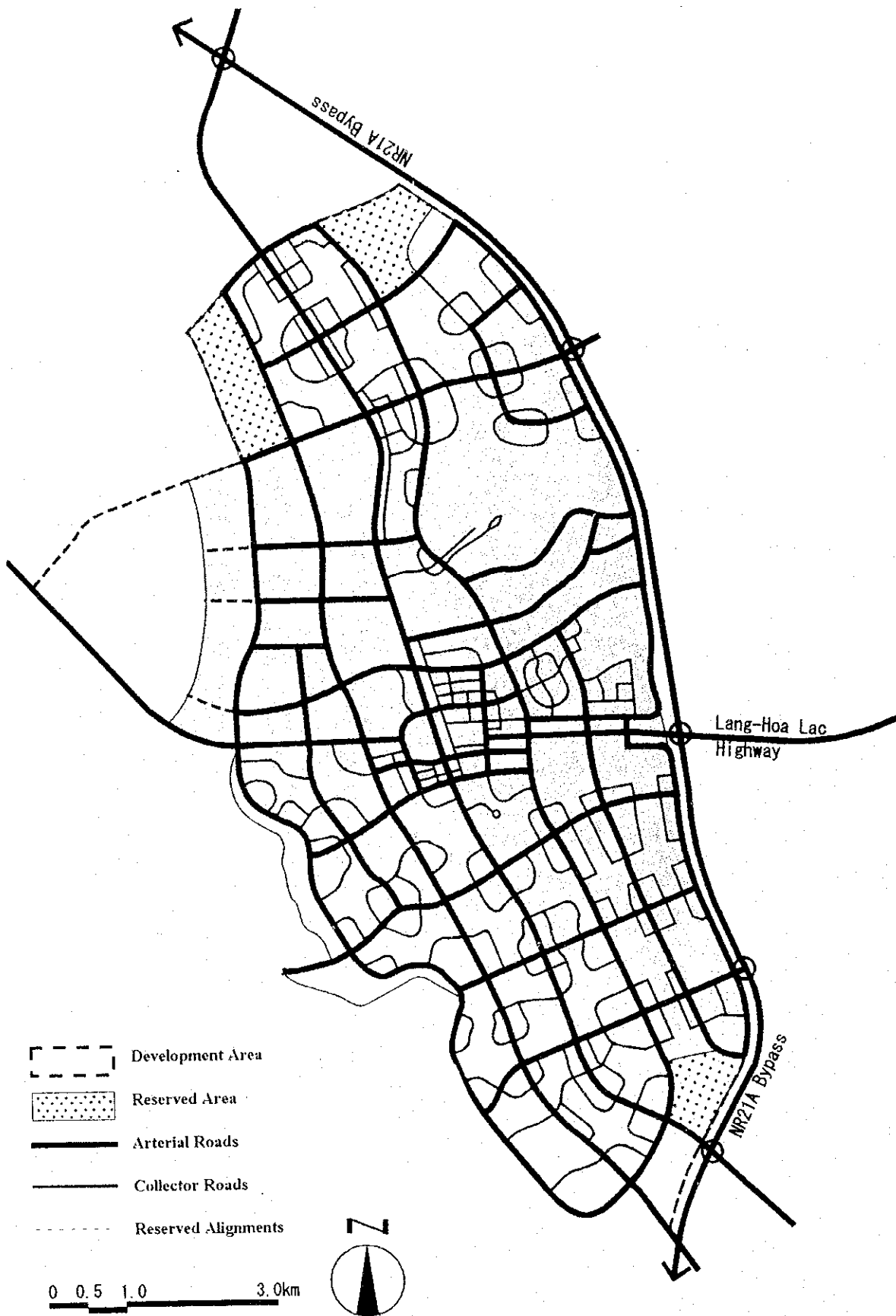


Figure 4.6.5 Alternative Grid Pattern Road Network for Phase-2

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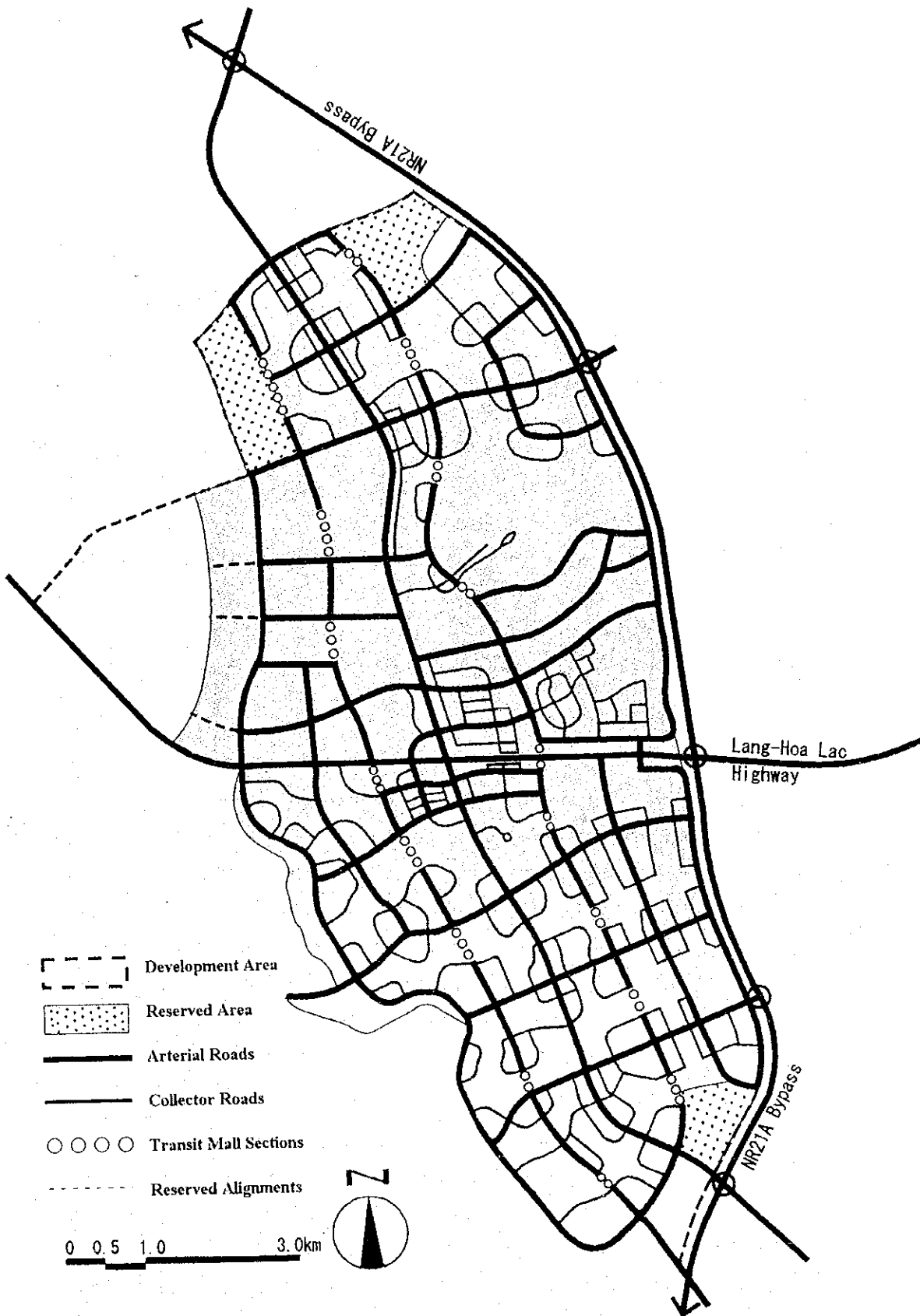


Figure 4.6.6 Alternative Public Transit Oriented Road Network for Phase-2

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(4) Staged Development Approach for Roads

The staged development approach for major arterial roads are proposed and compiled in the section. Although the staged development plans for three development phases should be reviewed and flexibly adjusted in accordance with the traffic situations and demand.

1) Lang-Hoa Lac Highway

Lang-Hoa Lac Highway is planned to be four lanes expressway in Phase-1A that is divided into four-wheel vehicle exclusive lanes and a motorcycle exclusive lane. Since the traffic volume of four-wheel vehicles is expected to be moderate in Phase-1A, the two exclusive lanes for four-wheel vehicles are assigned for priority bus lanes during rush hours to insure a scheduled operation of express bus system. In Phase-1B, as the traffic demand of this highway increases, it becomes necessary to expand from four lanes to six lanes. The central two lanes of the expanded six lanes should be physically divided for exclusive bus lanes, which could contribute to insure express and scheduled express bus operations. Furthermore, when the traffic demand exceeds the capacity of the express bus system in Phase-3, the public transportation system should be shifted to a Mass Rail Transit (MRT) system and make all six lanes for private vehicle traffic.

The total width of the highway between Hanoi and Hoa Lac, including ROW for MRT for the future development, should be planned and reserved to hold 70-meter width. In the section within the urban development area, MRT will cross many urban arterial roads, which require grade-separated intersections. The open cut method, which requires 30-m width of ROW for MRT, will be appropriate as compared to an elevated type of MRT. In addition, wide pedestrians are required in the urban area, so that the width becomes 90 meter. The ROW for MRT in Phase-2 development should reserve in the center a wide greenery median until the MRT is introduced.

2) NR 21A

The ROW of NR 21A in the urban center area should be planned and reserved to hold 80-m width. In Phase-1A, 5-m width pedestrian sidewalks and 9-m width carriage way on both sides are only required, which needs 28-m width development within the 80-m width ROW. For this section, road development method and location should be well coordinated with the situation of land acquisition along the section, where many small shops and townhouses are existing along the section.

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In Phase-1B, the traffic volume of north-south direction will be increased. A widening of carriage way (20-m width) and sidewalk (10-m width) are required 60-m width of 80 m ROW. The widened carriage way should be physically divided into four-wheel vehicle lanes and motorcycle lanes, and two lanes of the four-lane carriage way should be assigned to the priority bus lanes. In this case some space for bus stops should be reserved between the four-wheel vehicle lane and the motorcycle lane.

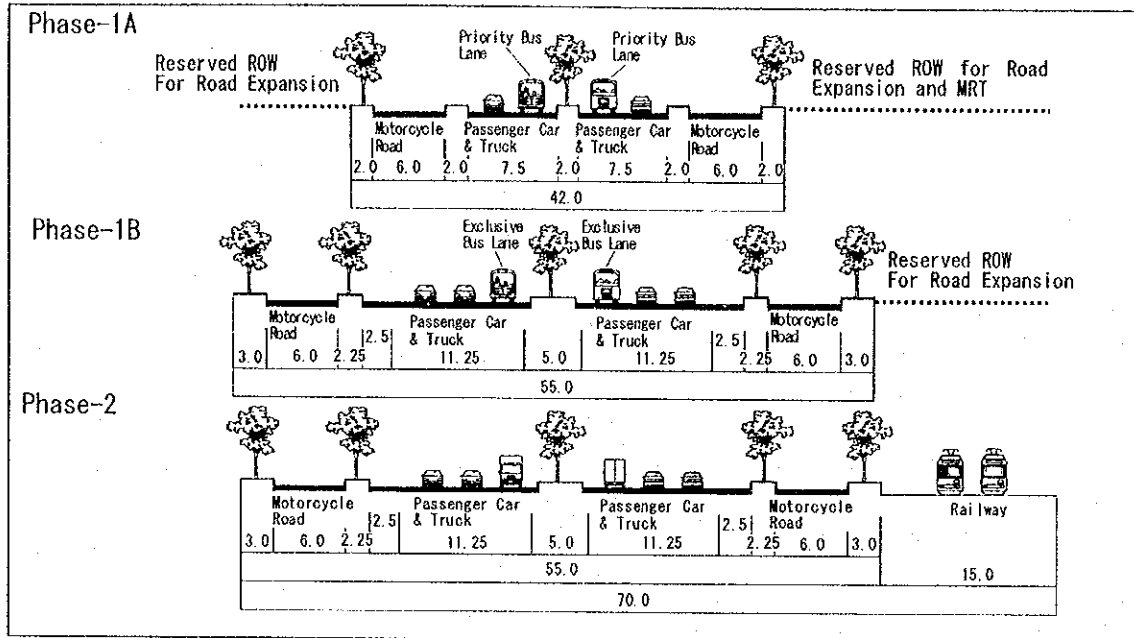
In Phase-2, the reserved 80-m width ROW will be fully developed. From the centerline, 2 exclusive bus lanes with bus stops require 20-m width, which could be utilized for a Light Rail Transit (LRT). On both outsides, 3 lanes each carriage way require 22.5 m width in total. On both outsides the carriage way, 6-m width motorcycle lanes are required. On the both outsides, 10-m width sidewalk is required. Landscaped medians are require between the each lane.

3) Other Urban Arterial Roads (D1)

The other urban arterial roads are planned as to have 40 to 45-m wide ROW. Four lanes carriage ways, physically divided into motorcycle lanes, and 4 to 7 m width sidewalk are proposed within ROW. However, during the period of Phases-1A and 1B, construction of carriage ways and pedestrian sidewalk should be minimized as much as possible, which should be coordinated with the traffic situation and demand. The north-south urban arterial road should be incomplete on some sections to control and discourage over motorization. And also, part of the north-south urban arterial roads are proposed for transit mall sections with access control for private vehicle traffic, which will encourage a public bus use and bicycle. This transit mall system could be continue for Phase-2 transportation system in coordination with the future transportation condition and traffic demand.

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Hanoi-Hoa Lac Interchange Section



Interchange-Inner Motor Section

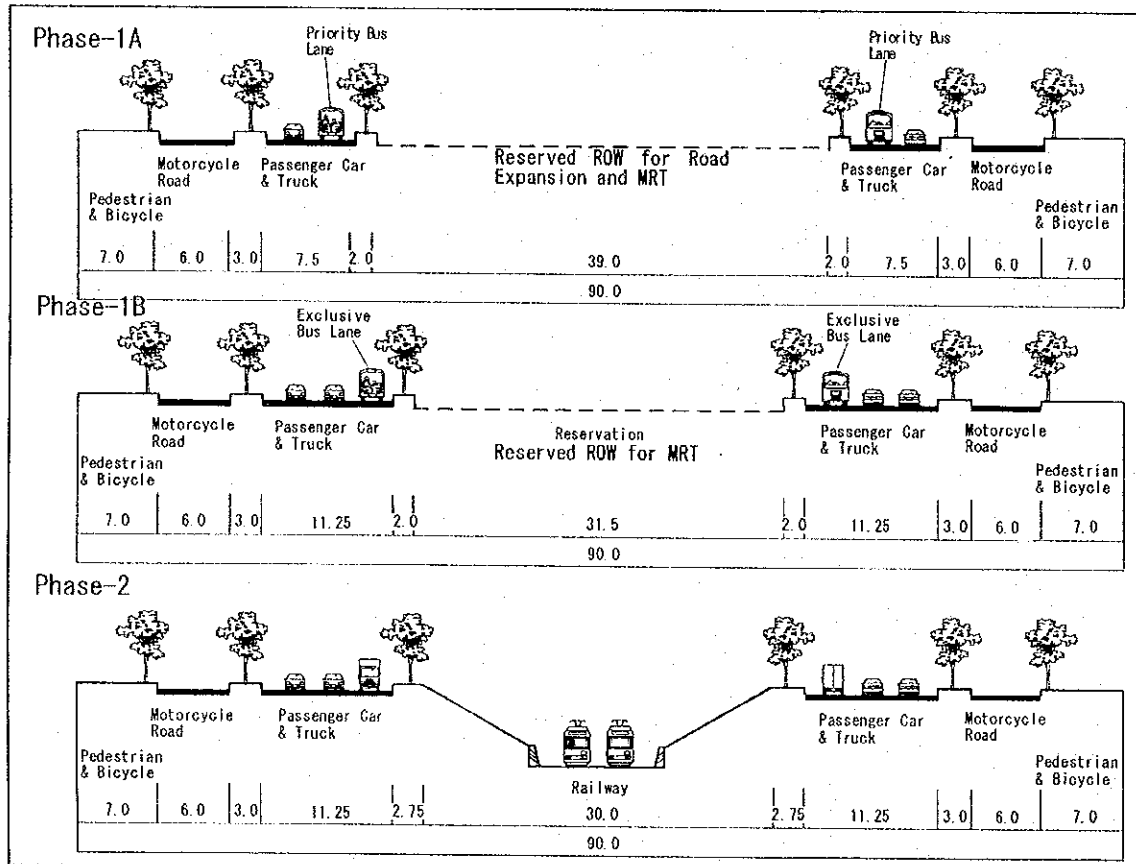


Figure 4.6.7 Typical Cross Section of staged Road Development: Lang-Hoa Lac

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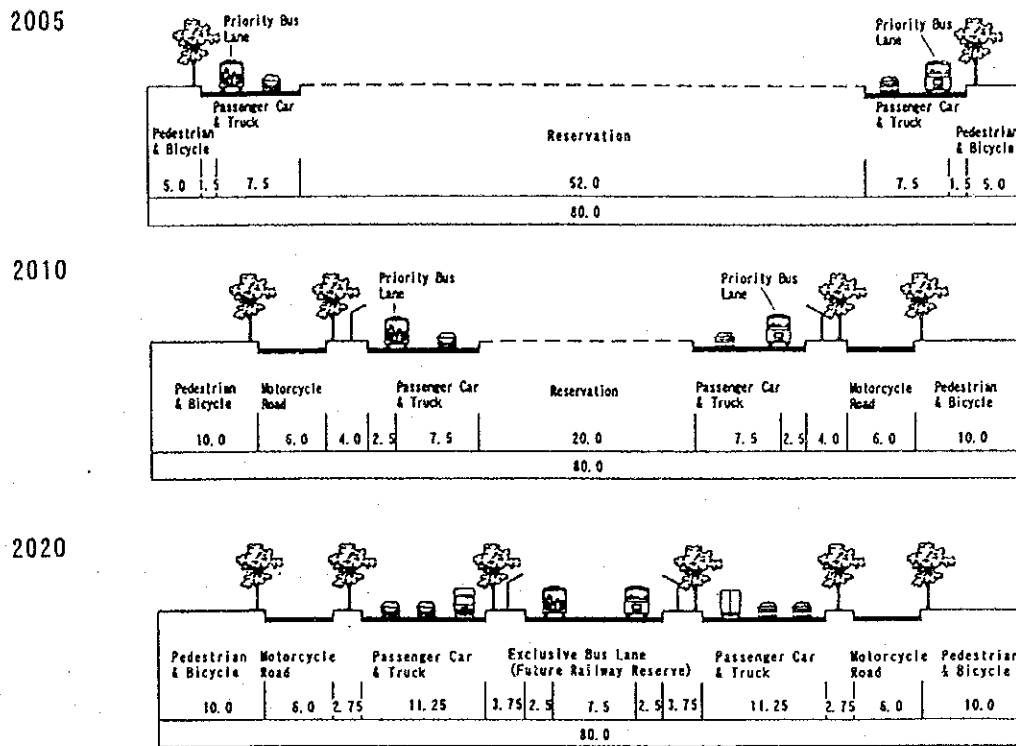


Figure 4.6.8 Typical Cross Section of Staged Development for NR 21A

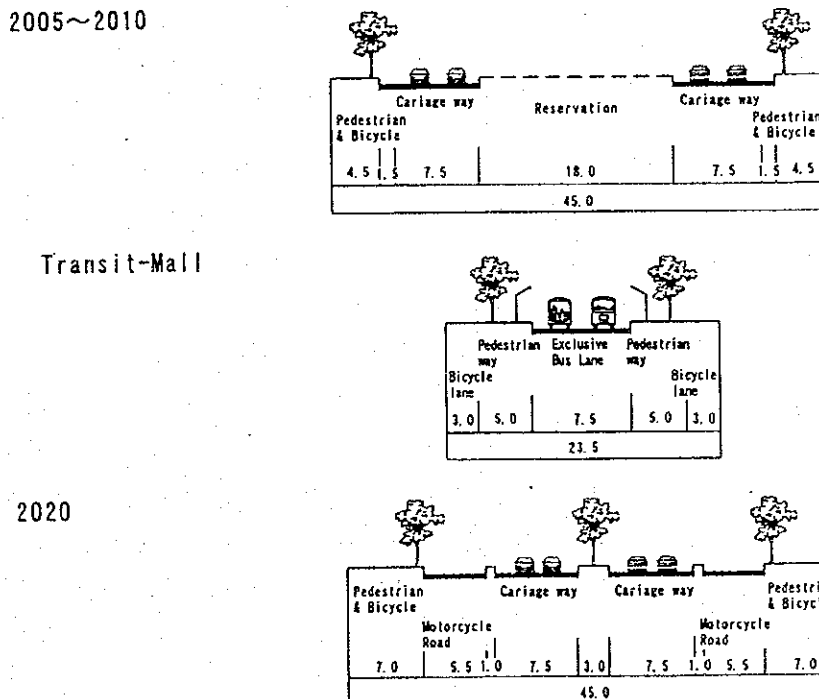


Figure 4.6.9 Typical Cross Section of Staged Development for Urban Arterial Road

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4.6.3 Public Transportation System

The public transportation system for the Hoa Lac and Xuan Mai Development Project and C21 development area consists of the following three network systems:

(1) Inter City Network System between Hanoi and Hoa Lac

Priority and exclusive bus lanes systems are applied on the Lang-Hoa Lac Highway, and an express bus system is also introduced between Hanoi and Hoa Lac. At the time when the traffic demand exceeds the capacity of this bus system in the future, public transportation can be transferred to a Mass Rail Transit (MRT) system. ROW for the railway system should be reserved from the beginning of the project.

(2) Intra C21 Network Connecting among Son Tay, Hoa Lac, Xuan Mai, and Mieu Mon

The rapid bus network connecting among the areas is established as an urban trunk route along NR 21A with a priority and exclusive bus lane system. After Phase-2, the ROW of exclusive bus lanes could be transferred to a Light Rail Transit (LRT) from Hoa Lac to Mieu Mon.

(3) Intra Hoa Lac Network

A local feeder bus network is established where the urban center is the hub, and the supporting bus terminals are in the north center, south center, and Xuan Mai center.

The more detailed of the above plan is described in Chapter 6 of this report. The bus route network in the Hoa Lac Urban Area is described here and shown in Figures 4.6.9 to 4.6.11. The main bus terminal planned to be developed in the urban center is the hub of express bus, rapid bus, and local bus servicing Hoa Lac Area. It is located southwest of the intersection of the Lang-Hoa Lac Highway and NR21A. The main bus terminal is the node of long distance and local buses and the hub of the local bus route network servicing each zone; that is, the Urban Center, VNU, HHTP, Dong Xuan, and Phu Cat. In accordance with an increase in the future passenger traffic demand, sub-bus terminals are distributed in the north and south center along NR21A, and new bus routes connecting these sub-bus terminals are established in order to mitigate congestion of the main bus terminal.

Effective use of the exclusive bus lanes on NR21A and transit mall of two arterial roads parallel to NR21A could establish a more effective and convenient bus route and services.

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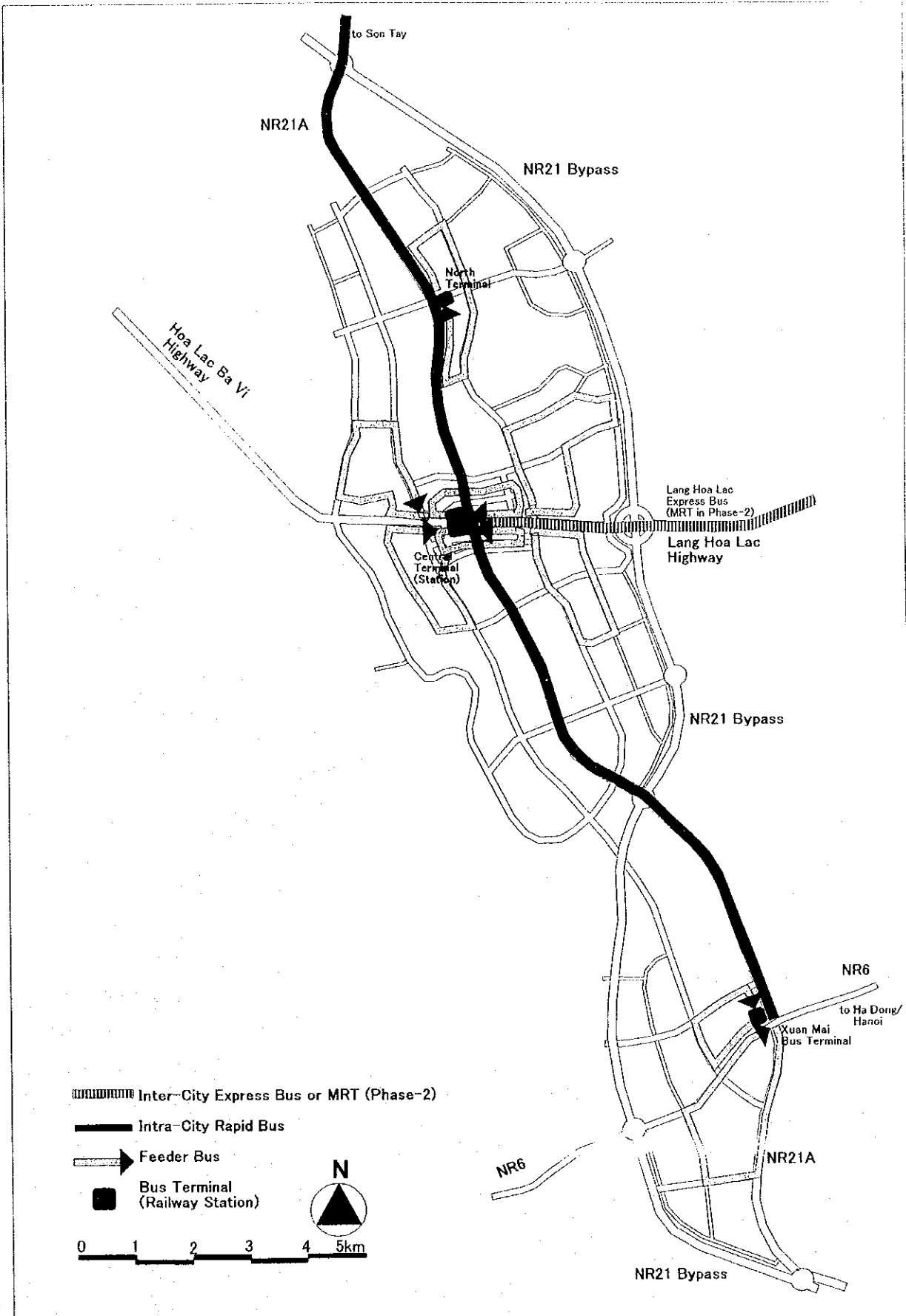


Figure 4.6.10 Bus Route Network in Hoa Lac Area (Phase-1A)

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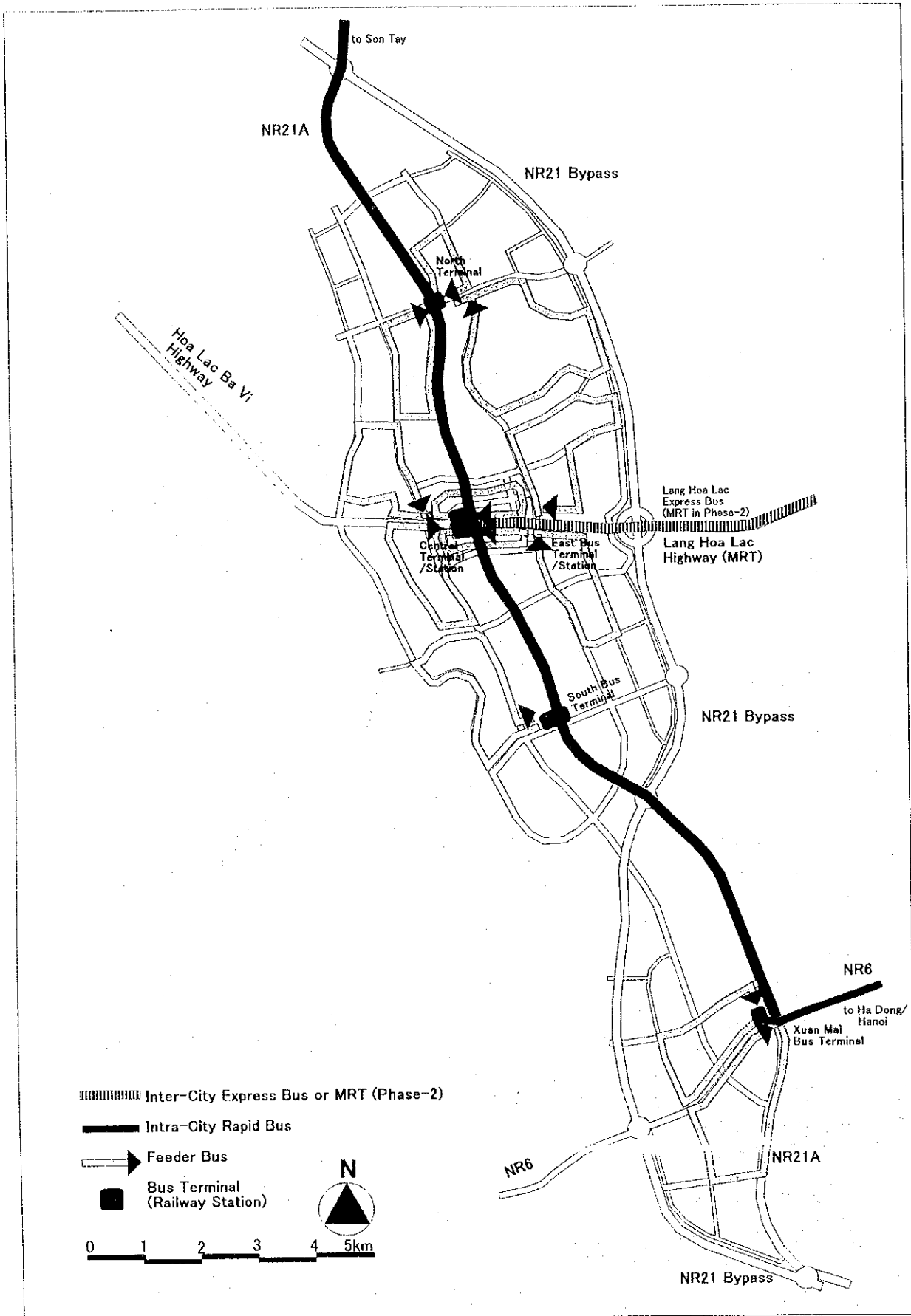


Figure 4.6.11 Bus Route Network in Hoa Lac Area (Phase-1B)

The Corridor 21 Development

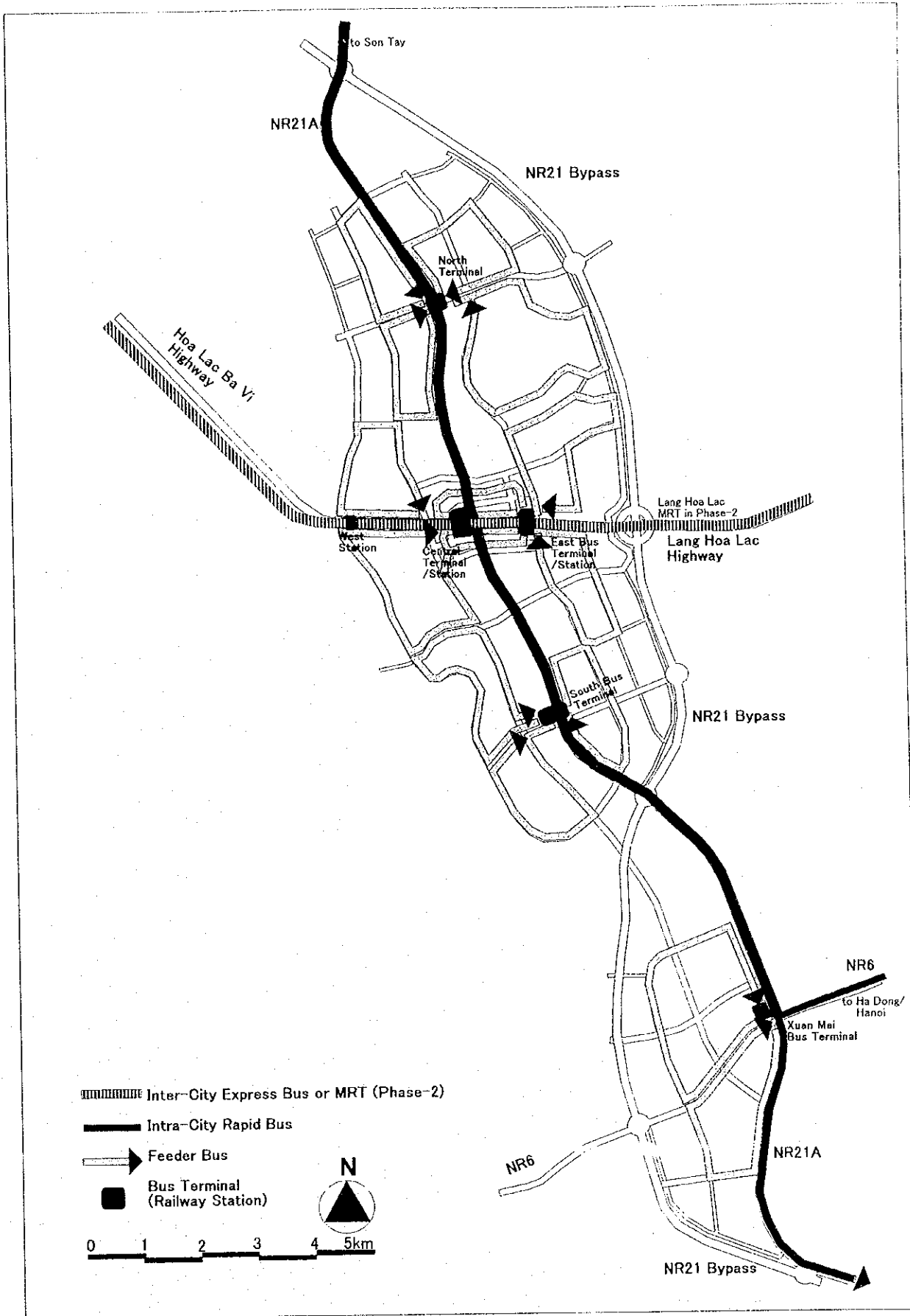


Figure 4.6.12 Bus Route Network in Hoa Lac Area (Phase-2)

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4.6.4 Pedestrian and Bicycle Network

(1) Planning Principles for Sidewalk and Bicycle Lanes

An urban transportation is consist of many types of public transportation such as a rail and bus, private vehicle transportation such as 4-wheeled vehicle and motorcycle, bicycle, and walking. A bicycle and walking have the limited travel distance, but are most easily and available mode for people. Moreover, they are rarely cause a traffic accident and environmentally friendly, which could be identified from viewpoints of energy saving, global issue of emission gas, and urban environmental pollution. Therefore, on the urban transportation planning, a bicycle and walking should be carefully considered as a major urban transportation means for the 21st Century. Convenient, safe, and pleasant pedestrian and bicycle lane network development are required to provide a strolling and biking in a daily life activities particularly in the residential zone. In particular, sidewalks should be designed to be friendly for children, the elderly, and handicapped people. It will encourage activities of pedestrian and biking on the daily life of residents.

Exclusive bicycle lanes are planned to develop on almost all urban arterial roads, which provide more convenient biking route. This method has been already applied for the existing road network in many cities in Europe. Biking and bicycle network development plan is identified as an important on transportation planning for the Development Project. Because the travel distance of bicycles is longer than that of walking, a bicycle route connecting through neighborhood units and urban areas is necessary.

There are many streams running from the western mountainous areas through the Urban Development Area, and the part of green belts along the streams will be conveniently used for the exclusive bicycle and pedestrian network. Development of these bicycle and pedestrian network should have grade-separated crossings with arterial roads within the neighborhoods. When the green belts along the streams are not available, proposed open space and green network will connect the exclusive bicycle and pedestrian network in the M/P.

(2) Exclusive Pedestrian Paths

A pedestrian path network is created in the neighborhood so that the residents can be easily accessible to major community facilities such as neighborhood center, primary school, kindergarten, parks, and so on. In planning and designing pedestrian paths,

care should be invited to the serviceability for all residents including the handicapped and elderly people. Slopes should be gentle enough and additional slopes should be provided where steps are to be inevitable. Green belts connecting neighborhoods and urban areas can be utilized for providing pedestrian paths. The width of pedestrian paths is minimum 2 m considering the use of a wheelchair.

Pedestrian paths should be provided in the Urban Center including so-called shopping malls. Similarly, VNU campus and HHTP need a convenient and comfortable pedestrian path network. However, this Master Plan highlights only those pedestrian paths to be provided along the green belts on both sides of streams.

All types of roads including pedestrian paths should conveniently and mutually link to transport nodes such as bus terminals, VNU, HHTP, Urban Center, and neighborhood centers. To the end, sufficient traffic signs and grade-separated crossings are of prime importance.

(3) Exclusive Bicycle Roads

Exclusive bicycle lanes provided in urban arterial roads and exclusive bicycle roads provided in green belts should have minimum 2.5 m width. Due consideration should be given to the principle such as the “priority to the weak” and “priority to the public transport” in planning of intersections with other modes of transport. For example, at the intersection with a pedestrian path, exclusive bicycle roads should be so designed as to slow down their speeds to avoid collision. Similarly, arterial roads should be designed to secure bicycles from collision with vehicles.

To promote the use of bicycles, adequate parking facilities should be provided in the place where many bicycles tend to gather such as commercial area, bus terminals, civic facilities, hospitals and clinics, and so on.

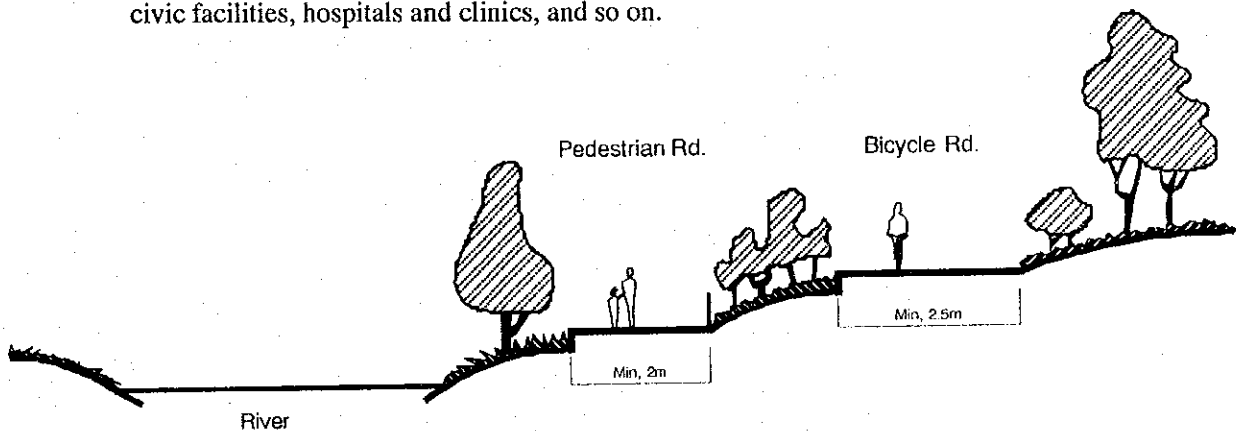


Figure 4.6.13 Concept of Pedestrian Path and Bicycle Road in Green Belt

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4.7 Parks and Open Space Network Plan

4.7.1 Green Belt Network

Open space network will be created in the Hoa Lac and Xuan Mai Area by utilizing and networking the green belts along rivers and streams flowing from west to east of the Area. Also, the existing small hills in the Area are conserved and utilized for urban amenity space having more than tens of hectares. The largest one in the Area is the mountainous area located west of the Dong Xuan area, which has over 200 hectares. These green areas will be linked each other by green belts along rivers and streams to form a green network that expands over the whole Area. The natural green belts along rivers and streams are mostly of 100 to 200 m in width, and green belts artificially created are 20 to 60 m in width. Also, a green belt as buffer zone will be provided between residential and industrial zones so that environmental pollution could be mitigated for the residential zone.

NR21 Bypass is to be used for a high standard highway in the future. Therefore, a green buffer zone will be provided between the Bypass and the area for urban use. Open space includes the areas for sports and recreation. The sports fields in the VNU campus and the Olympic Game Complex in Phu Cat area (adjacent to the Lang-Hoa Lac Highway) are large-scale open space, which are planned to link to the green belts network along the nearby river.

The open space network is linked to the mountainous area located west of the Area and to the Tich River in the east of the Area, thus it links to the natural environment and production green areas outside the Development Area. This implies that the east-west natural environment will remain linked even after the Development. Due consideration is invited in open space planning in that it will be utilized for urban green area, and area for sports and recreation, and at the same time, it will form important part of the natural environment on a regional basis. The following is the area requirement of parks and open space for the M/P area estimated in accordance with the Building Code of Vietnam.

Table 4.7.1 Land Requirement for Parks and Open Space

Land Use Category	Planning Standard for Area Requirement	Area Requirement (ha)		
		Phase-1A	Phase-1B	Phase-2
	Bldg. Code of Vietnam	49,800 pop. 8 N. Units	93,400 pop. 14 N. Units	255,600 pop. 36 N. Units
For whole Urban Area	10-15 m ² /person	49.8-74.7	93.4-140.1	255.6-383.4
For Civil Area	5-8 m ² /person	24.9-39.8	46.7-74.7	127.8-204.5
For Residential Area	3-4 m ² /person	14.9-19.9	28.0-37.4	76.7-102.2

Source: JICA Study Team. The source of planning standard for area requirement is Building Code of Vietnam

Note: Area standard is set as a minimum standard.

4.7.2 Parks and Green Area Plan

The total area requirement of parks and open space is estimated in accordance with the Building Code of Vietnam. The area is classified in the following three categories by the Study Team; (1) large-scale parks and open space, (2) green belts along rivers and canals having huge area, which create the structure of the green belt network, and (3) parks and open space specifically in the neighborhoods.

(1) Large-scale Parks and Open Space

1) Urban Center

There exists Muc hill of about 103 m altitude located northwest of the Urban Center (VNU area side), which is accessible to the top by vehicle. A green belt will link the hill to the commercial area in the Urban Center through to the park in Dong Xuan. Along the green belt, diverse cultural facilities will be provided. Also, in the south of Dong Xuan is a hill of 72 m altitude, which is preserved as a park. This implies that the two of hill park are linked with the open space network and the commercial area of the Urban Center spreads over between the two hill parks, which attaches a unique landscape to the Urban Center. The hill park in the north is about 25 ha and the south is about 45 ha.

2) VNU

A sort of central park will be provided in the middle of the area to be developed by 2020, surrounded by various campus facilities. This park will form a part of the green belt along the river together with the lake existing nearby. Sports facilities for use of students will be provided in the west of the park. The space is about 64 ha in total.

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3) HHTP

The plan for the HHTP development is aimed at preserving the natural environment and adopting the land use fairly low density, thus creating tranquil atmosphere matching the R&D activities and high-tech industries as well. The HHTP has the richest natural environment in the Hoa Lac Area with the Tan Xa Lake in the middle. A large-scale central park will be provided in proximity with NR21A with the area of 43 ha. This park is also linked to the green belt of the nearby river. Total open space including nearby green space amounts to about 100 ha. A golf course is planned to locate north of the central park with the area of about 130 ha, which is expected to attract many golfers due to its convenient accessibility with suitable topography.

4) Phu Cat

A sports and recreational complex will come in the area adjacent to the Urban Center in the east and the Lang-Hoa Lac Highway in the north. This complex is conveniently located with the direct linkage to the Lang-Hoa Lac Highway and the Urban Center as well, and hence, it can provide the space for a large-scale Olympic game in the future. A large-scale park is planned to locate in the middle of the Area along NR21 Bypass, which spreads over the east-west direction with the area of about 35 ha. This park is also located in the middle of the Phu Cat Industrial Zone, and linked to the green belt along the nearby river and lake. The park can cater a restful place to those working in the Industrial Zone and provide a place for sports and recreation.

5) Dong Xuan

The Dong Xuan Area is mostly used for the residential purpose except for the Urban Center area. The Area is divided into the central and the south residential district, each having its residential district park having more than 10 ha. The parks create parts of the green spaces along the nearby rivers. In the western perimeter of the reserved area for the development by 2020 is a range of mountains having the highest altitude of more than 200 m, which is expected to be an urban green area. The area has the area of more than 200 ha, which is located outside the M/P area but proposed for the natural conservation area by the Study Team.

6) Xuan Mai

In the middle of the Xuan Mai Area is a small hill having the altitude of 133 m. The area to be developed by 2020 is designated so as to surround the hill. The hill with its surrounding area constitutes an urban green space of 146 ha. As the area is quite a hilly terrain, it will be mostly used as an urban green area.

(2) Green Belts along Rivers

The proposed green belts along rivers and streams create a structure of the green belt network in the Hoa Lac and Xuan Mai Area. Such green belts naturally include the rivers, lakes, and reservoirs. They naturally form a weaving shape with the widths of 100 to 200 m. Most of the major parks as categorized in the above (1) and the parks in neighborhoods as categorized in the above (3), are both linked to these green belts along rivers and streams. And green belts are utilized for the provision of exclusive bicycle roads and pedestrian paths. Besides their principal element of structuring a green network in the Area, its important function is to link the natural environment lying outside the Development Area in the east and the west.

(3) Parks in Neighborhoods

Playground are provided by and adjacent to the housing cluster made up with 100 to 150 units, which provide restful environment in the housing cluster. These parks need the space for playground of about 500 m². By a few housing clusters with 500 to 700 units, larger parks of about 5,000 m² are provided as a “strolling garden”, and by neighborhood unit with 1,500 units, neighborhood park is provided with green spaces and sports and recreational fields. A buffer green zone of 50 m in width is provided between residential and industrial zones.

(4) Area Standard for Parks

The following is the minimum standard size of parks, regulated by the Building Code of Vietnam.

(a) Urban Center Park	15 ha
(b) Residential District Park	10 ha
(c) Neighborhood Park	3 ha
(d) Strolling Garden	0.5 ha
(e) Public Garden in Small Urban Area	2 ha

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(f) Urban Forest Park	50 ha
(g) Forest Nursery	1.0 sq. m/person
(h) Flower Nursery	0.2 sq. m/person

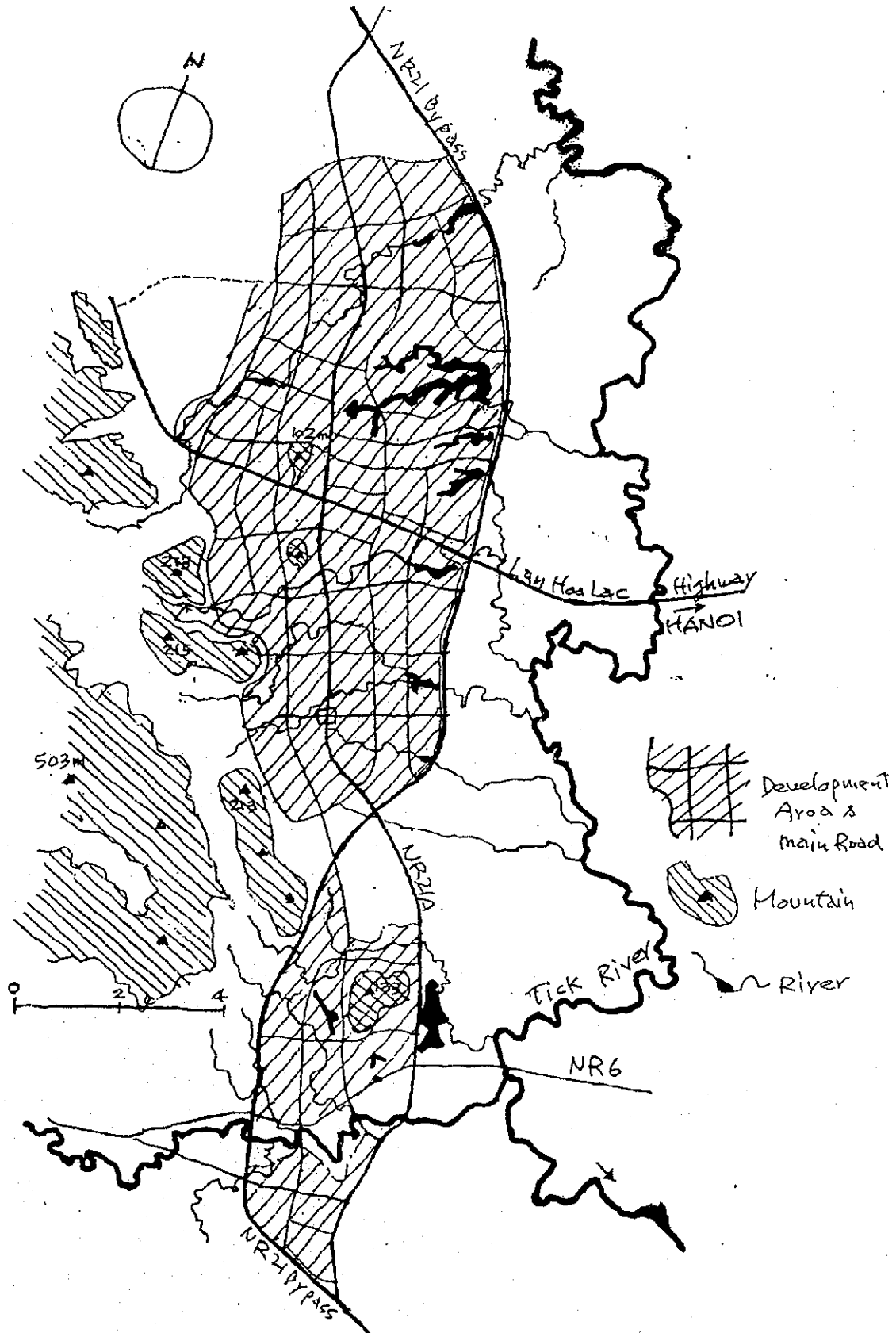


Figure 4.7.1 Rivers and Mountains around Hoa Lac and Xuan Mai

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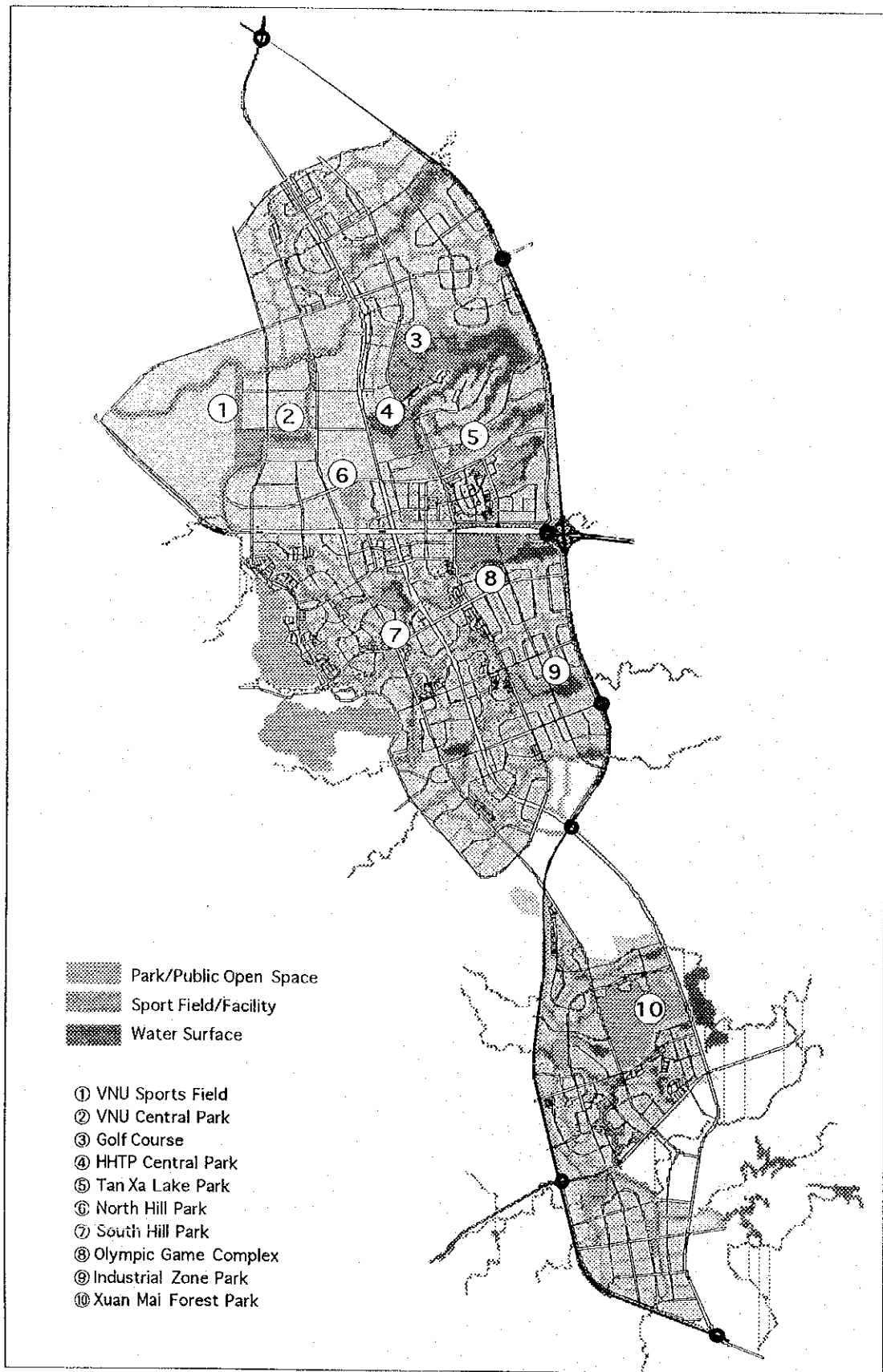


Figure 4.7.2 Parks and Open Space Network Plan

4.8 Phased Development Plan

The development area by year 2020 of this project is approximately 6,000 ha in Hoa Lac, 1,400 ha in Xuan Mai, and totally 7,400 ha, which requires the vast amount of investment cost. Therefore, this project is necessary to be cost effective by applying the phased development plan. Establishment of a compact city around the intersection between the Lang-Hoa Lac Highway and NR21A, which is geographical center of Hoa Lac, should be given the first priority. Moreover, facilities of VNU and HHTP should be concentrated along NR21A in consideration of HRD, R&D, and high-tech industrial development, so that they can easily cooperate each other. The quality of the urban center should be also paid careful attention from the early stage. At the early stage when the population is small, the urban center should be as compact as possible and necessary facilities should be carefully selected for the construction. The residential areas should be developed around the urban center.

(1) Urban Center Area

The land requirement for necessary facilities of the urban center by Phase-1A is about 40 ha. Those facilities should create symbolic space of the urban center, they should be included in Phase-1A plan. It is important to establish agglomerated urban space; that is, the residential area of Phase-1A located in the west of the urban center and the commercial district should be integrated, cultural facilities should be established along NR 21A in the VNU area, and HHTP area and Phu Cat area should be developed around the intersection between the Lang-Hoa Lac Highway and NR 21A. In Phases 1B and 2, the core of the city expands further.

(2) VNU Area

The planned facilities in VNU area for Phase-1A are developed along NR21A, and the campus of natural science and technology which should be located close to the urban center, are given first priority to be developed. The RIST facilities, including laboratory, related to natural science and technology, are also distributed along NR21A to reinforce the linkages with R&D functions in HHTP.

From the point of view to minimize the initial investment for infrastructure, all the required campus developments should be concentrated along NR21A in Phase-1A. In order to do that, the faculties or universities using the developed campus in Phase-1A needs to be relocated to the originally planned location in later phases. However, because it is expected that it takes huge amount of initial investment costs and causes

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difficulties to relocate its facilities, the faculties of natural science and technology should remain in the same location from the beginning.

Besides, dormitories to accommodate 65,000 students are planned to be constructed in the northern and southern parts of VNU area by year 2020. At Phase-1A, the southern part of dormitory area, which is relatively close to the urban center, should be developed in coordination with the Phase-1A residential development in Dong Xuan.

(3) HHTP Area

The HHTP Project has already been approved by the Government and is moving toward the implementation. From the point of view to create a compact city, land use and site layout plan of HHTP is planned rather at low density, with key facilities and land use dispersed in the larger area. In order to create a compact city, the existing HHTP plan should be coordinated with the urban structure of the M/P. For example, it is required to coordinate and review arterial roads in HHTP so as to link, linkages with VNU, especially in terms of a facility layout plan and relationship with surrounding areas such as the urban center and Phu Cat area.

The two residential zones in HHTP are planned for a staff housing of HHTP development. Each of them is planned as independent neighborhood units.

(4) Dong Xuan Area

The most important issue of the residential zone is to provide the convenient and comfortable living environment for residents. In Dong Xuan area, the residential zone adjacent to the urban center should be developed in the first. Unlike the other areas, all of the Dong Xuan area is planned as a residential zone. The residential zone in the area forms rather a narrow shape along NR21A, the south Hoa Lac center is provided to serve the southern part of the residential area.

(5) Phu Cat Area

Phu Cat area has many urban functions such as industrial, recreational and residential zones. It is appropriate to develop the industrial zone along NR 21 Bypass in consideration of the land use. It is planned that the eastern part of Phu Cat area is the industrial zone, and the western part is the residential zone. On the phased development principle for Phu Cat area, the development should be spread out from

the urban center to the south. The south center is established along NR21A for the southern residential zone, which is planned to be developed in Phase-2.

(6) Xuan Mai Area

The Xuan Mai center is planned to be established in the northwest corner of the intersection of NR21A and NR6. North of NR6 is planned for the residential zone, and south is the industrial zone. The residential zone should be developed in accordance with the distribution of the population framework, and the principle of residential development direction is from the southeast to the northwest as a whole.

Because more than half of the residential zones in Xuan Mai area are categorized as a Type 2 neighborhood unit, which includes existing villages, it is required to develop such residential zones from the early phase. The model project for the Type-2 neighborhood unit development would be required for Xuan Mai, with the development of a residential zone in Type 2 neighborhood unit under the initiative of Ha Tay Province and other local governments. The development of the industrial zone spreads out from NR 21A to the west and south.

HOA LAC AND XUAN MAI URBAN DEVELOPMENT MASTER PLAN

PHASE : 1A

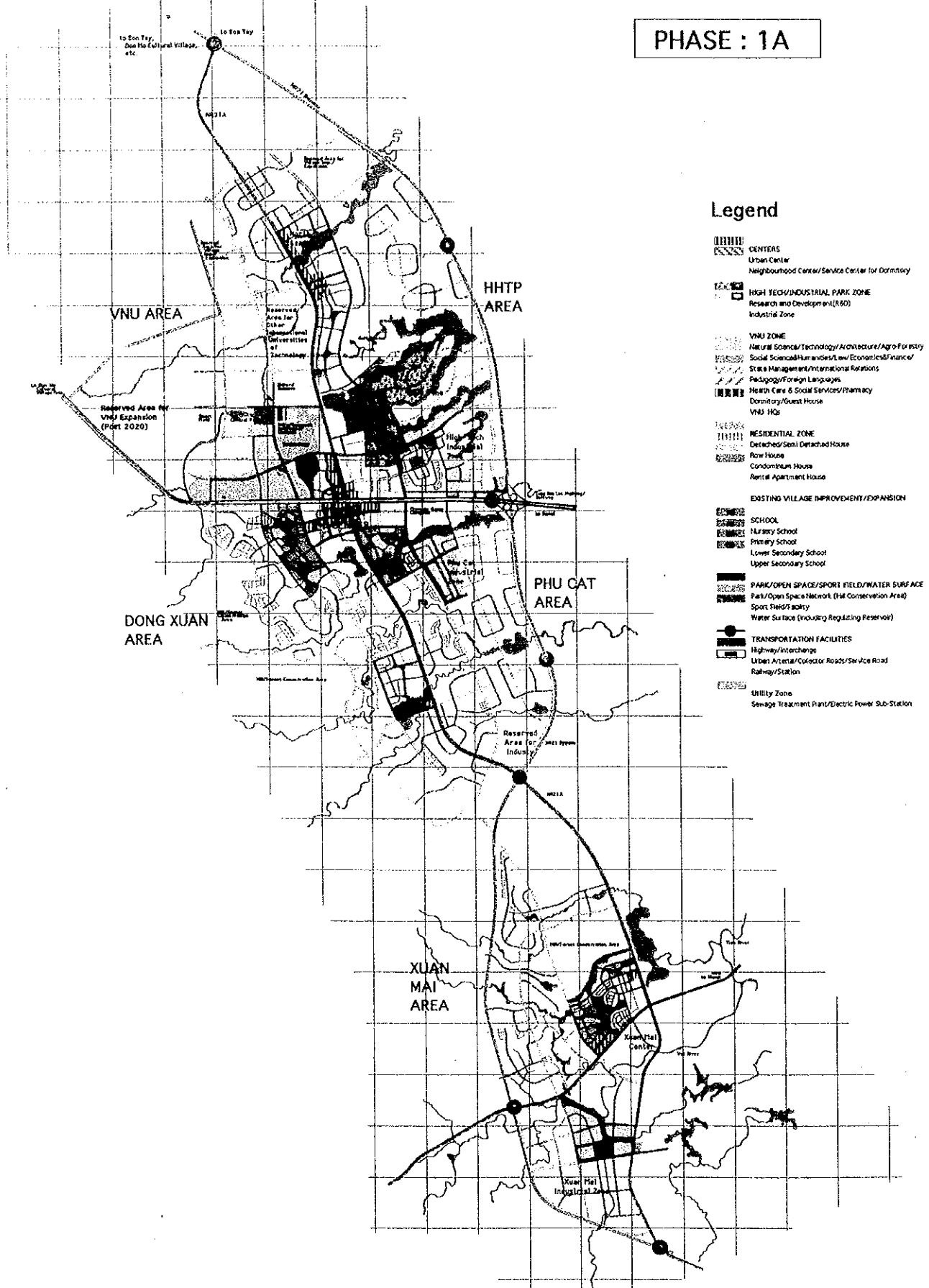


Figure 4.8.1 Hoa Lac and Xuan Mai Urban Development Master Plan: Phase-1A

HOA LAC AND XUAN MAI URBAN DEVELOPMENT MASTER PLAN

PHASE : 1B

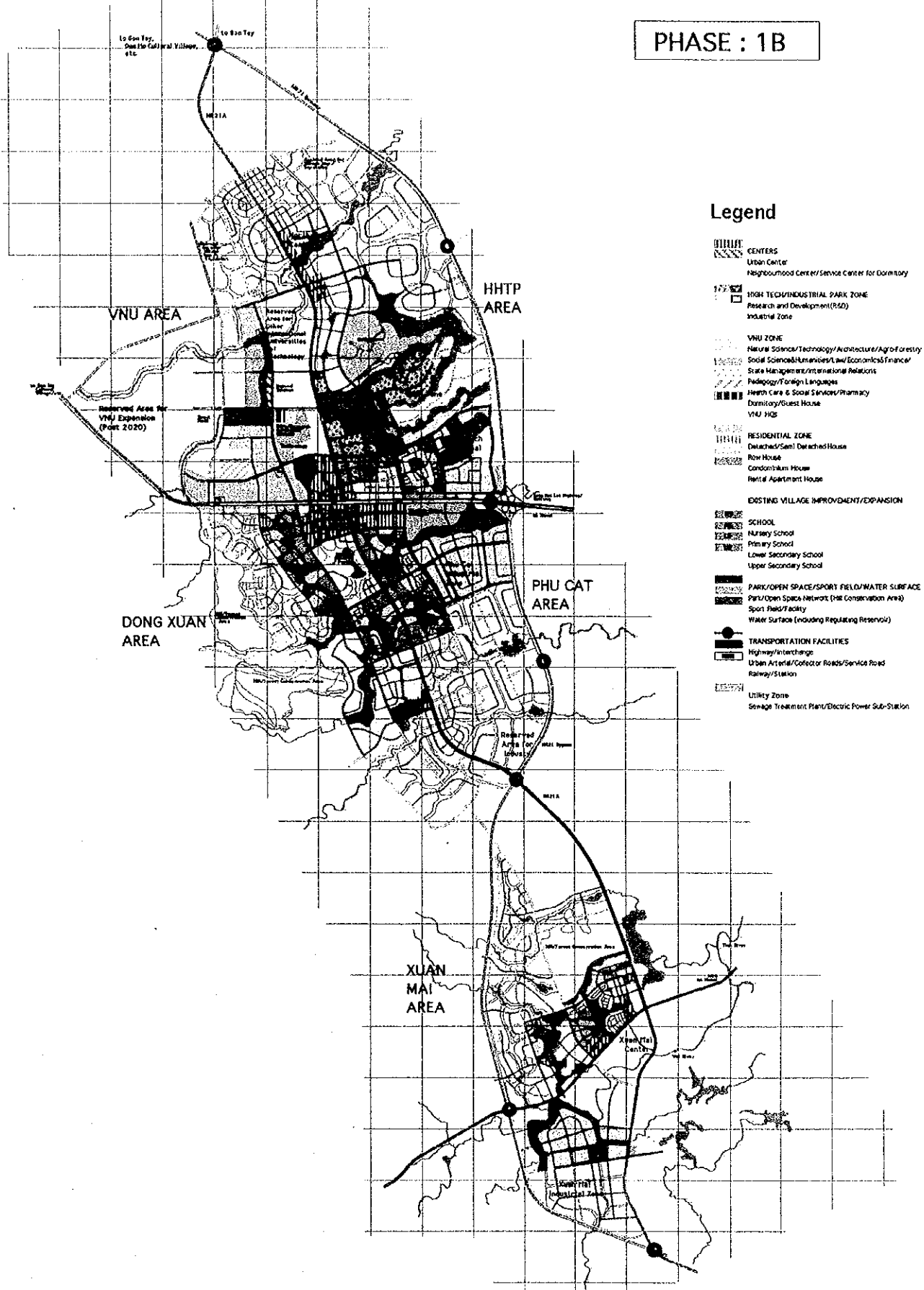


Figure 4.8.2 Hoa Lac and Xuan Mai Urban Development Master Plan: Phase-1B

HOA LAC AND XUAN MAI URBAN DEVELOPMENT MASTER PLAN

PHASE 2

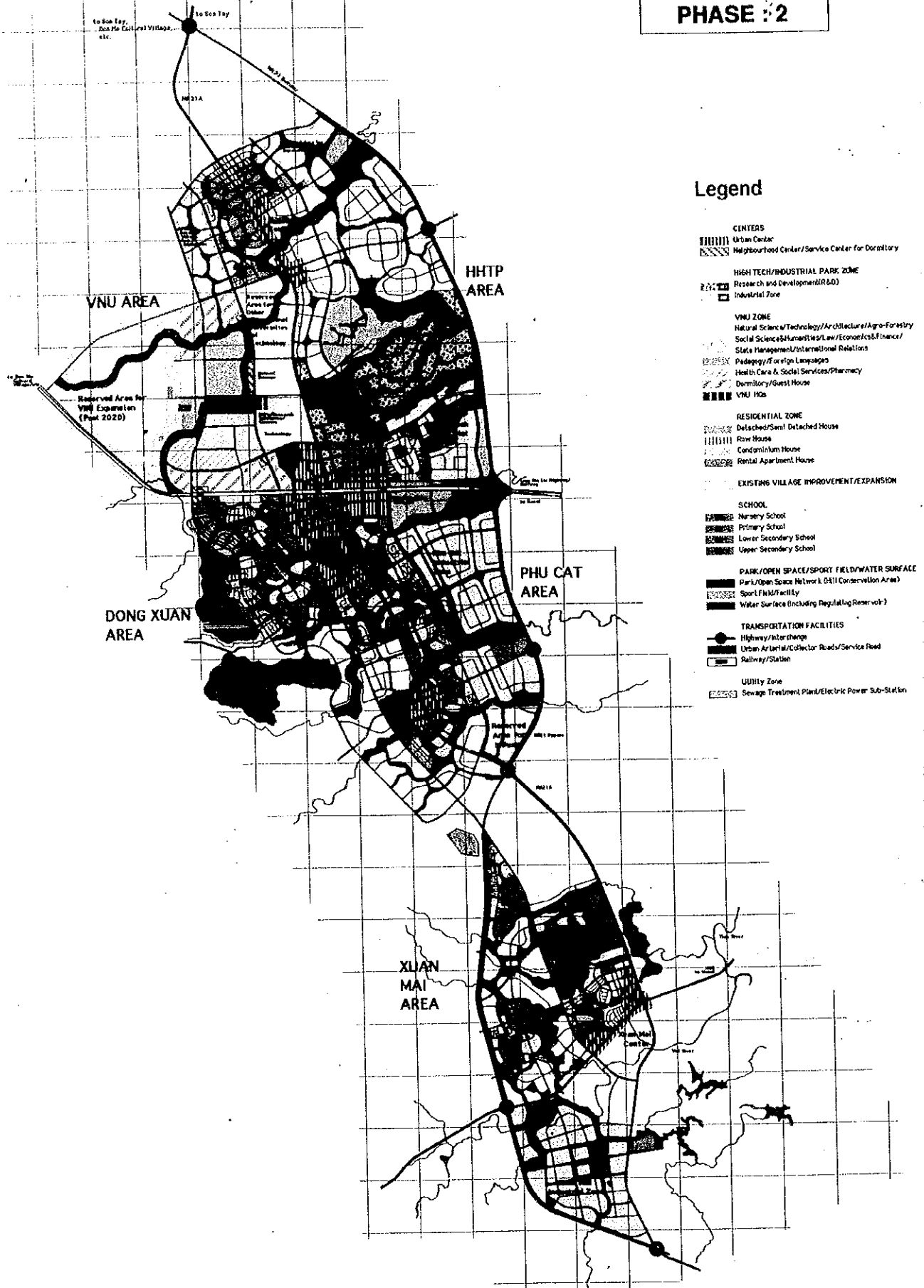
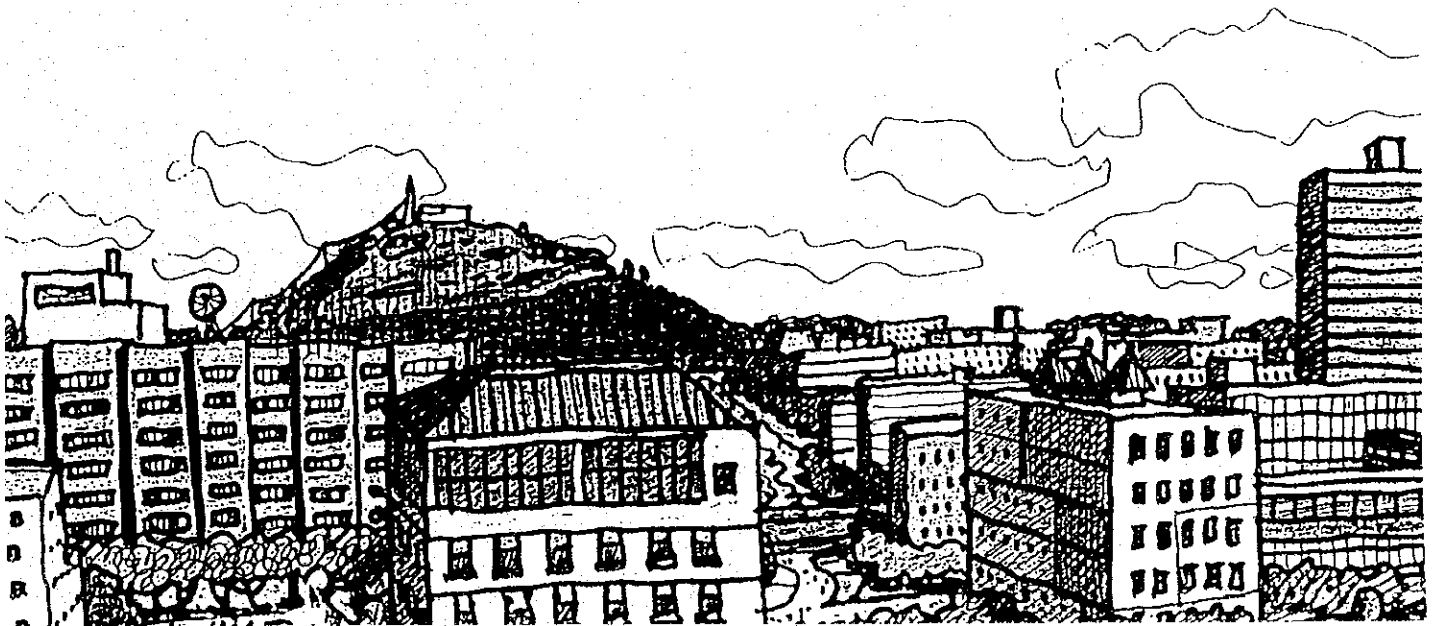


Figure 4.8.3 Hoa Lac and Xuan Mai Urban Development Master Plan: Phase-2

CHAPTER 5

LAND USE, FACILITY, AND PHASED DEVELOPMENT PLAN FOR HOA LAC AND XUAN MAI URBAN DEVELOPMENT





CHAPTER 5 Land Use, Facility, and Phased Development Plan for Hoa Lac and Xuan Mai Urban Development

Hoa Lac and Xuan Mai Urban Development Area is divided into the following six areas. Land use, facility plan, and phased development plan of each area are compiled in this chapter.

- (a) Urban Center Area
- (b) VNU Area
- (c) HHTP Area
- (d) Dong Xuan Area
- (e) Phu Cat Area
- (f) Xuan Mai Area

5.1 Urban Center Area

5.1.1 Land Use and Facility Layout

The Urban Center Area consists of NW Area (the side of VNU Area) of 64 ha, NE Area (the side of HHTP Area) of 23.5 ha, SW Area (the side of Dong Xuan Area) 131 ha, SE Area (the side of Phu Cat Area) of 45 ha, which totals to 263.5 ha. The gross area including the part of NR21A and the Lang-Hoa Lac Highway totals to approximately 320 ha.

The commercial and civic centers occupy the largest space in Dong Xuan Area, which are the major functions of ordinary urban centers. It is intended to create the attractive Urban Center different from ordinary ones by attaching diverse functions distinctive in each constituent Area as above mentioned. Also, the small hills existing in the NW Area and the SW Area are linked each other with a wider green belt, thus introducing the natural environment in the Urban Center to fit the garden city.

It is envisaged that mass transit system (MRT) will be introduced by 2020 to link the Central Hanoi and Hoa Lac. Until then, a bus transport system will be the mode of main public transport, and to facilitate the bus system, the Lang-Hoa Lac Highway as well as NR21 A will be expanded to accommodate exclusive bus lanes. The MRT is to be grade separated at the underground level in the Urban Center Area, and the central bus terminal is provided adjacent to NR21A and the MRT station in the part of the NW and SW Area.

The commercial zone is provided along NR21A, and in the west of it is the SW. The cultural, educational and health care zone is provided in the western perimeter of the Urban Center Area, which is linked to the cultural facilities to be provided in the NW.

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In the north-western corner of the SE area, opposite to the Dong Xuan Area, the amenity and commercial zone is provided along NR21A, and in the east of it, the sports and recreational zone is provided. Also, adjacent to the sports and recreational zone is the Olympic Game Complex outside the Urban Center that will be the Mecca of national and international sports events.

The western half of the NW area is a large-scale parks and open space with the small hill (103 m altitude) from which the whole Hoa Lac area can be viewed. The hill is to be developed in Phase-1A by providing an observation facility so that visitors can enjoy a panoramic view over the whole Development Area. In the east of the VNU Area is the cultural zone with the facilities open for use of residents such as library, science and technology exchange center, museum, theaters, and so on.

The NE area is used for international exchange as well as business and commercial centers to support the R&D and HRD urban functions in HHTP.

The development of the Urban Center depends on the accumulation of the urban functions that provide diverse and quality services to the residents and visitors as well. The Urban Center also needs to have convenient transport facilities of multiple modes including pedestrians. For the purpose, a grade-separated flyover is provided to NR21A at the intersection with the Lang-Hoa Lac Highway, which is to be conveniently connected to the central transportation terminal (bus terminal and the future MRT station with parking facilities). Elevator and escalator facilities as well as stairs and slopes will be provided at up and down places so that even handicapped persons can easily use the facilities.

In addition, the Urban Center needs to provide a vivacious atmosphere and openness. The public open space network to link the two small hills with the cultural and civic centers alongside can create such atmosphere and openness.

Table 5.1.1 Facility Requirement for the Urban Center Functions

	Phase-1A		Phase-1B		Phase-2	
	Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)
NW Academic & Cultural Center	78,200	15	174,000	31	226,200	36
NE International Exchange Center/ Supporting	36,700	5	61,100	8	237,900	40
SE Recreation Center	15,300	7	23,200	39	47,300	45
SW Civic Center/ Commercial Center	137,100	21	279,700	41	638,500	88
Total	267,300	47	538,000	119	1,149,900	209

Source: JICA Study Team

Table 5.1.2 Detail Facility Requirement for the Urban Center

(1) NW area (VNU side)

Function	Facility	Phase-1A		Phase-1B		Phase-2	
		Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)
VNU extension service	VNU central library	20,000	5.0	20,000	5.0	20,000	5.0
	Science museum	20,000	5.0	20,000	5.0	20,000	5.0
Supporting function of science and technology	Information center for science and technology			20,000	5.0	20,000	5.0
	Rental laboratory			10,000	1.0	20,000	2.0
Exchange function of science and technology	Science and technology exchange center	10,000	1.0	20,000	2.0	40,000	4.0
Supporting function of science and technology	Administrative facilities	15,200	1.5	20,000	2.0	30,200	3.0
Culture	Museum			15,000	3.0	15,000	3.0
	Art museum			10,000	1.5	10,000	1.5
	Theatre			20,000	3.0	20,000	3.0
	Concert hall					10,000	1.0
	Cultural center	10,000	2.0	10,000	2.0	10,000	2.0
	Exhibition hall			5,000	1.0	5,000	1.0
Commercial and business services	Shopping facility, office, service shop	3,000	0.3	4,000	0.4	6,000	0.6
Street and open space			3.7		7.7		9.0
Total		78,200	14.8	174,000	30.9	226,200	36.1

(2) HHTP Zone

Function	Facility	Phase-1A		Phase-1B		Phase-2	
		Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)
International Exchange	International conference hall					15,000	3.0
	International exhibition hall					50,000	10.0
	Event hall					15,000	3.0
	Convention hotel					10,000	1.0
	World trade center					50,000	5.0
Supporting function of science and technology	Business center and office	36,000	3.6	60,000	6.0	96,000	9.6
Commercial and business services	Shopping facility, office, service shop	700	0.1	1,100	0.2	1,900	0.4
Street and open space			0.9		1.6		8.0
Total		36,700	4.6	61,100	7.8	237,900	40.0

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(3) Don Xuan Zone

Function	Facility	Phase-1A		Phase-1B		Phase-2	
		Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)
Civic center	Central, provincial, and local government offices	108,000	10.8	156,000	15.6	300,000	30.0
Commercial	Sells facility	54,000	5.4	78,000	7.8	150,000	15.0
	Restaurant	16,200	1.6	23,400	2.3	45,000	4.5
	Open market		1.0		1.5		2.0
Supporting for urban business	Bank/insurance/real estate business offices	72,000	10.8	104,000	15.6	200,000	30.0
Accommodation and exchange	City hotel, inn, and other	5,000	0.5	10,000	1.0	20,000	2.0
Education and training	Vocational school and cultural school	10,000	1.0	15,000	1.5	30,000	3.0
Cultural	Central library			5,000	0.5	5,000	0.5
	Exhibition center	5,000	0.5	5,000	0.5	10,000	1.0
	Cultural center for children			5,000	1.5	10,000	2.0
	Theater, cinema and gallery	10,000	1.0	15,000	1.5	30,000	3.0
	Sports club	5,000	0.5	5,000	0.5	10,000	1.0
Amusement	Amusement center	5,000	0.5	5,000	0.5	10,000	1.0
Medical/social welfare	General hospital	4,000	0.8	4,000	0.8	8,000	1.6
	Clinic	4,000	0.8	4,000	0.8	8,000	1.6
Transportation terminal	Multiple transportation terminal		1.0		1.5		2.0
Street and open space			9.1		13.4		25.1
Total		298,200	45.3	434,400	66.8	836,000	125.3

(4) Phu Cat Zone

Function	Facility	Phase-1A		Phase-1B		Phase-2	
		Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)	Floor (sq. m)	Site (ha)
Recreation	Theme park				20.0		20.0
	Amusement park		3.0		3.0		5.0
	Circus		1.0		1.0		1.0
	Zoo/Botanical garden				5.0		5.0
	Theatre/cinema	10,000	1.0	15,000	1.5	30,000	3.0
	Bowling/play ground	5,000	0.5	7,500	0.8	15,000	1.5
Commercial and business services	Shopping facility, office, restaurant, service shop	300	0.1	700	0.1	2,300	0.4
Street and open space			1.4		7.9		9.0
Total		15,300	7.0	23,200	39.3	47,300	44.9

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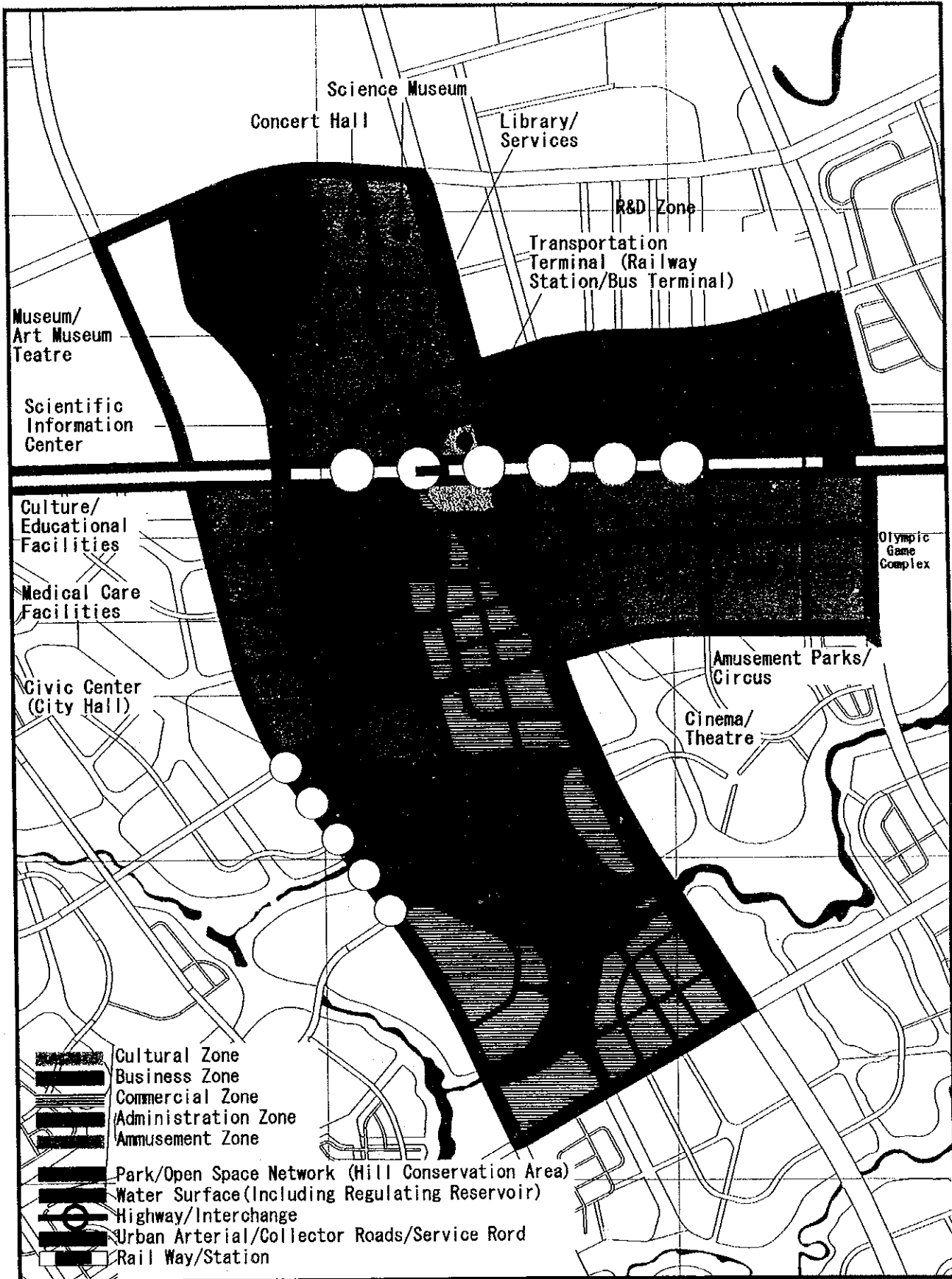


Figure 5.1.1 Urban Center Facility Layout Plan

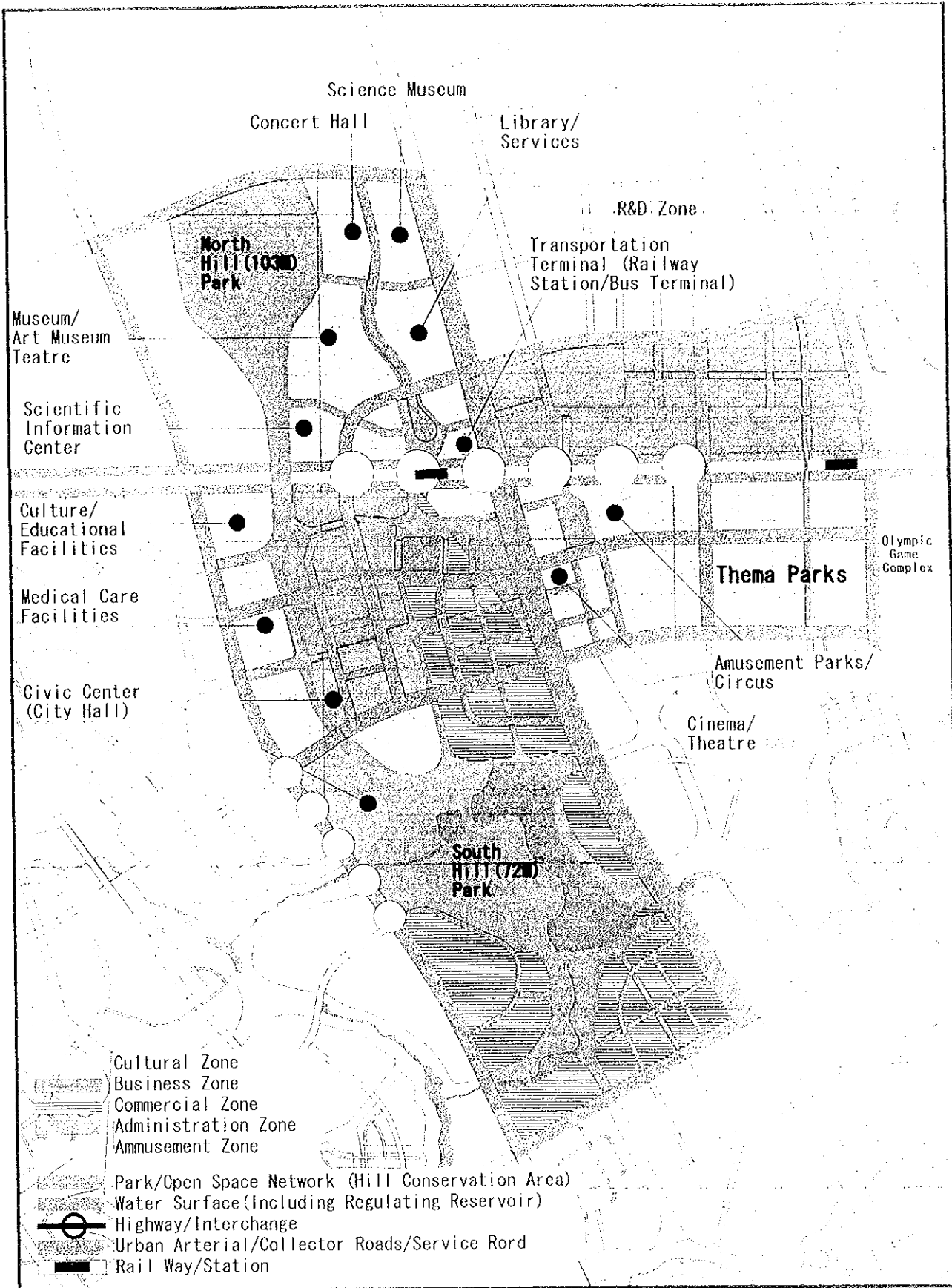


Figure 5.1.1 Urban Center Facility Layout Plan