

## 6 HANOI'S ROLE IN THE REGION

### Main Issues

6.1 Hanoi's urban development must be an integral part of the national urban policy and regional development framework. This requires existing policies and plans relating to Hanoi's urban development to be reviewed in order to come up with appropriate recommendations on the development direction Hanoi should take. However, an effective coordination mechanism for regional planning and development in Vietnam is yet to be established. Existing regional plans, such as the Red River delta plan<sup>1</sup>, the Northern Focal Economic Zone plan<sup>2</sup>, and the Hanoi metropolitan area plan<sup>3</sup>, as well as the regional transport master plan<sup>4</sup> provide orientations for different target areas and scope.

6.2 The main issues in regional development are summarized as follows:

- (1) **Widening Inequalities:** Most provinces, besides the provinces of Hanoi and Hai Phong in particular, are still at a low development level, and their focus is primarily still on agriculture. The gaps in socioeconomic development as well as in the gross domestic product (GDP) shares among provinces are still high. The regional imbalance has resulted in the underutilization of the region's potential and competitive advantages.
- (2) **Land Use:** As urbanization makes progress, agricultural land has become marginalized in favor of industrial zones and other development uses. This is particularly seen in the more urbanized areas of Hanoi and Hai Phong. Meanwhile, the land fund is often not effectively used to develop infrastructure, and compensations for land clearance is still low.
- (3) **Environment:** High urbanization and, consequently, the increasing number of in-migrants amplify urban management problems. Industrial and traffic pollution has become severe in many areas. Air quality and water pollution in urban areas and industrial zones have worsened. Most urban areas have insufficient and ineffective sewerage and drainage systems, causing health problems and environmental degradation. Flooding and water shortages are also the other effects of urbanization.
- (4) **Economy:** Despite structural changes in the economy, Hanoi region's competitiveness has been relatively slow in improving. It still has low investment attraction compared with HCMC. Probable reasons for this are poor technology and low labor skills, unfavorable investment environment, long procedures for investing, and high production costs.
- (5) **Transportation and Infrastructure:** Road density in the Red River delta is low. The development of the road network is not coherent with rapid urbanization growth, with a number of sections unevenly distributed and in poor condition, particularly in rural areas. Infrastructure development has not followed the increasing demand caused by the fast development and urbanization rate. The provision of electricity, clean water, and sanitation is improving albeit at a medium pace, with many areas still not properly connected.
- (6) **Planning:** Hanoi experiences problems as a result of the lack of coordinated planning and regional integration, which is rooted in the lack of, and unreliable, information base, as well as on sectoral instead of comprehensive planning and a slow shift to market economy.

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<sup>1</sup> Covers nine provinces with an area of 12,632km<sup>2</sup> and a population of 15.4 million. Prepared by MPI.

<sup>2</sup> Covers eight provinces with an area of 15,287km<sup>2</sup> and a population of 13.2 million. Prepared by MPI.

<sup>3</sup> Covers Hanoi City and eight surrounding provinces with an area of 13,379km<sup>2</sup> and a population of 12 million. Being prepared by MOC.

<sup>4</sup> Covers the entire northern region. Prepared by MOT.

## National Urban Policy: Comprehensive Poverty Reduction and Growth Strategy

6.3 The 2002 Comprehensive Poverty Reduction and Growth Strategy (CPRGS) is an action plan for poverty reduction, translating the government's socio-economic development strategies and plans, as well as other sectoral development plans, into a concrete implementation agenda. On the other hand, the national annual socio-economic development plan brings policies and measures contained in the CPRGS into practice.

6.4 The overall objective of the Socio-economic Development Plan up to 2010 is to bring Vietnam out of the state of underdevelopment with the following goals: improving people's material, cultural, and spiritual lives; transforming the country into a modern and industrialized country by 2020; improving human resources, scientific/technological capacities, infrastructure, the economy, defense and security; establishing institutions for a socialist-oriented market economy; and, heightening Vietnam's role in the international arena.

### Aims of Existing Regional Plans

6.5 These plans aim to promote economic growth by developing the industrial and services sectors, providing efficient infrastructures and a conducive investment environment for foreign and domestic investors, reducing poverty and narrowing gaps in living standards, and promoting environmentally sustainable development. Study areas are expected to increase to a combined population of 27.7 million by 2020, of which 37% will be urban. GDP will also increase by 9.7% a year and per capita GDP will be VND 25.2 million or US\$ 1,600. Poverty rates are expected to be minimal (see Table 6.1).

**Table 6.1 Orientation of the HMA Plan**

Sector	Major Development Direction			
Regional Development	<ul style="list-style-type: none"> <li>To develop HMA with a multi-center structure, where Hanoi and its satellite cities in adjoining provinces are better interconnected, and to reverse the current concentration in the core city and put more emphasis on medium-size cities.</li> <li>To establish an institutional framework for effective management and administration.</li> </ul>			
	Indicator	2005	2010	2020
	Population (million)	12.05	13.2-13.5	14.5-15.0
	Urban population (million)	2.8	3.9-4.2	7.9-8.5
	Urbanization rate	23.2	30-32	55-63
Economy	<ul style="list-style-type: none"> <li>To develop economic growth corridors, comprising the two east-west corridors (Kunming - Ha Long and Hanoi - Hai Phong), a ring growth corridor, and two supporting corridors</li> <li>To promote an integrated industrial-agricultural development, with small industrial clusters to generate job opportunities and diversify products of the region.</li> </ul>			
	Indicator	2005	2010	2020
	GRDP growth rate (%/yr)	-	10.7	10.5
	Structure of GRDP (pri/sec/ter)	17/ 39 / 44	11/ 46 / 43	6 / 51/ 43
	Per capita GRDP (US\$)	574	1,130	2,570
	Employment (mil)	6.82	7.51	8.46
Social and Environment	<ul style="list-style-type: none"> <li>To establish a triangle zone of education comprising Hanoi - Hai Phong - Nam Dinh to provide human resources for the country and the region. Many universities, especially new ones, will be relocated to outer areas such as Hoa Lac and along Bat Thang Long - Noi Bai - Soc Son, NH18, and Pho Noi- Yen My (Hung Yen) corridors.</li> <li>To manage environment in terms of solid waste treatment plants, cemeteries, water sources, power supply; and to regulate the river system in the region.</li> <li>To develop first-class health care centers in Hoa Lac and Hai Duong, etc., in order to share the load of central hospitals in Hanoi.</li> </ul>			

Source: Summary of Draft Final Report of the Study on Hanoi Metropolitan Area Master Plan.

## Proposed Regional Development Orientation

6.6 In coordination with ongoing planning activities of MOC, the development direction for the region was formulated (see Table 6.2), comprising the following strategies:

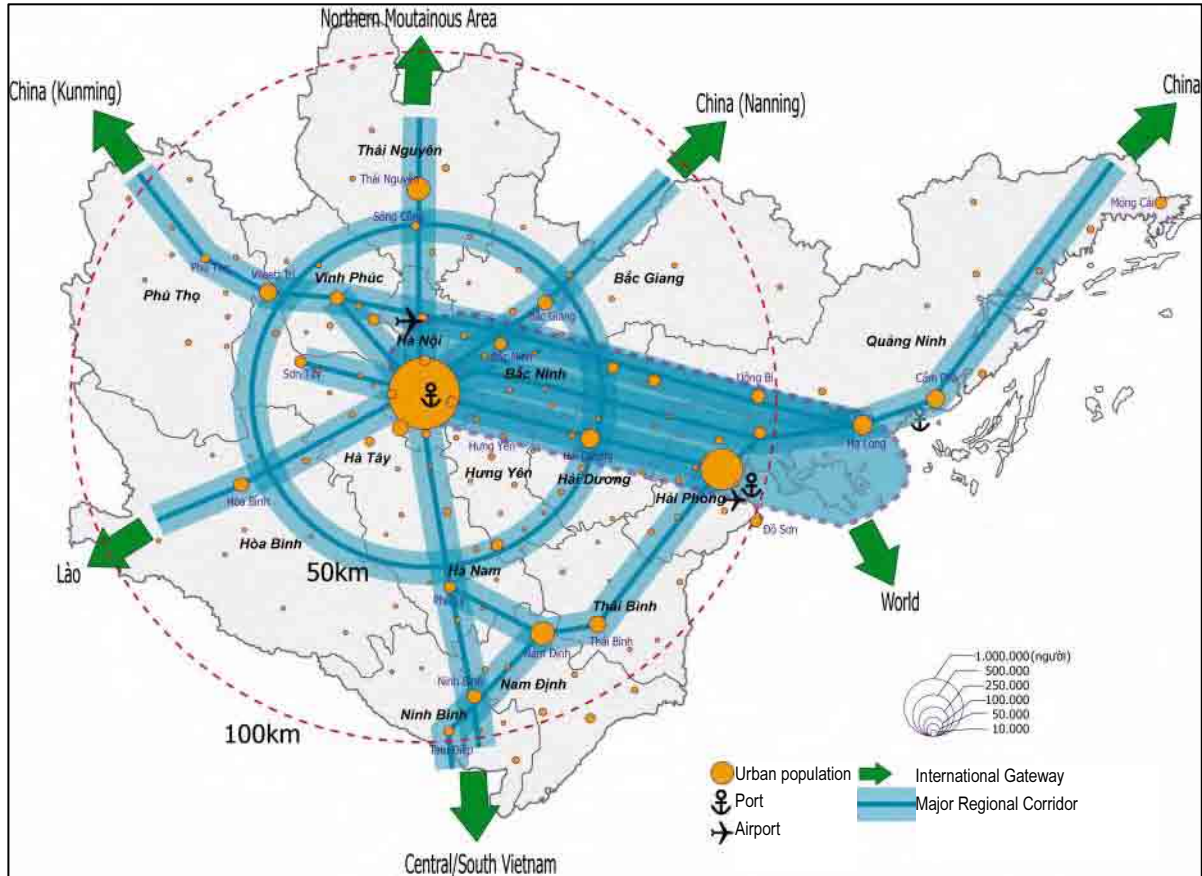
- (1) **Regional Coordination and Integration:** Provinces in the northern region are not effectively connected due to inadequate infrastructure and the presence of institutional barriers which have discouraged interprovincial transportation in the past. Since most of the provinces rely on international trade through limited gateways, such as Haiphong, Quang Ninh, and other border provinces, and must provide competitive and attractive investment environment, they must be integrated to synergize their strength and resources as well as contribute in lessening interprovincial inequality.
- (2) **Establishment and Development of Growth Corridors:** To strengthen regional integration and coordination at the regional and international levels, a corridor approach is considered appropriate. Seven corridors, comprising six radial corridors to/from Hanoi and a coastal corridor, were identified for which infrastructure improvement and incentives for development are provided.
- (3) **Strategic Transportation System Development and Market Integration:** The northern region's economic growth owes a lot to foreign investments and trade. Hence, the Hanoi-Haiphong/Ha Long corridor must be strengthened by: (i) expanding transportation capacity of ports, roads, and other modes; (ii) reducing travel time; and (iii) improving logistics services. The provision of a strategic transportation system along the corridor will promote the integration of industries with the international market.
- (4) **Urban Development and Strengthening of Urban-Rural Linkages:** Along the corridors, urban centers must be developed to lessen the load on Hanoi and promote balanced regional development. The development of access roads to link rural areas with urban growth centers is expected to contribute to the growth of rural areas.
- (5) **Promotion of Effective Land Use and Environmental Management and Promotion of Social and Cultural Integration and Development:** Land use in the region must be clearly classified by defining lands for preservation and development to ensure environmental sustainability and to promote socio-cultural growth wherein developments are concentrated along the corridors.
- (6) **Strengthening of Regional Development Administration Capacities:** The region's future growth and sustainable development can be achieved by addressing various issues from the perspective of an integrated region. For this, the management capacities of provinces must be strengthened and a coordination mechanism among them must be established.

## Development Strategies and Priority Projects

6.7 On the basis of the above, development strategies and actions were formulated as shown in Table 6.2. The priority projects are identified as follows:

- (i) Development of globally competitive strategic growth corridors
- (ii) Cross-border regional development
- (iii) Establishment of coordinated regional investment promotion program and one-stop center
- (iv) Establishment of regional planning database and information system
- (v) Establishment of regional coordinating councils among provinces

**Figure 6.1 Development of Growth Corridors**



Source: HAIDEP Study Team.

**Table 6.2 Proposed Regional Development Strategies and Actions**

Strategy	Action	Monitoring Indicator
A1 Update regional development strategies	A11 Complete coordinated and integrated/ coordinated regional development plans A12 Establish practical implementation mechanism including wider practices of PPP and PFI schemes A13 Identify and implement coordinated/integrated regional development projects	<ul style="list-style-type: none"> <li>Understanding and consensus among stakeholders on plans/strategies</li> <li>Project progress</li> </ul>
A2 Develop growth corridor with global competitiveness	A21 Develop high-quality transportation/logistics corridor along Vin Phuc – Hanoi – Hai Phong / Quang Ninh A22 Develop urban areas and attractive industrial zones provided with competitive services A23 Establish conducive investment environment to encourage FDIs	<ul style="list-style-type: none"> <li>Project progress</li> <li>Amount of investments made in the corridor</li> <li>Satisfaction of investors</li> <li>Trade volume/value share of the corridor</li> </ul>
A3 Strengthen poverty reduction strategies and expand program	A31 Map and identify poverty in the region A32 Provide effective menus and programs for identified poverty issues A33 Establish coordinated mechanism for effective implementation of poverty reduction program	<ul style="list-style-type: none"> <li>Poverty indicators</li> <li>No. of poverty reduction programs carried out</li> <li>Budget/expenditure for poverty reduction component</li> </ul>
A4 Establish workable regional coordination mechanism	A41 Strengthen coordination on regional development among provincial governments A42 Establish regional development coordinating council comprising provincial government representatives A43 Expand coordination with donors through Urban Forum	<ul style="list-style-type: none"> <li>Progress of institutional arrangements</li> <li>Number / Frequency of meetings</li> </ul>
A5 Strengthen capacities of provincial governments	A51 Establish common information database to aid regional planning and development A52 Establish permanent training system for capacity building of provincial officers under the central government A53 Strengthen planning departments of provincial governments	<ul style="list-style-type: none"> <li>Progress of system design and operation</li> <li>Number of officials trained</li> <li>Number of plans prepared</li> </ul>

Source: HAIDEP Study Team

## 7 FUTURE POPULATION AND URBAN GROWTH MANAGEMENT

### Main Issue

7.1 Population growth in Hanoi is expected to continue long into the future. Hence, the city must be prepared to accommodate the increase in and distribution of the population in the process of development to ensure the city's sustainable development.

### HAIDEP-proposed Population Framework

7.2 Comparing the population framework in the 1998 Master Plan, the HMA plan, and other supplementary analyses, it is the view of the HAIDEP Study Team that Hanoi's total population, including its adjacent integrated urban areas, will be 5.1 million. Since, a sharp population increase in the integrated adjacent urban areas, as assumed in the HMA plan, may not occur, unless good infrastructures, especially transportation facilities, to link them with Hanoi are provided, it was assumed that the 2020 population of the integrated adjacent urban areas could be lesser, at 600,000, and that of Hanoi at 4.5 million (see Table 7.1).

7.3 While the population of Hanoi was estimated to be 4.5 million by 2020, it is very much likely that the population will further increase beyond 2020, because the country's urbanization rate by 2020 is expected to remain low. Moreover, industrialization and economic growth are expected to become more robust. If it is assumed that the population would increase relatively slowly at 2% per year after 2020, Hanoi's population would reach 5.9 million in 2030.

### Population Distribution

7.4 Based on the future growth scenario and development directions, the future population distribution was estimated. The urban population of 4.5 million would be distributed in urban development promotion areas (UDAs) within the urban growth boundaries of Hanoi City and adjacent urban areas. Rural population would be distributed outside the growth boundary based on the current distribution except for the area outside of the dyke<sup>1</sup> in the urban core (see Figure 7.1).

7.5 Accordingly, urban population in the urban core will decrease to 0.75 million or by 0.8 times by 2020. With a population density of 250 persons/ha, living conditions in the urban core is expected to improve. In the urban fringe, the population will continue to increase. In Thanh Xuan and Cau Giay districts, the population density is expected to reach 200 and 180 persons/ha, respectively, and then population increase will slow down. On the other hand, the population of Long Bien and Hoang Mai districts, owing to their large development potentials, will increase at an annual growth rate of more than 4.5%.

7.6 In suburban areas, Tu Liem will absorb a significant volume of the population, about 0.63 million, while urbanization in Thanh Tri District outside the urban growth boundary will be restricted. In Dong Anh District, the population will increase at a growth rate of 6.6% much higher than the current one of 1.4% for the 1999-2003 period, as major infrastructures, especially key railway sections and primary roads, are planned for development.

7.7 In adjacent urban areas, the population was estimated based on the HMA forecast and current trend. There are five existing urban areas in Ha Tay, Vinh Phuc, Bac Ninh, and Hung Yen provinces in 2003, which are directly connected with Hanoi City. Moreover, there will be two urban areas to be developed by 2020, namely An Khanh in Ha Tay Province and Me Linh in Vinh Phuc Province. As a result, there will be seven adjacent urban areas to Hanoi.

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<sup>1</sup> The area between the dyke and the Red River is designated as outside of the UDA. It was assumed that 30% of this area's population would be relocated by 2020, particularly those living in parts vulnerable to flooding.

**Table 7.1 Future (2020) Population of Hanoi and Integrated Areas**

		1998 MP	HMA Plan	Trend	Proposed
Hanoi	Urban	2,800 <sup>2)</sup>	3,700 <sup>4)</sup>	4,000 <sup>2)</sup>	3,900 <sup>2)</sup>
	Rural	1,100	600 <sup>3)</sup>	800	600
	Total	3,900	4,300	4,800	4,500
Adjacent Areas <sup>1)</sup>		n.a.	800	300	600
Total (Hanoi's Adjacent Areas)		n.a.	5,100	5,100	5,100

Source: HAIDEP Study Team

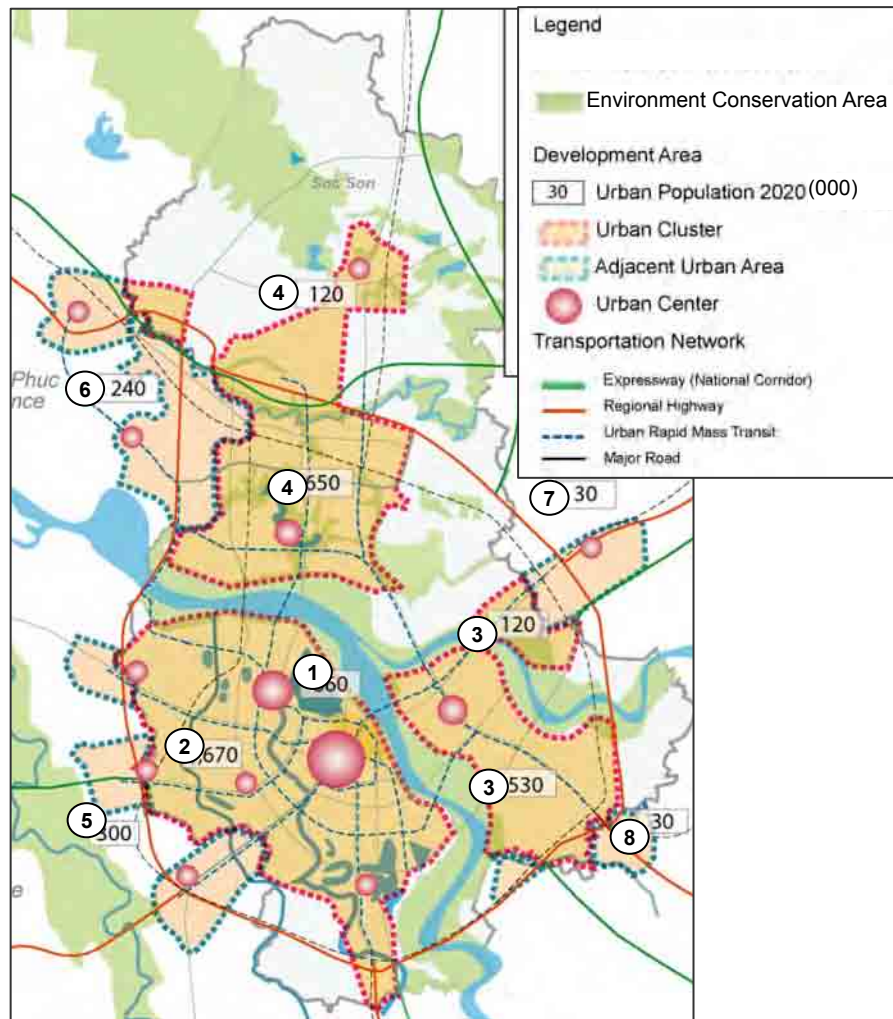
1) Including Ha Dong, Tram Troi, and An Khanh in Ha Tay Province; Phuc Yen and Me Linh in Vinh Phuc Province; Tu Son in Bac Ninh Province; and Nhu Quynh in Hung Yen Province.

2) Including Soc Son.

3) Rural population by 2020 was estimated based on the 2010 figure, which was calculated based on the total population of Hanoi City forecasted in the SEDP 2006-2010.

4) The HMA Development Plan of MOC (2005) estimated that the population growth of Hanoi between 2003 and 2020 would be 1.9 million comprising natural growth and migration on top of the existing 1.8 million as of 2003.

**Figure 7.1 Future Population in Urban Areas of Hanoi and Adjoining Provinces**



	Cluster		Population Density		
			000	%	no/ha
Hanoi City	(1)	Central Area	860	22	225
	(2)	West of Red River	1670	42	119
	(3)	East of Red River	650	16	72
	(4)	North of Red River	770	20	62
	Total		3950	100	100
Adjacent Urban Areas	(5)	Ha Tay Province	300	-	215
	(6)	Vinh Phuc Province	240	-	59
	(7)	Bac Ninh Province	30	-	30
	(8)	Hung Yen Province	30	-	23
	Total		600	-	166

1) UDA = Urban development promotion area.

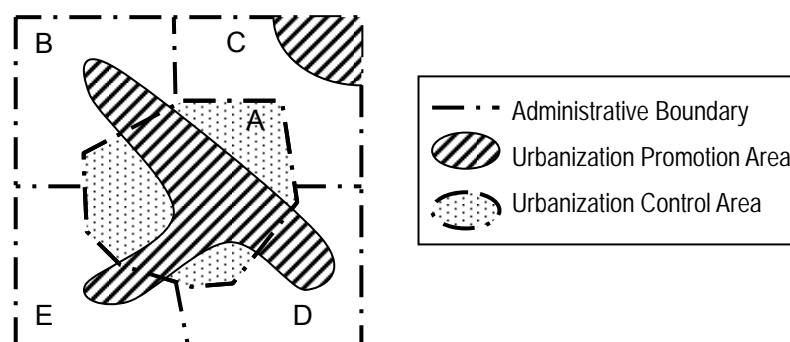
Source: HAIDEP Study Team

## An Approach to Growth Management

7.8 The growth management strategies adopted by HAIDEP are as follows:

- (1) **Introduction of Urban Growth Boundary:** In many cities, a system of urban growth boundary (UGB) is practiced to stop the sprawl of urban areas, protect conservation areas (eg green spaces and prime agricultural lands), and promote the development of efficient urban areas with adequate infrastructure. With this, limited public investments can be more effectively used to promote more efficient land use (see Figure 7.2).
  - (a) **City Planning Boundary:** Boundary within which planning must be made and includes rural areas. For Hanoi, it may be the same as the administrative boundary, although it is preferable that the urban areas of adjoining provinces are included.
  - (b) **Urban Growth Boundary:** Covers areas which will become urbanized within 10 - 15 years. The boundary must be reviewed, say, every 5 years to match development needs. For Hanoi, this is similar to the currently practiced urban area boundary. Areas within the urban growth boundary are called urbanization promotion areas where infrastructure provision is prioritized. Appropriate institutional measures are provided to promote planned development including land-use conversion, the adjustment of various rights, and the facilitation of development procedures, among others.
  - (c) **Urban Development Control Area:** Areas outside the urbanization promotion areas are called urbanization control areas. Development activities are controlled and guided more strictly to comply with the urban master plan, although public investments will be allotted for environmental and infrastructure improvements in rural areas and villages.
- (2) **Integration of Transportation and Urban Development:** A transportation network, including roads, rail, inland waterway, and air, is key to the effective integration of the region as well as urban areas within the city and determines the basic urban structure of an area. Hence, it should be planned in a way that it effectively and efficiently promotes the planned urban growth. Although each mode has its own role in the hierarchy, roads are the most crucial.
- (3) **Creation of Urban and Activity Centers:** The urban structure is also determined by a combination of major activity centers, such as commercial centers, industrial estates, government center, and other special centers such as university complexes, medical centers, high-tech parks, sports center, etc., of which modern and competitive commercial centers and industrial estates/ zones are the most important for promoting growth and generating employment.

Figure 7.2 Concept of Urban Growth Boundary



Source: HAIDEP Study Team



## Urban Growth Management Strategies

7.9 Growth management for Hanoi must be attended to both at the regional and city levels. At the regional level, it is particularly important to structure and manage urban areas within a 30-50km range of Hanoi. Sharing of functions among Hanoi, related satellite cities, and urban areas could lessen the excessive load on Hanoi and enhance the synergy of an integrated metropolitan area. At the city level, the introduction of mass transit systems and integrated urban development, including the development of new subcenters, will determine the future urban structure and transform the urban areas served by multiple centers. The proposed orientation to promote effective urban growth management is explained in Table 7.2.

**Table 7.2 Proposed Urban Growth Management Strategies and Actions**

Strategy	Action	Monitoring Indicator
B1 Establish metropolitan growth and development strategies for areas within 30-50km radius of Hanoi	B11 Complete a coordinated and integrated metropolitan development plan for areas within 30-50 km radius B12 Establish interjurisdictional coordination mechanism B13 Develop corridors by integrating all aspects including socio-economy, land use, infrastructure, etc.	<ul style="list-style-type: none"> <li>• Progress of plan preparation and consensus on the plan</li> <li>• Establishment of organizations/institutions</li> </ul>
B2 Establish strategies for mass transit-oriented urban development	B21 Develop concrete physical and institutional concepts of TOD (transit-oriented development) in Vietnam's context B22 Establish a preparatory unit to promote TOD in Hanoi B23 Implement pilot projects to concretize development mechanism	<ul style="list-style-type: none"> <li>• Development of plans and institutions</li> <li>• Length of mass transit lines</li> </ul>
B3 Develop competitive subcenters	B31 Develop concrete concept and strategies for subcenter development B32 Identify projects and establish specific project management units for project implementation B33 Implement pilot projects to concretize development mechanism	<ul style="list-style-type: none"> <li>• Understanding of strategy</li> <li>• Establishment of project implementation organization</li> <li>• Development of subcenters</li> <li>• Location of enterprises and size of workforce</li> </ul>
B4 Upgrade/Redevelop existing urban areas	B41 Diagnose existing conditions, problems and formulate improvement plans and strategies B42 Establish concrete mechanisms to upgrade existing urban areas including Ancient Quarter, French Quarter, outside-of-dyke areas, public housing areas, urban villages, etc. B43 Implement pilot projects to concretize development mechanism	<ul style="list-style-type: none"> <li>• Progress of institutional arrangements including preparation of plans/guidelines</li> <li>• Establishment of project implementation organization</li> <li>• Beneficiaries due to improvement/redevelopment</li> </ul>

Source: HAIDEP Study Team

7.10 Based on the above, the priority actions identified are as follows:

- (i) Establishment of development and growth strategies for key urban corridors integrated with UMRT
- (ii) Integrated development of UMRT stations/terminals
- (iii) Conservation and sustainable development of new CBD in Dong Anh
- (iv) Establishment of strategies and mechanism for development and rebuilding of existing urban areas
- (v) Establishment of updated strategies and institutional arrangement for redevelopment of outside-of-dyke areas
- (vi) Redevelopment of old public housing areas
- (vii) Establishment of development strategies and mechanism for other identified action areas



## 8 SOCIO-ECONOMIC DEVELOPMENT

### Main Issues

8.1 Although the overall economic growth has been remarkable, the future prospect does not look as bright, unless proper measures are taken immediately to correct the weaknesses that have come to fore in this first stage of Vietnam's economic development. While the initial success has been achieved mainly due to the growth of conventional industries, this will not suffice in the face of economic globalization, especially after Vietnam's accession to the WTO community takes effect. Many industries still have low added value and low productivity. FDI industries lack local supporting industries. Large amounts of consumer goods still depend on imports. Commercial and service sectors are mostly small scale, providing relatively low-quality services. In order for Hanoi City to be a driving force of economic development, the upgrading and expansion of industries and services are needed to meet diversifying market demands. Urban services are still insufficient and living conditions need much improvement. Urban planning and development for the future must be undertaken in a way that socio-economic development is promoted together with spatial and physical development.

### Development Orientations

8.2 **Industry:** Hanoi is now at a crossroad, facing a new challenge in the future of industrial development which has served as the country's engine of growth. As urbanization makes progress and infrastructures in the region are developed, the negative impacts of conventional industries on the environment and the competition from other provinces increased. Further industrial development in Hanoi needs to be pursued under a more strategic role-sharing with adjoining provinces to boost the synergy of an integrated region. While other provinces and cities in the region intend to further promote economic and industrial development, Hanoi must shift to more knowledge-based economic activities to take the lead for the region's economic development. Toward this end, Hanoi's higher education capacity must be strengthened and collaboration with the economic sector needs to be promoted. At the same time, locations for research and development companies must also be provided with quality infrastructures and a conducive investment environment.

8.3 More specific strategies include identifying knowledge-based and high-tech industries in which Hanoi has a competitive edge, promoting diversification of industries to respond to equally diverse urban needs, strengthening the competitiveness of industries in the face of stiff competition from other WTO member-countries through the improvement of infrastructure, human resources and technology as well as institutional reform, further restructuring of SOEs, and support for SMEs as well as the informal sector.

8.4 A spatial development strategy for the locations of industries is becoming critical. This involves two main aspects: one is the relocation of polluting factories from urban areas, and the other is the accommodation of strategic industries targeted for foreign trade. For the former type of industries, adequate sites for relocation must be provided, while taking account of the sustainability of operations. For the latter, industrial estates or zones must be provided along primary transportation corridors, such as NH2, NH18, and NH5, in coordination with other provinces to maintain Vietnam's competitive edge over other countries in the region.

8.5 There is in fact a huge opportunity for this being the capital city where key policy decisions are made. However, in order to achieve this, the development of quality urban centers provided with modern and efficient infrastructure and services is necessary. Moreover, Hanoi must also make available quality housing and better living conditions with necessary

amenities. The strategy to develop the commercial/business sector must be formulated both at the city/region and the community levels in integration with spatial development and land-use orientations. In addition to the Ancient Quarter and the French Quarter, new centers must be developed at the regional and city levels to accommodate future demands in an organized manner. When Hanoi succeeds in revitalizing the Ancient Quarter and the French Quarter, while preserving their cultural value and meeting new development needs, these areas could become globally competitive cultural-cum-commercial/ business centers. An adequate mix of residential function in urban centers is also desirable. At the community level, commercial and business activities must also be promoted in a way that they are integrated with residential areas and other land uses but without causing local traffic congestion and environmental disturbances.

8.6 SMEs and the informal sector play an important role in employment generation and economic development of the city. Moreover, they add value to the socio-cultural scene of Hanoi. While they may transform in many ways as the economy grows, it is crucial to establish a clearer policy on supporting them. Traditional handicraft businesses are one of the important activities which can contribute further to economic development and cultural enhancement of the city. At the same time, they also strengthen urban-rural linkages, benefiting not only craft villages in the rural areas of Hanoi but those in the hinterland provinces, as well.

8.7 **Higher Education:** The higher education sector must be looked into not only from the perspective of boosting research and development, but also from the economic point of view: with more competitive national and regional education facilities, Hanoi can attract more students and brains, which in turn can draw more auxiliary investments and provide a stable pool of quality labor capital that will service other industries and sectors. Since Hanoi is heading toward a knowledge-based economy and industries, the role of higher education must be more clearly defined and the strategy for upgrading its capacity and spatial development must be formulated. At the same time, closer collaboration between the higher education and the industrial sectors must be made to enable the former to contribute concretely to socio-economic development. This can be expected when the former is able to contribute to technological innovations, human resource development, and improved operation and management.

8.8 **Agriculture:** The agricultural sector must be given proper attention in two ways: one is in the provision of guidance and support to shift from traditional agriculture to urban market-oriented cash crops, and the other is in the conversion of agricultural lands. During the process of rapid urbanization, large tracts of agricultural lands must be converted into urban lands. Although the urbanization is an irreversible trend, the process must be properly managed to achieve effective urban development and at the same time to protect the livelihoods and the traditions of farmers and communities in rural areas. To do this, a detailed plan must be prepared involving affected communities in a way that resettlement can be minimized and alternative economic activities can be provided in the same communities. District plans are deemed best suited to attend to such local issues and needs while following the overall orientation of city-level general plans. A comprehensive approach wherein socio-economic and spatial development can be properly integrated is necessary.

8.9 **Tourism:** Tourism is a strategic economic industry in Hanoi. Not only does Hanoi have a variety of unmatched tourism resources; it also serves as a jump-off point or base for tourism destinations in the hinterland, in the north, or elsewhere. Tourism, as a labor-intensive industry, can be developed based on infrastructure that can be shared with other economic industries.

The sector has grown rapidly at a growth rate of 10.7% and 11.9% in terms of international and domestic tourist arrivals in Hanoi, respectively. In 2005 the number of international and domestic tourist arrivals was 1.05 million and 3.6 million, respectively. The contribution to the city's economy was a remarkable VND 6,400 billion (US\$ 400 million) in 2005, accounting for about 10% of the total city GRDP. It is expected that the number of international visitors will increase to 4 million and that of domestic visitors to 19 million in 2020. Considering the high economic growth in the Asian region and the surging interest in Vietnam, the eventual figure may even exceed this forecast. Again, Hanoi must be prepared for such eventuality.

8.10 Hanoi and its hinterland region offer many potential tourism experiences that have the underpinnings of a unique blend of rich culture, colorful history, and diverse nature with four seasons. Stable security conditions further bolster Vietnam's tourism industry. However, many of the region's resources remain largely untapped simply because infrastructure and services are not available. Transportation and accommodations are insufficient and services are yet to be improved. While the northern region as a whole offer a variety of tourism products, due consideration must be given to Hanoi as the most important tourism resource. It is a common observation that large cities, especially capital cities, are tourist destinations in themselves. Thus, tourism development and promotion for Hanoi must be an integral part of urban planning and development, especially in relation to the development strategy of adopting the water-greeneries-culture concept as the physical and cultural backbone for the city's development.

8.11 The requirement for hotel rooms to accommodate the 19 million tourists by 2020 is enormous at 52,700 rooms. This requires additional 32,500 rooms on top of the existing 12,500<sup>1</sup> rooms in Hanoi. Moreover, the quality of the hotel and hotel rooms has to improve. To increase the accommodation capacity, investment incentives must be offered to larger hotels. While guidelines and support measures have to be provided to improve small hotels, providing training to tourism personnel is also necessary. Where these additional hotels and accommodation will be located is an important planning agenda in urban planning and development. The city must thus find adequate locations and provide investment incentives. It is HAIDEP's view that investments must basically gravitate toward the planned green network and special areas such as the Co Loa – Thang Long axis which cover the Red River, Ho Tay, the Ancient Quarter, and the French Quarter.

8.12 The Ancient Quarter and craft villages are two of Hanoi's most unique and valuable tourism resources that can become very competitive in the international market. Besides sharing a very long history with the craft villages, the Ancient Quarter has a socio-cultural network and possesses intangible cultural values that have been handed down from generations past, thereby forming the core value of the Ancient Quarter as proven in the pilot project. Hence, the physical revitalization of the Ancient Quarter in the name of tourism promotion and development has to consider its cultural preservation.

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<sup>1</sup> The existing 12,500 hotel rooms are composed of 2,045 rooms (with 3 to 5-star rating), 6,285 (1-2 stars), and 4,170 rooms (others).

## Socio-economic Development Strategies and Actions

8.13 The proposed strategies and actions for economic and social development are explained in Table 8.1.

**Table 8.1 Proposed Socio-economic Development Strategies and Actions**

Strategy	Action	Monitoring Indicator
C1 Establish competitive economic base	C11 Establish interministerial coordination mechanism to promote new urban economics involving private sector and higher education C12 Develop new types of urban industries which combine culture, technology, and human resources C13 Provide strategic supporting infrastructure to enhance competitiveness of existing industries	<ul style="list-style-type: none"> <li>Share of new urban industries (output value, employment, number of establishments)</li> <li>Institutional arrangements made</li> </ul>
C2 Update industrial development strategies	C21 Relocate polluting industries C22 Establish concrete strategies for developing industries and industrial estates/zones in close coordination with other provinces in the region C23 Provide necessary supporting environment for industrial estates including housing, accessibility, and amenities for workers	<ul style="list-style-type: none"> <li>Number of polluting industries relocated and satisfaction of communities</li> <li>Progress of projects</li> <li>Satisfaction among industries</li> </ul>
C3 Improve investment environment further	C31 Improve Hanoi's competitiveness in Vietnam and Asia on providing conducive environment for FDIs C32 Further improve investment information system for Hanoi and region C33 Establish coordinated one-stop center for Hanoi and region	<ul style="list-style-type: none"> <li>Competitiveness index and ranking</li> <li>Satisfaction among investors and users</li> <li>Accessibility to information and level of business facilitation</li> </ul>
C4 Establish concrete support system for low-income groups and urban poor	C41 Define and identify the urban poor in Hanoi C42 Establish adequate policy on providing needed support for the poor in sustainable manner C43 Establish adequate monitoring mechanism	<ul style="list-style-type: none"> <li>Shared definition and indicators of the poor</li> <li>Satisfaction among the poor</li> <li>Accessibility to indicators and related information</li> </ul>
C5 Strengthen capabilities of communities	C51 Define and identify issues at the community level C52 Establish adequate policy on providing needed support in sustainable manner. C53 Establish adequate monitoring mechanism	<ul style="list-style-type: none"> <li>Available mechanism for public participation</li> <li>Available plans / programs</li> <li>No. of meetings and participants</li> </ul>

Source: HAIDEP Study Team.

8.14 Priority projects and actions of strategic importance are identified as follows:

- (i) Establishment of updated urban economic development strategies and conducive investment environment
- (ii) Establishment of supporting mechanism for SMEs including informal sector
- (iii) Establishment of competitive urban industrial estates/zones
- (iv) Strengthening of capacity and technological linkages of higher education and urban industries
- (v) Strengthening of tourism promotion, infrastructure, and services
- (vi) Establishment of participatory community environment management system
- (vii) development of effective mechanism to address urban poverty and rural issues

## 9 URBAN TRANSPORTATION

### 9.1 Development Goal and Planning Principles

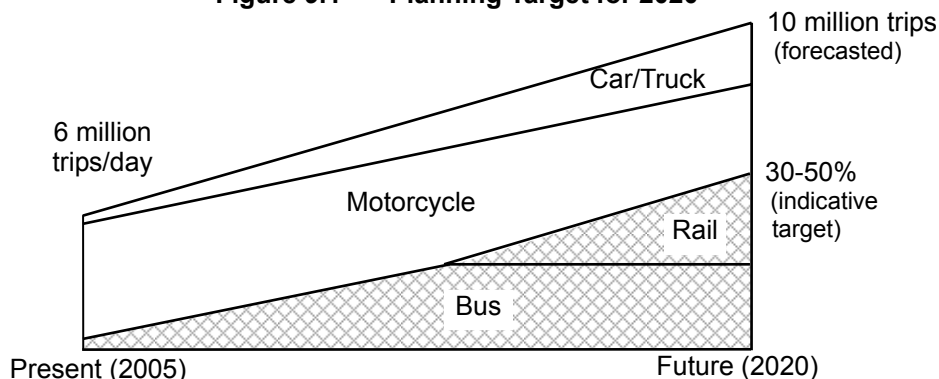
9.1 Transportation infrastructure acts as the foundation of urban development, as development takes place along, and is greatly affected by, transportation facilities such as roads, urban railway, and terminals. Roads also provide important space for urban utilities (such as water supply, drainage, electricity, and telecommunications), opportunities for disaster prevention, and improved landscape. They also function as a venue for the people's varied activities. Efficient transportation is critical in linking Hanoi to international gateways for trade and tourism, and at the same time to integrate it with the provinces in the region, thereby creating synergy for growth and development in both areas.

9.2 In order to achieve sustainable urban transportation development in Hanoi, the key principles that must be duly considered in policy and plan formulation include the following:

- (1) **Firm Policy Commitment, Clear Strategy, and Effective Mechanism for Development of Mass-transit-oriented Urban Areas and Society:** Lessons learned from the experiences of large cities in developed and developing countries explicitly indicate that the provision of effective public transportation is the prerequisite in ensuring sustainability of not only urban transportation but also the entire urban system, wherein urban mass-transit comprising urban rail and bus rapid transit (BRT) form the backbone.
- (2) **Timely Provision of Road Network:** Roads are the most fundamental transportation infrastructure not only for transportation but also for urban development, landscape improvement, environmental management, and disaster prevention. Roads must be developed in the form of a network with proper hierarchical functions. Moreover, roads must be provided in a timely manner to avoid traffic bottlenecks and promote land use as well as urban development and through more effective ways to accelerate implementation.
- (3) **Adoption of Comprehensive Traffic Management and Enhancement of Public Awareness of Urban Transportation Issues:** While space for transportation is limited and the provision of facilities is constrained, maximizing available resources is the most fundamental issue to address by both governments and transportation users. Since it is clear that both sides are to be blamed for the current traffic situation as is typically seen in the driving attitudes of motorists and the lax enforcement of traffic rules, the basics of traffic management must be immediately implemented and firmly enforced ahead of expensive and time-consuming infrastructure development.
- (4) **Establishment of Effective Interface of Urban and Regional Transportation Systems:** Due to its strategic location in the northern region, all important corridors converge in Hanoi, partly as the origin/destination point and partly as transit point. Since both urban and regional traffic are expected to grow, they must be properly segregated and/or interfaced to avoid traffic conflicts. The interface of urban and regional systems is equally important for Hanoi metropolitan area—the area within 30-50 km radius from Hanoi center—to integrate satellite cities and urban areas with Hanoi.
- (5) **Strengthening of Transportation Management Capacity:** Infrastructure development is important but sustainable transportation development requires attention to many aspects from policy setting, planning and prioritization, to budgeting, implementation, and monitoring. Considerations to social and natural environment are also important. Then too an improved mechanism for preparing lands for infrastructure and resettlement is badly

needed, and this requires much closer harmonization with urban development. Participatory approach in planning and project implementation is likewise becoming critical in large urban areas where there are cross-cutting issues and piecemeal solutions will not be effective.

**Figure 9.1 Planning Target for 2020**



Source: HAIDEP Study Team.

**Table 9.1 Target Modal Shares for 2020**

Transportation Mode		2005		2020			
				Without UMRT		With UMRT	
		No. <sup>1)</sup>	%	No. <sup>1)</sup>	%	No. <sup>1)</sup>	%
Private	Bicycle	1,579	25.3	374	3.8	372	3.8
	Motorcycle	3,396	63.2	5,777	58.7	5,206	52.9
	Car/Taxi	227	3.6	1,921	19.5	1,555	15.8
	Others	69	1.1	350	3.5	350	3.5
	Subtotal	5,811	<b>93.3</b>	8,422	<b>86.5</b>	6,896	<b>70.0</b>
Public	UMRT	-	-	-	-	2,012	20.5
	Bus	420	6.7	1,426	14.5	940	9.5
	Subtotal	420	<b>6.7</b>	1,426	<b>14.5</b>	2,364	<b>30.0</b>
Total		6,321	100.0	9,848	100.0	9,848	100.0

Source: HAIDEP Study Team.

1) Trips/day (000), trips inside Hanoi only.

**Table 9.2 Modal Shares in Asian Cities**

City	Hanoi, 2005	HCMC, 2002	Manila, 1996	Jakarta, 2002	Singapore, 1993	Tokyo, 1998
<b>Private</b>	<b>93.3</b>	<b>94</b>	<b>22</b>	<b>42</b>	<b>34</b>	<b>64.1</b>
Bicycle	25.3	17	-	4	-	-
Motorcycle	63.2	75	1	21	6	21.5
Car/Taxi	3.6	1	25	15	19	42.6
Others	1.1	1	2	2	9	-
<b>Public</b>	<b>6.2</b>	<b>6</b>	<b>78</b>	<b>58</b>	<b>66</b>	<b>35.9</b>
Bus	6.7	2	17	51	42	3.1
Urban Railway	-	-	2	2	12	32.8
Others	-	4	53	5	13	-
Road Ratio (km/km <sup>2</sup> )	4.2		10.7 <sup>1)</sup>	11.5 <sup>1)</sup>	12	15.8
Urban Railway (km) <sup>2)</sup>	- (142)	- (29)	43.9 (30)	- (170)	109	300 (657) <sup>3)</sup>

Sources: HCMC, Manila, Jakarta data: JICA Study, Tokyo data: Tokyo Metropolitan Region- Person Trip Survey, Millennium Cities Database for Sustainable Mobility.

1) In urban areas only.

2) Figure in parentheses refer to inter-city railway length.

3) Only within the 23 wards of Tokyo. Total length in Tokyo Metropolitan Area is 2,100km.

## 9.2 Regional Transportation Development Strategy

### Planning Approach

9.3 The existing draft regional transportation master plan prepared by MOT and submitted to the Government is the starting point of the study in HAIDEP. The plan was reviewed from the following viewpoints:

- (1) **Comparison with Future Demand:** Interprovincial traffic movement of passenger and freight for 2020 was forecasted based on an update of the work made in the VITRANSS (The Study on the National Transport Development Strategy in Vietnam, 2000).
- (2) **Compliance with Regional Development Strategy:** The MOT master plan was reviewed based on existing regional development plans for the Red River delta, Northern Focal Economic Zone, and, particularly, for the Hanoi metropolitan area.
- (3) **Interface with Hanoi Urban Transportation Network:** The MOT master plan was reviewed to ensure proper interface/integration with Hanoi's urban transportation system.

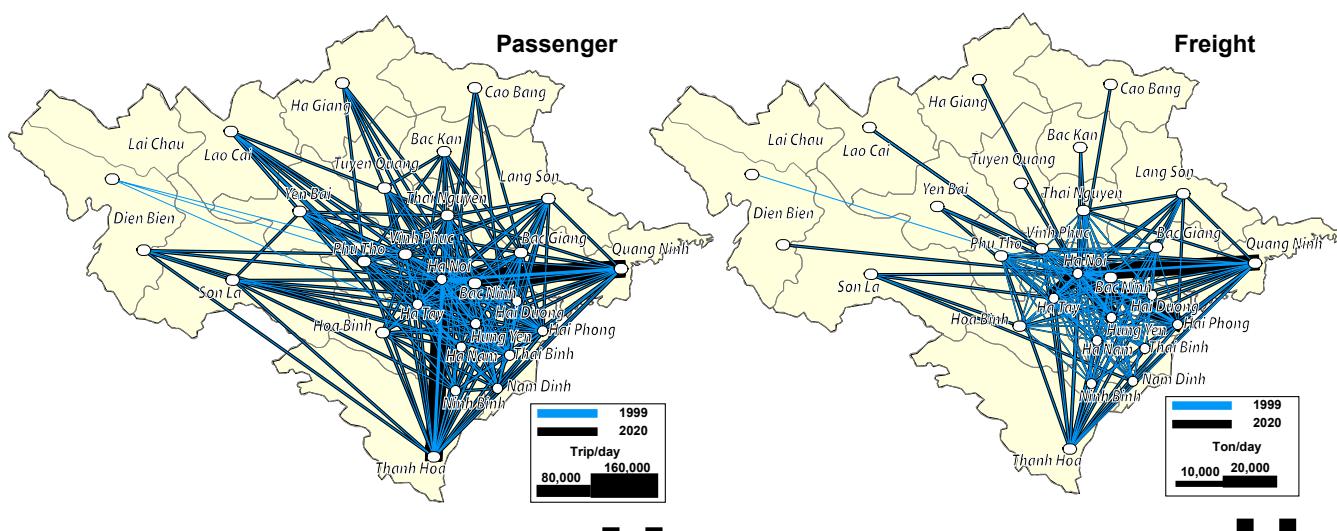
9.4 A sharp increase in traffic demand requires the expansion of multimodal regional transportation infrastructure and services. Both passenger and cargo traffic will increase almost four times between 2005 and 2020. The impact on roads, particularly NH5, NH8, NH2 and NH1, will be significant. Although intermodal relationships were not fully analyzed in the HAIDEP, it was observed that the MOT Master Plan, together with some modifications proposed by the HAIDEP as explained in the next pages, would be able to meet the future demand adequately.

**Table 9.3 Modal Shares of Interprovincial Transportation to/from Hanoi**

		1999		2005		2020		Growth Rate (1999-2005) (%)	Growth Rate (2005-2020) (%)
		No.	%	No.	%	No.	%		
Passenger (Pax/day)	Road Car	19,913	17	59,014	25	460,362	52	19.8	14.7
	Road Bus	86,999	74	154,846	67	350,164	40	10.1	5.6
	Railway	11,356	10	17,627	8	66,378	8	7.6	9.2
	Total	118,268	100	231,487	100	876,904	100	11.8	9.3
Cargo (Ton/day)	Road Truck	24,390	77	66,003	63	232,253	56	18.0	8.7
	IWT	3,495	11	34,795	33	167,225	40	46.7	11.0
	Railway Cargo	3,667	12	4,481	4	16,352	4	3.4	9.0
	Total	31,552	100	105,280	100	415,830	100	22.2	9.6

Source: HAIDEP Study Team (refer to VITRANSS 1999, TDSI 2005, and Traffic Demand Forecasting 2020).

**Figure 9.2 Interprovincial Traffic Distribution in the Study Area**



Source: HAIDEP Study Team.



## Future Network

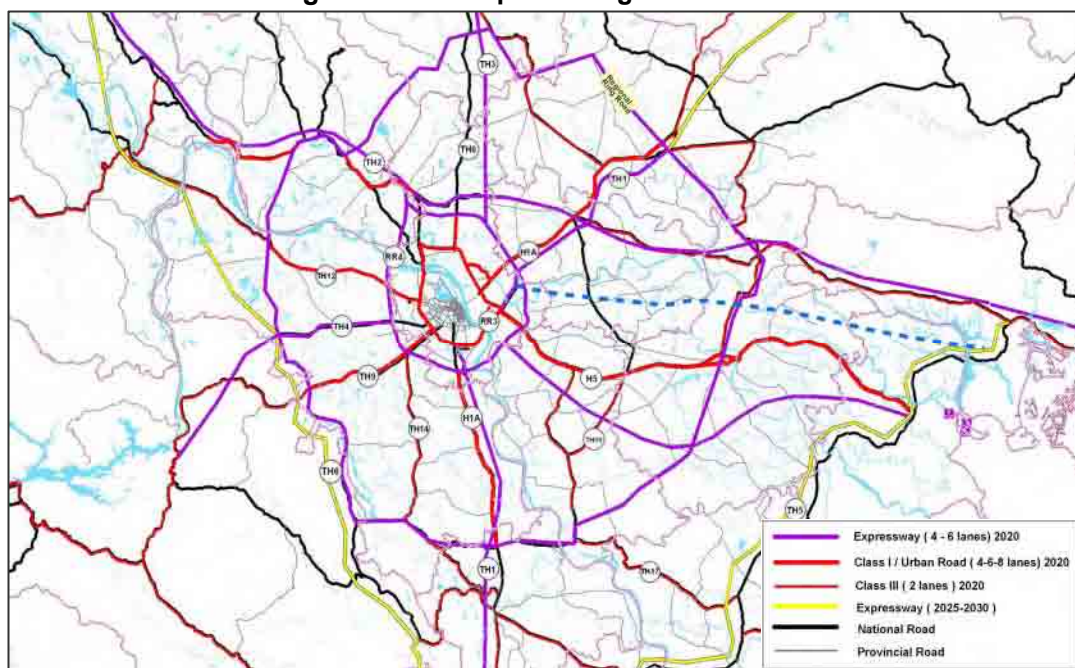
9.5 **Expressways:** In the MOT transportation master plan, major improvements on and development of primary roads, including expressways and national highways, are proposed for implementation by 2020. The six expressways have a total length of 694km. These are: (i) Eastern North-South Expressway (Lang Son - Thanh Hoa, 170km); (ii) East-West Expressway (Noi Bai - Ha Long - Mong Cai, 320km); (iii) Hanoi - Viet Tri - Doan Hung - Lao Cai Expressway (124km); (iv) Hanoi - Thai Nguyen Expressway (ongoing, 65km); (v) Hanoi - Hai Phong Expressway (105km); and (vi) Lang - Hoa Lac - Hoa Binh Expressway (80km).

9.6 **Railway Network:** In its transportation master plan (version 2005), MOT identified 6 major projects. Three of these relate to the upgrading of existing track infrastructure in the Hanoi area, one to the upgrading of Van Dien Station, and two to the development of urban railway in Hanoi. The HAIDEP Master Plan for railway incorporates these schemes in its proposals, albeit in a different form, and in some cases not in their entirety. While the MOT master plan proposes a rail network around Hanoi City, the HAIDEP Master Plan reviewed and revised the MOT plan.

9.7 **Inland Waterway Transportation:** The transfer of the existing Hanoi Port, including coal storage, to Khuyen Luong and its conversion into a tourism port (waterfront with beautiful landscape) is suggested in the Red River Inland Waterway Transport System (JICA, 2003). The relocated Hanoi Port will exclusively handle construction materials and containers.

9.8 **Air Transportation:** Airports in the study area share 95% of the total capacity of airports in the north or 34% of the country's total. The Noi Bai International Airport can receive 4 million passengers a year and can accommodate B747s. Its five-year plan for the 2006 - 2010 period sets a target of 12 million passengers per year. Noi Bai has enough reserved land and the appropriate conditions to accommodate 50 - 60 million passengers a year, according to the Civil Aviation Authority of Vietnam (CAAV). Therefore, a new international airport will not be required, at least by 2020.

**Figure 9.3 Proposed Regional Road Network**



Source: HAIDEP Study Team.

## Regional Rail Development In and Around Hanoi

9.9 The proposed development orientation for regional rail relating to Hanoi's development is twofold, as follows:

(1) **Completion of Ring Rail:** To provide direct connections to major rail traffic flow, the missing sections between Hai Phong - Hanoi - Vinh (south) and between Vinh Phuc - Hanoi - Hai Phong/Cai Lan should be constructed. With the completion of the ring rail and the double tracking of the ring routes, all interprovincial rail traffic, especially cargo traffic, can be effectively diverted from the congested city center (see Figure 9.5).

(2) **Extension of UMRT to Satellite Cities and Urban Areas:** This arrangement can provide completely integrated passenger services. The UMRT Line 2 can be extended to Xuan Mai in the southwest and Soc Son in the north, while Line 3 can go further to Son Tay and Line 3 branch line to Hoa Lac in the west. Line 1 services can be provided using VR lines to Bac Ninh in the northeast. BRT can be introduced while the demand is low, eventually converting it to rail as demand increases.

### High-quality Expressways

9.10 Vinh Phuc - Hanoi - Hai Phong/Quang Ninh, which is part of the Kunming - Hai Phong corridor, is the most important corridor in the northern region. The area along this corridor must be promoted as an industrial area and provided with competitive and high-quality infrastructure to continuously attract investments in the face of fierce competition from other areas in Asia. While the current MOT transport plan intends to develop two expressways along NH18 and NH5, HAIDEP proposes to combine them into one high-quality expressway (see Figure 9.4) provided with logistics facilities, ITS, and industrial complexes due to following reasons:

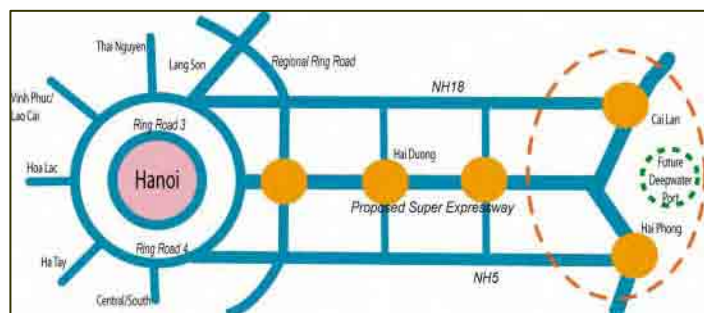
(i) Investment costs can be reduced while traffic volume can be increased. Development opportunities are higher than in other routes. Therefore, the feasibility to implement this project through PPP or PFI becomes higher.

(ii) As existing investments are located along NH5 and NH18, the proposed new route can directly benefit them at the same time.

(iii) Hai Phong and Quang Ninh can be connected with branch lines in the end. They can also provide direct expressway link between Hai Phong and Cai Lan which can further be extended to Mong Cai.

(iv) Because of the distance to/from international gateway ports in Hai Phong and Cai Lan, Hanoi and Vinh Phuc, respectively, are at a disadvantage compared to other cities including HCMC. The distance must be minimized with high-quality transportation infrastructure to enhance their competitiveness.

**Figure 9.4 Concept of High-quality Expressway**

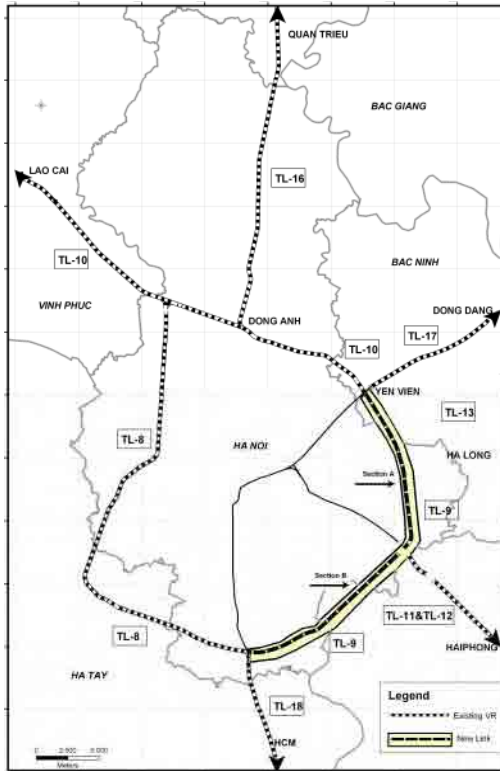


### New International Airport

9.11 Although the existing Noi Bai Airport can meet the forecast demand by 2020, there is a need for a long-term plan of selecting alternative sites for a more competitive international airport which is expected to be needed as Asia grows and becomes integrated. To this end Hanoi must find an edge over other existing and potential competitions in the region. The

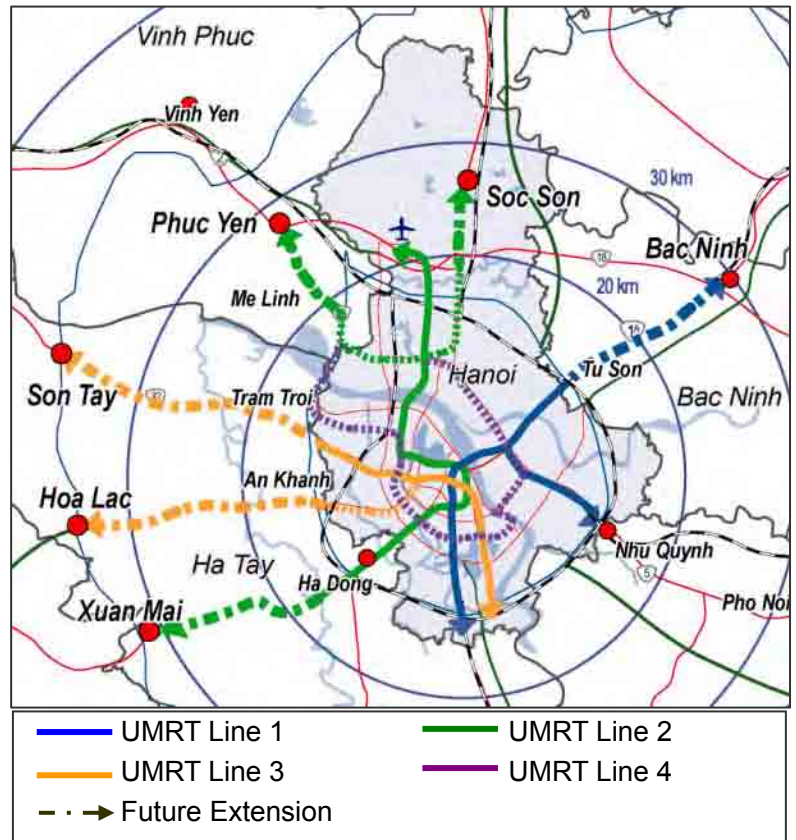
factors that must be considered include distance from Hanoi and other major growth centers, availability of high-quality access transportation, and favorable geographic conditions for airport operation. Although it is difficult at this stage to determine such a location, it could be along the proposed high-quality super expressway.

**Figure 9.5 Completion of Ring Rail Route around Hanoi**



Source: HAIDEP Study Team.

**Figure 9.6 Extension of Hanoi's UMRT to Satellite Cities / Urban Areas**



**Figure 9.7 Integrated High-quality Expressways**



Sources: Above left, various Internet websites. Right, Google Earth.



## 9.3 Road Development

### Main Issues

9.12 Except in city centers Hanoi absolutely lacks roads, with the existing road network characterized by many bottlenecks and missing links. Traffic management is weak and the awareness of road users is low, aggravating the traffic situation. Moreover, road development is slow due to resettlement and land issues. Roads in Hanoi are the most fundamentally needed infrastructure for efficient and effective transportation and urban development.

### Planning Principles

9.13 While roads have multiple functions, the key aspects from the transportation planning viewpoints are as follows:

- (i) To segregate urban and interprovincial traffic to avoid entry of heavy vehicles into the city which can cause congestion and at the same time to facilitate efficient operation of inter-city transportation. Adequate interface between the two must be ensured.
- (ii) To establish clear ring and radial road systems to provide users with a clearer orientation and to guide prioritization for development.
- (iii) To consider in road and road space development and management the nontransportation function of roads such as space for roadside urban development and activities, for landscape and urban design, etc.
- (iv) To establish a more effective mechanism for at-grade road development to mitigate the negative social impacts due to resettlement, to reduce costs of land acquisition, and to facilitate a more effective land use and urban development.

### Proposed Urban Road Network

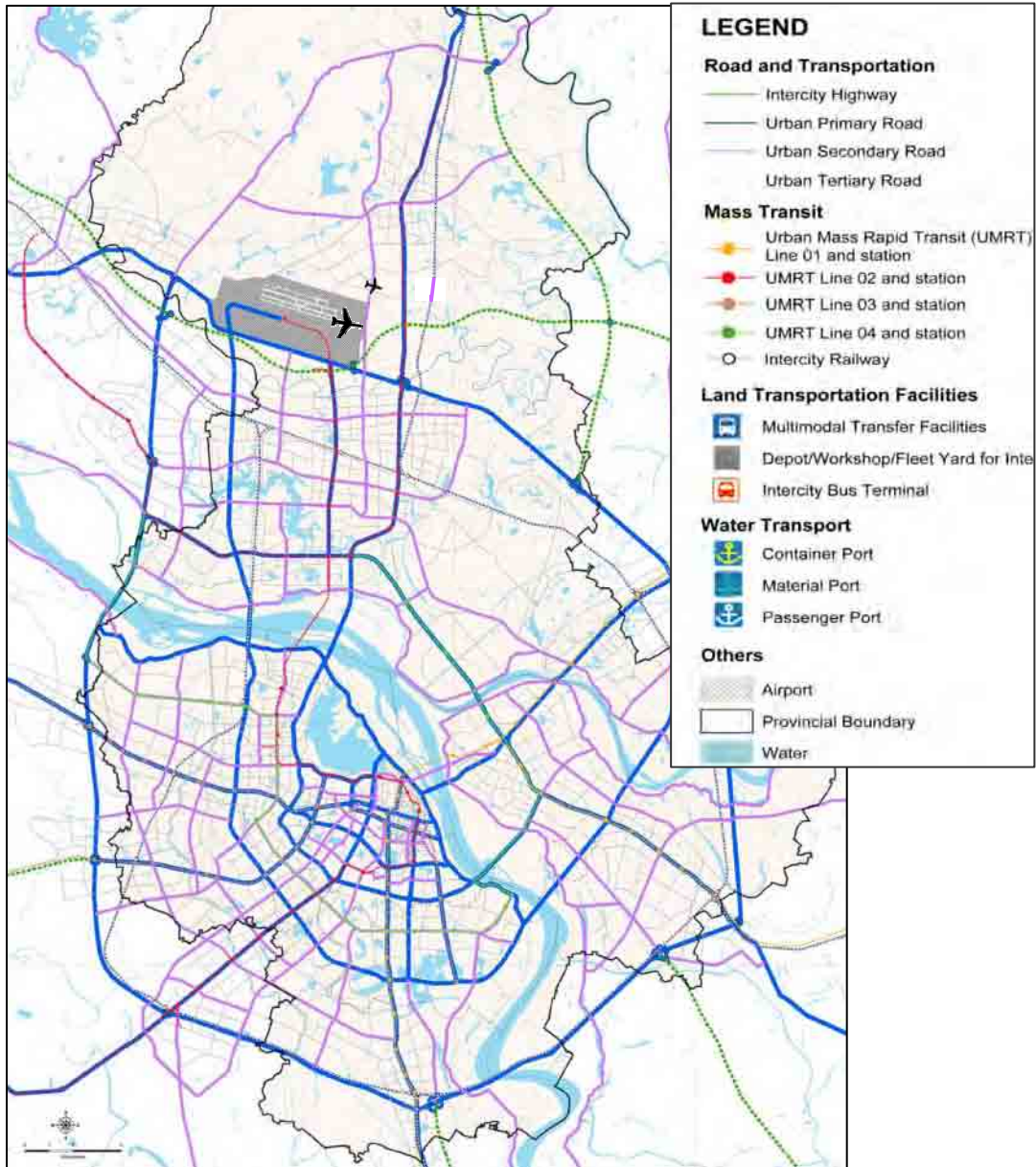
9.14 The proposed road network consists of a combination of eight (8) radial and four (4) ring roads in the city (see Figure 9.8). Although radial roads link interprovincial primary roads in each direction, their interface is provided at RR4 which separates interprovincial traffic from urban traffic. With the proposed plan, the road network of Hanoi City will increase from 624km to 1.143km in length and from 5.9km<sup>2</sup> to 21.8 km<sup>2</sup> in area. The availability of road space in 2020 will be better than Bangkok (see Figure 9.9). HAIDEP proposes a classification of roads according to their function, as follows:

- (1) **Urban Primary Roads:** The urban primary road system services the major portions of trips entering and leaving the CBD and subcenters as well as the majority of throughway traffic that bypasses the city center.
- (2) **Urban Secondary Roads:** The urban secondary road system interconnects with and augments the urban primary road system. Secondary roads must serve not only vehicular traffic but also various transportation and nontransportation activities.
- (3) **Urban Tertiary Roads:** The urban tertiary road system aims to provide access to areas located along roads and to serve not only vehicular traffic but also nonmotorized vehicle as well as roadside, nontransportation activities.

### Road Maintenance

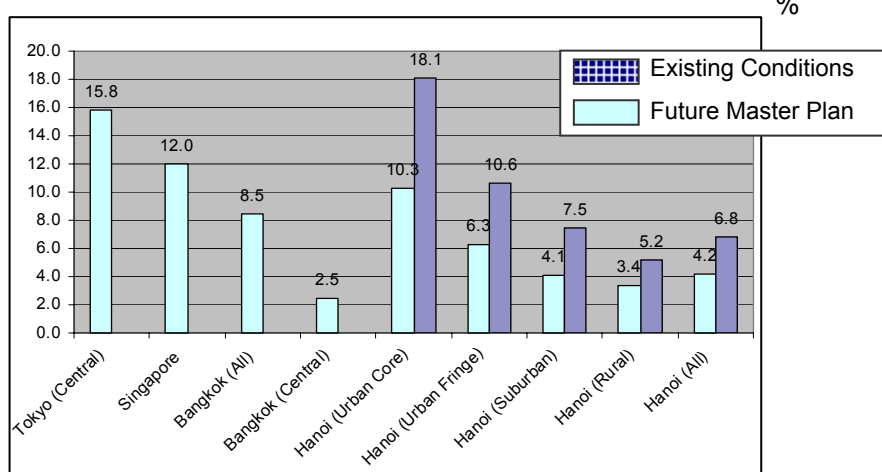
9.15 Road maintenance will become increasingly important as more roads are constructed and widened, as traffic grows, as the number of buses on roads increases, and especially when the shift from motorcycles to cars occurs. Since poor road maintenance in congested urban areas will directly lead to increases in maintenance costs and traffic accidents, the city must ensure that roads are properly maintained throughout the year.

**Figure 9.8 Proposed HAIDEP Road Network**



Source: HAIDEP Study Team

**Figure 9.9 Comparison of Road Network Densities**



Source: HAIDEP Study Team.

## Bridges across the Red River

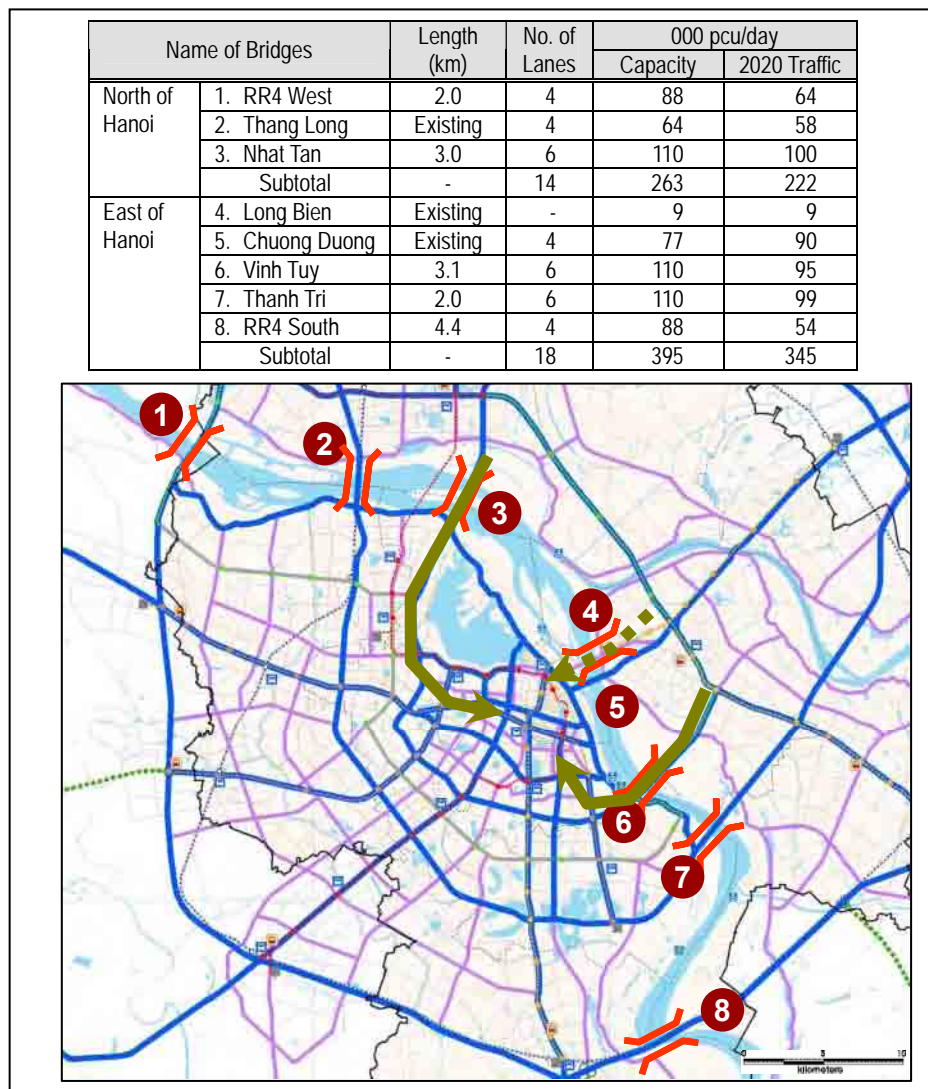
9.16 As the future growth of urban areas is also directed toward the left bank of the Red River, bridges across the Red and the Duong rivers are important to integrate the urban areas on both sides of the rivers. However, planning for the bridges must be carefully done because of the following reasons:

- (i) Locations and capacities of bridges significantly affect urban development and traffic patterns.
- (ii) Bridges across the Red River are costly.
- (iii) Bridges can enhance or ruin the city's landscape.

9.17 An analysis was made in HAIDEP and the following are the results:

- (i) On the basis of the proposed General Plan, 8 bridges including the existing Chuong Duong, Long Bien, and Thang Long bridges can meet the demand in 2020 (see Figure 9.10).
- (ii) Constructing bridges which directly lead to the city center is not advisable. As is experienced in the Chuong Duong Bridge, there is a lot of traffic directly stopping in the city center and passing through it, thereby amplifying the already congested traffic situation. To improve the situation traffic heading for the city center can be diverted to Nhat Tan and Vinh Thuy bridges as well as the ring roads.

**Figure 9.10 Proposed Bridges Across the Red River**



Source: HAIDEP Study Team.

## Location and Role of Ring Road 4

9.18 HAIDEP proposes to modify the alignment of Ring Road 4 (RR4) from that indicated in the MOT plan due to the following reasons:

- (i) RR4 must be situated in the periphery of the future urban areas and within an adequate distance from RR3. In this location RR4 can function in the most effective manner, i.e. to effectively divert both urban and interprovincial traffic and the total length can be much shorter, while higher traffic volume can be attracted, thereby making the project more viable economically and financially.
- (ii) RR4 can connect urban centers of adjoining provinces and future growth centers such as Ha Dong, Tu Liem, Me Linh, and Phuc Yen in the west. The location will also complement the development of new urban centers beyond 2020.
- (iii) In the east, RR4 together with NH5 will function more as an interprovincial link between northern Hanoi and Vinh Phuc. This section can be effectively linked with the proposed high-quality expressway discussed in Chapter 8.2.

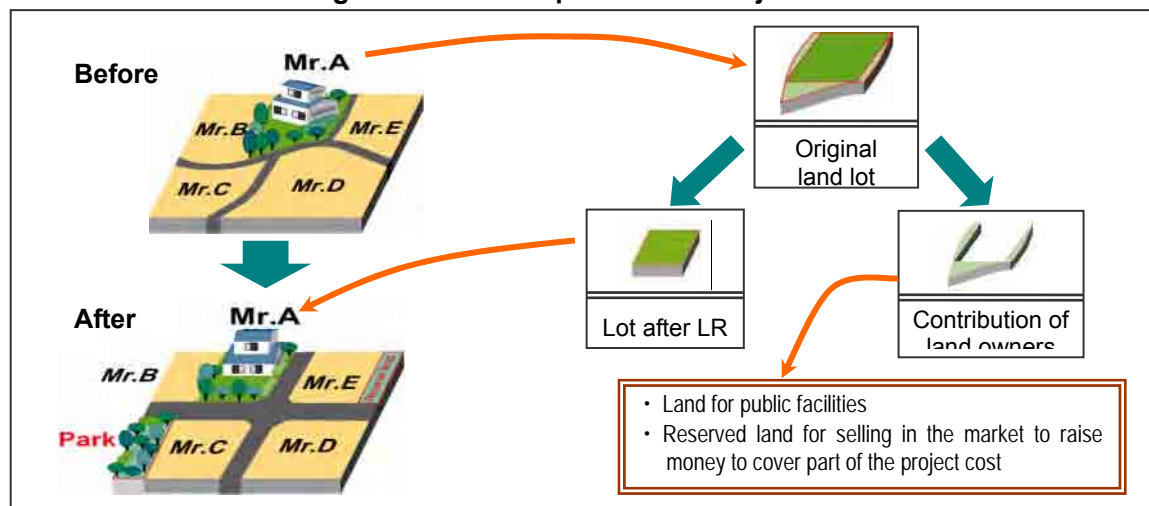
## Interface of Urban and Regional Road Networks

9.19 The urban road network will interface with the inter-city road network on RR4. As RR4 is designed with expressway standards, the main regional roads, including expressways, are best connected on RR4, with their intersections fully grade-separated. Integrated development of logistics facilities including inland container depots (ICDs) along RR4 would also be beneficial to industries.

## Alternative Methods for Land Acquisition and Resettlement

9.20 Road construction in Hanoi has become increasingly complex due to difficulties in obtaining land for roads and resettlement issues as well. Since current methods of land acquisition increase the investment costs, lengthen project periods, create various social conflicts, and are detrimental to the people, it is necessary to develop alternative schemes to address road development issues more comprehensively, as can be done through the land readjustment scheme adopted by many successful cities in Japan. The land readjustment scheme aims to develop comprehensively the infrastructure together with urban development in the defined project area and involving the residents and land owners in the subject area. This mechanism can minimize resettlement and contribute to the reduction in the amount of public investment.

**Figure 9.11 Concept of Land Readjustment**



Source: Worked out by the HAIDEP Study Team based on existing publications.



## 9.4 Urban Mass Rapid Transit (UMRT) Development

### Planning Principles

9.21 The UMRT is very important but it is a costly undertaking. In order to maximize the benefits of UMRT development and minimize the financial burden for the government, the following measures must be considered:

- (1) **Integration with Urban Development:** When urban development projects, such as commercial complexes, new towns, industrial estates, university complexes, and recreation parks, are implemented in a coordinated manner with transportation development, the combined effect is far greater than their individual benefits. An integrated development will not only spread the burden of financing the infrastructure but will also increase the value of these developments because of improved accessibility, increased UMRT ridership, and new business opportunities.
- (2) **Development as a Network:** The effects of one line are limited. The UMRT has to be developed as a network to effectively cover the critical parts of the urban areas.
- (3) **Phased Development:** Since the development of a UMRT network requires huge investments and a lengthy time, a phased development strategy must be adopted which, however, must ensure all lines are properly integrated as one efficient system.

### Proposed UMRT Network

9.22 The proposed UMRT network was worked out based on the eight lines proposed in the MOT plan which were analyzed based on the future traffic demand, and then integrated into four lines (see Figure 9.12). The proposed network within Hanoi is 193km long comprising urban rail and BRT which can be selected depending on the demand.<sup>1</sup>

- (1) **UMRT Line 1 (Ngoc Hoi to Yen Vien, Nhu Quynh):** This 34.5-kilometer-long UMRT line following the existing VR line will serve the northeastern and southern suburbs of Hanoi via the CBD including the proposed multimodal interchange terminal at Hanoi Station.
- (2) **UMRT Line 2 (Noi Bai to City Center & Ha Dong):** The 63-kilometer-long UMRT Line 2 will combine the proposed Ha Dong and Noi Bai lines identified in the MOT plan. Line 2 provides the most significant backbone to sustain the existing and future urban areas by integrating Noi Bai Airport, Dong Anh new town areas, the proposed government complex in Tu Liem, the Ancient Quarter, the French Quarter, and the fast-growing NH6 corridor leading to Ha Dong. In view of its importance, Line 2 was selected for a prefeasibility study in HAIDEP.
- (3) **UMRT Line 3 (Nhon to City Center & Hoang Mai):** This 33-kilometer-long UMRT Line 3 links the west, the CBD, and the south of the city via the Hanoi Station of Line 1.
- (4) **UMRT Line 4 (Ring Route):** This line, which can be initially developed as a BRT, will provide circular rail services by connecting lines 1, 2, and 3 to diversify the radial demand and integrate subcenter development which will be further promoted in the future.
- (5) **Other Branch Lines:** UMRT lines 1, 2, and 4 can be provided with branch lines connecting the main rail lines with BRT lines.

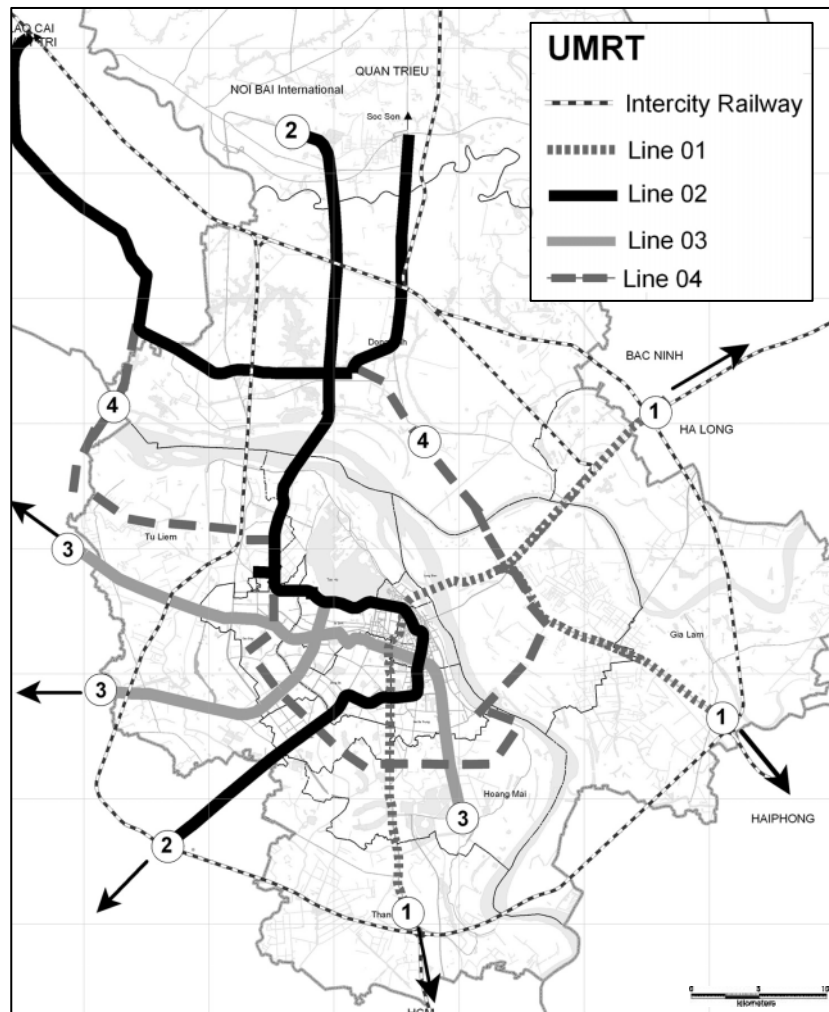
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<sup>1</sup> For example, a UMRT line can be initiated with a BRT and eventually converting it to urban rail as demand increases. The BRT must be planned in a way that its structure can be smoothly converted to urban rail and that needed land is secured.

(6) **Regional Lines:** In order to further serve satellite cities and urban areas in adjoining provinces UMRT lines 1, 2, and 3 can be extended. For Line 1, urban services can be accommodated in a provincial rail network, while for lines 2 and 3, the same urban services can be extended to connect the main satellite cities.

9.23 When the four UMRT lines are completed, the UMRT system can serve 2.6 million passengers a day with an average trip length of 7.8km per passenger. Line 2 will carry the highest volume at 866,000 passengers a day, followed by Line 1 at 704,000 (see Table 9.4).

**Figure 9.12 Proposed UMRT Lines, 2020**



Source: HAIDEP Study Team.

**Table 9.4 Profile of UMRT Lines, 2020**

Unit: km

UMRT	Urban Rail					BRT	Total	Ridership		
	Underground	Elevated	At-grade	Bridge	Subtotal			Pax-km (000/day)	No. (000/day)	Ave. Trip Length (km)
1	nil	12.3	24.4	2.0	38.7	nil	38.7	5,968	704	8.5
2	18.6	20.4	nil	2.5	41.5	33.9	75.4	7,278	866	8.4
3	12.0	1.3	7.7	nil	21.0	12.0	33.0	2,521	488	5.2
4	nil	nil	nil	nil	nil	53.1	53.1	4,463	526	8.5
Total Km	30.5	34.0	32.1	4.5	101.2	99.0	200.2	20,230	2,585	7.8

Source: HAIDEP Study Team.

### Role and Function of the UMRT

9.24 The role and function of the UMRT system are as follows:

- (1) **Role in Transportation:** The UMRT will provide efficient services connecting suburban areas with the CBD and support the effective expansion of urban areas. It will provide smooth travel within the congested city center.
- (2) **Impact on Urban Development:** The UMRT will provide ample opportunities for urban development at and around the stations and terminals.
- (3) **Social Impact:** The UMRT will provide affordable, reliable, and high-quality transportation services.
- (4) **Environmental Impact:** The UMRT will contribute to the reduction in air pollution and energy savings.
- (5) **Technological Impact:** Modern means of transportation can contribute to the development of new technology and supporting industries.

### Integrated Development

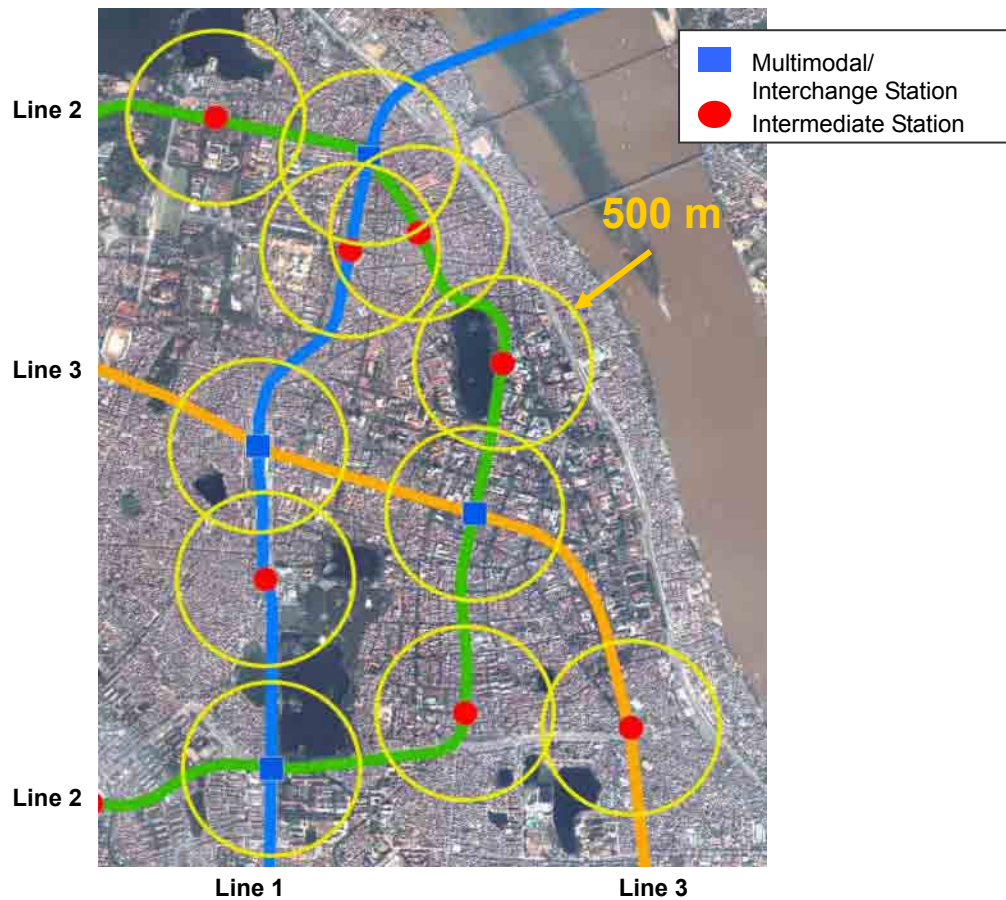
9.25 To maximize the benefits that can be derived from UMRT development, a common and successful approach is the adoption of an integrated urban development. At stations and terminals and in their adjoining areas, commercial and public facilities are integrally developed with transportation. With this UMRT can expect higher patronage and commercial/urban development will benefit from good accessibility. This synergy is often so huge that many private railway companies in Japan have adopted this measure and in the process have generated considerable revenue.



### UMRT Network Configuration in CBD

9.26 UMRT lines must form an effective network in the city center to maximize coverage. If the network is properly configured many parts of the CBD can be reached within walking distances of 500 to 800 meter or 5 to 10 minutes from a UMRT station (see Figure 9.13). With this kind of network, stronger traffic demand management measures in the city center can be implemented such as the restricted use/entry of cars and motorcycles or the imposition of high entry tolls or of high parking fees for them.

**Figure 9.13 UMRT Network Configuration in CBD**



Note: Worked out by the HAIDEP Study Team based on satellite imagery.

### Development of Underground Space

9.27 The development of underground space is also a promising opportunity for Hanoi's urban and economic development particularly in the city center where building heights must be restricted. Underground space can be developed integrally with UMRT underground stations for commercial use (e.g. shopping) and public facilities (e.g. underground parking). With extensive development of underground air-conditioned walkways destinations in the city center can be effectively and conveniently connected.



Metro station.

Sources: Various websites.



Image of underground shopping arcade.

## **Expansion of UMRT Lines to Adjoining Provinces**

9.28 As explained in Chapter 9.2, the UMRT lines can be extended to link satellite cities and main urban areas in adjoining provinces.

## **Functional Share of UMRT and Rail: Interface between Urban and Interprovincial Rail Transportation Services**

9.29 The differences in the functional and operational characteristics between urban and interprovincial rail services all must be duly considered. The former provides frequent urban services with short station spacing, while the latter offers long-distance interprovincial services. Since Hanoi is large the function of UMRT and rail needs to be clearly delineated, especially when traffic demand becomes large. The HAIDEP proposal aims to terminate interprovincial services at the ring rail route with rail sections within the ring route to be converted solely for urban services. Interchange stations between urban and interprovincial services will be developed along the ring route.

## **Strategic Funding**

9.30 The UMRT requires large investments, but with a strategic mix of different funding sources, including ODA, private sector equity, and commercial borrowings, the burden on government can be lessened. At the same time, it is revenue-generating with proceeds coming from fares and the integrated commercial and urban development at and around the stations including the underground spaces wherein the private sector can participate.

9.31 In the HAIDEP view, the future role of the Hanoi Station as the central station would be more titular rather than functional, because of the increase in traffic congestion at and around the stations that a concentration of several lines in the CBD will generate. It is also proposed that interprovincial services be terminated at the ring route where they can be smoothly interfaced with the UMRT.

## **Operation and Management of UMRT**

9.32 The implementation, as well as the operation and management of the UMRT can be most realistically achieved and sustained through a strong government initiative due to the perceived high risks in the project. Thus it is recommended that HPC create the Mass Transit Authority (MTA) which will plan, design, build, and initially run the UMRT system. In the future as experience and expertise grow, the task of operating and maintaining the system will be divested to private entities under a competitive framework, and the MTA will narrow its focus on network planning and rail network expansion, as well as on technical and economic regulation of rail operators.

9.33 MTA will also take the lead in rail-related property development. To maximize opportunities for commercial development within the context of the transit-oriented development (TOD), MTA is recommended to consider schemes, such as joint commercial development ventures and land readjustment arrangements, to coordinate land owners and to secure sufficient land for integrated urban development. It is expected that land development would not only generate large revenues for further rail investment, but would also enhance the functionality and effectiveness of the UMRT system.



**Figure 9.14 UMRT Systems**



Metro (Tokyo)



BTS (Bangkok)



Monorail station (Kuala Lumpur)



MRT station (Metro Manila)



Inside the UMRT (Kuala Lumpur)



Ticket gate (Tokyo)



BRT (Jakarta)



BRT station (Curitiba)

Sources: Various sources.

## 9.5 Public Transportation Development

### Main Issues

9.34 The public transportation system will have three basic components, as follows: (i) a high-capacity urban mass transit system composed of rail and BRT; (ii) an intermediary bus system composed of primary and secondary bus routes; and, (iii) a supplementary system with small vehicles operated by the private sector.

9.35 While the UMRT is expected to form the transportation backbone of the city, buses will remain to be the most important road-based public transportation mode even in the future, providing services in areas not covered by the UMRT or providing feeder services to it. And unless the UMRT is integrated with bus and other public transportation modes, including taxi and xe om, even cars and motorcycles, at the stations, it may not be fully utilized and the quality of public transportation services as a complete system may diminish.

### Planning Direction

9.36 A priority bus network can vary from a closed system with designated buses and pre-ticketing facilities (true BRT), to an open or semi-open system which can possibly be used by all buses (which also does not mean that all buses must always be allowed). A closed system is most effective if a full standard BRT system is available in the whole network. An open system, on the other hand, requires monitoring to prevent bus congestion. Generally speaking, the more uncertainties and/or missing links there are, the greater the case for a less complex network.

9.37 The primary bus route network will initially form the backbone of the system and will thus fulfill the role of the future UMRT network. It consists of bus routes providing high-capacity and high-commercial speeds by using the priority network. After the completion of the UMRT system, the primary network will connect to multimodal stations but will not essentially be a feeder network. The primary network will be operated by standard and articulated buses.

9.38 The secondary bus network will consist of feeder routes and local routes providing dense coverage. The secondary network will normally operate in mixed traffic. And accordingly, commercial speeds and performance levels will be lower. This network will be operated by standard and smaller buses.

9.39 There are mainly three types of supplementary public transportation services in Hanoi today, namely:

- (i) The widespread and well-functioning taxi system.
- (ii) The unofficial but thriving motorcycle taxis (xe om).
- (iii) The traditional bicycle rickshaws (cyclo) now largely phased out.

9.40 The expansion of semi-public transportation services such as school buses and factory bus services, must also be encouraged to meet specific demand.

9.41 Further improvements to public transportation services are also necessary such as the following, among others:

- (i) Common ticketing between UMRT and feeder buses.
- (ii) Improvement of bus information services.
- (iii) Introduction of low-floor buses or those that are easily accessible to vulnerable groups including the aged, the physically challenged, etc.

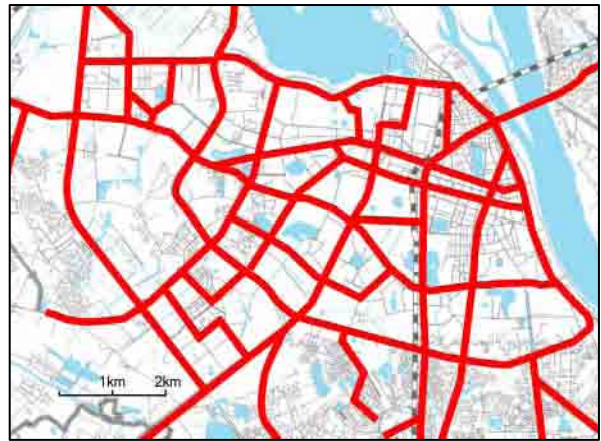


**Figure 9.15 Primary Bus Route Network**



Source: HAIDEP Study Team.

**Figure 9.16 Secondary Bus Route Network<sup>1)</sup>**



Source: HAIDEP Study Team.

1) For inner areas.

**Figure 9.17 Public Transportation Development**



Buses and stops in the “Transmilenio” PBT system in Bogotá.



Bus rapid transit.



Low-floor bus.



Bus information system.



Bus services connected with urban railway.

Source: Various sources.

## 9.6 Traffic Management and Safety

### Critical Role of Traffic Management

9.42 Traffic management is the most fundamental and important factor in the transportation sector. Traffic management and safety are serious weaknesses which usually limit the efficient use of available facilities and endanger life and property. Specifically, the lack of proper traffic management may underutilize costly infrastructure, shorten its economic life, amplify congestion, compromise safety, worsen the environment, and generally adversely affect the land use/urban development along roads. Poor traffic safety and serious traffic congestion are largely due to a lack of effective traffic management. While traffic management measures are not costly, they require a mix of engineering, enforcement, and education measures. Key aspects are as follows:

- (i) To enhance people's awareness of the need for traffic discipline and efficient use of limited road space which if done immediately can benefit society.
- (ii) To establish a clear policy on the priority use of available road space among transportation modes including bus, motorcycle, car, bicycle, and others.
- (iii) To establish a firm policy on the role of motorcycles in urban transportation and the people's socio-economic activities.

### Comprehensive Approach: Corridor Management

9.43 Isolated implementation of traffic management measures is inefficient and does not bring about expected effects. The purpose must be placed on comprehensive improvement of mobility and amenity of road users as well as landscape and environment. This approach is particularly important to ensure the continuity of smooth traffic and the enhancement of street identity. In HAIDEP a total of 16 main corridors were assessed as to their requirements for improvement.

### Strengthening Basic Traffic Engineering Measures

9.44 What must be done for the efficient use of available infrastructure is well known as the 3 Es which stand for engineering, enforcement, and education. Carriageway improvement includes pavement rehabilitation, drainage improvement, installation of median and street lights, while intersection improvement include geometric improvement, signalization and signal coordination, provision of left-turn lane, and grade separation. Basic traffic control include imposition of roadside parking ban and track ban, adoption of one-way systems, improvement of traffic signs and markings, as well as improvement of public transportation facilities and pedestrian environment. These measures do not require much investment and must be constantly enforced as an important component of the master plan in the short term.

9.45 **Parking:** Parking is becoming a serious concern in the city. The lack of space and management capacity amplifies the problem in many locations. A parking development policy must be formulated, clearly defining the roles of the public and private sectors. The basic rule is that buildings or institutions from which the parking demand is generated must provide parking facilities. More specifically, the recommended basic parking policy can be stated as: (i) concerned buildings or institutions must provide exclusive parking; (ii) buildings of certain types and sizes must have an adequate parking facility; and (iii) public parking must be limited to short-term parking for the public.

**9.46 Transportation Demand Management:** Many large cities implement various measures to curb ownership and use of private vehicles especially cars. Hanoi must introduce effective TDM measures to improve the traffic situation, as suggested below:

- (i) **Improved Pricing for Parking:** This includes the expansion of pay parking areas, increase in parking fees, and charging hourly parking fees.
- (ii) **Compulsory Provision of Garages:** This will force existing and potential car owners to provide garages in their respective residences.
- (iii) **Introduction of Area Licensing Scheme:** This can be implemented in the city center when the UMRT lines have been completed. This scheme will restrict the entry of private vehicles to particular sections in the city center by imposing tolls on them.

**9.47 Traffic Safety:** Traffic safety in Hanoi is largely blamed on the undisciplined driving behaviour of motorists and the lax enforcement of traffic rules. This implies that many of the accidents can be immediately reduced when awareness of the road users and enforcers is improved. Without a change in the mindset of the people, any measure and investment to improve the situation will be in vain.

**9.48 Sidewalk Improvement:** Sidewalks in Hanoi are very important not only for pedestrian traffic but also as space for various activities including vending, resting, parking, etc. in this unique nature of Hanoi, sidewalk improvement and management can be done with the active involvement of communities and roadside establishments.

**Figure 9.18 Concepts and Pictures of Ideal Sidewalks**



A sidewalk along a park in Hanoi.

Orchard Road in Singapore.

A sidewalk in Japan without electric wires.

Undergrounding electric wires in Japan.

Source: Various sources.



## 9.7 Urban Transportation Master Plan and Its Performance

### Summary of Master Plan Projects

9.49 The proposed Urban Transportation Master Plan is composed of a total of 146 projects including expressways and roads, UMRT and buses, traffic management, roadside facilities (ie sidewalk landscape, common duct, and parking), and training (see Table 9.5).

9.50 The total investment cost is about US\$ 12.7 billion excluding committed projects, of which roads share US\$ 6.8 billion (54% of the total), public transportation at US\$ 5.4 billion (43%), and others US\$ 0.4 billion (3%). However, costs to the government depend on to what extent the private sector would participate to the projects. In addition, the types of project such as public transportation and expressways can generate revenue to cover part of the investment costs. Based on preliminary assumptions the cost to government will somewhat be US\$ 10 billion.

9.51 Regional transportation projects will cost US\$ 10.5 billion comprising expressways, roads, railway, airport, and IWT sharing US\$ 3.1 billion, US\$ 1.4 billion, US\$ 2.3 billion, US\$ 3.3 billion, and US\$ 0.2 billion, respectively.

**Table 9.5 Summary of HAIDEP Projects**

Sector	Project Type	Project			Cost to Government <sup>6)</sup>		Implementation				
		No.	km	US\$ mil.	%	US\$ mil.	'06 – '10	'11 – '15	'16 – '20	'20 –	
URBAN TRANSPORT	<b>Committed Projects<sup>2)</sup></b>	<b>14</b>	<b>80</b>	<b>1,253</b>	<b>95</b>	<b>1,186</b>	<b>1,119</b>	<b>66</b>	<b>0</b>	<b>0</b>	
	ROAD	Expressway <sup>3)</sup>	12	127	1,364	48	652	73	89	490	0
		Primary	29	111	2,741	100	2,741	1,320	1,089	332	0
		Secondary	69	304	2,710	100	2,710	393	1,964	353	0
		<b>Subtotal</b>	<b>110</b>	<b>542</b>	<b>6,815</b>	<b>90</b>	<b>6,103</b>	<b>1,785</b>	<b>3,142</b>	<b>1,176</b>	<b>0</b>
	PT <sup>1)</sup>	UMRT	4	183	5,130	75	3,847	314	2,058	1,475	0
		Bus	2		263	35	92	31	31	31	0
		<b>Subtotal</b>	<b>6</b>	<b>183</b>	<b>5,393</b>	<b>73</b>	<b>3,939</b>	<b>344</b>	<b>2,089</b>	<b>1,506</b>	<b>0</b>
		Traffic Management	5		158	100	158	67	46	46	0
		Roadside Facilities <sup>4)</sup>	3		254	100	254	85	85	85	0
	Training, etc.	8		31	100	31	15	8	8	0	
	<b>Subtotal</b>	<b>146</b>		<b>13,905</b>	<b>84</b>	<b>11,671</b>	<b>3,416</b>	<b>5,436</b>	<b>2,820</b>	<b>0</b>	
REGIONAL TRANSPORT	Committed Projects <sup>5)</sup>	1		254	100	254	254	0	0	0	
	ROAD	Expressway	9	880	3,141	50	1,571	197	410	474	490
		Primary	12	1,811	1,469	100	1,469	248	447	490	284
		<b>Subtotal</b>	<b>21</b>	<b>2,691</b>	<b>4,610</b>	<b>66</b>	<b>3,040</b>	<b>445</b>	<b>857</b>	<b>964</b>	<b>774</b>
	Railway	11		2,328	100	2,328	463	1,610	255	0	
	Airport	2		3,350	100	3,350	3,350	0	0	0	
IWT	5		178	100	178	57	96	25	0		
	<b>Subtotal</b>	<b>40</b>		<b>10,720</b>	<b>85</b>	<b>9,150</b>	<b>4,569</b>	<b>2,563</b>	<b>1,244</b>	<b>774</b>	

Source: HAIDEP Study Team.

1) PT = public transportation

2) Committed urban transport projects include: (i) 1 expressway; (ii) 11 primary roads; (iii) 1 secondary road; and, 1 BRT project.

3) The 12 urban expressway projects comprise 9 RR4 segments and 3 other distinct expressway routes.

4) Including sidewalk landscape, common duct, and parking.

5) The committed regional transportation project is a railway project.

6) Cost to government was estimated based on the following assumptions:

= Expressways – 50% gov't, except for committed projects, which is 100% gov't

= UMRT – 75% gov't

= Bus: (i) Acquisition and replacement - 0% gov't; (ii) PBT – 100% gov't; and, (iii) BRT – 10% gov't

= Others – 100% gov't

## Assessment of the Master Plan Transportation Network

9.52 With the implementation of the proposed network, the traffic situation will be significantly improved compared with the “Do something” situation and the “Existing” situation. The main findings of the analysis are as follows (see Table 9.6):

- (i) Although the proposed network will eventually become more congested than the existing network, average travel speeds will be improved due to the effects of better network configuration of the proposed plan.
- (ii) Effects of the proposed network can also be seen from the coverage of the areas that can be reached within 30 minutes from a 60-minute travel to/from Hoan Kiem Lake. Without the plan, the coverage is reduced quickly, while with the plan, it can expand farther toward all directions in the city (see Figure 9.19).
- (iii) The effects of TDM are also significant in that travel conditions on the roads improve and UMRT ridership increases.

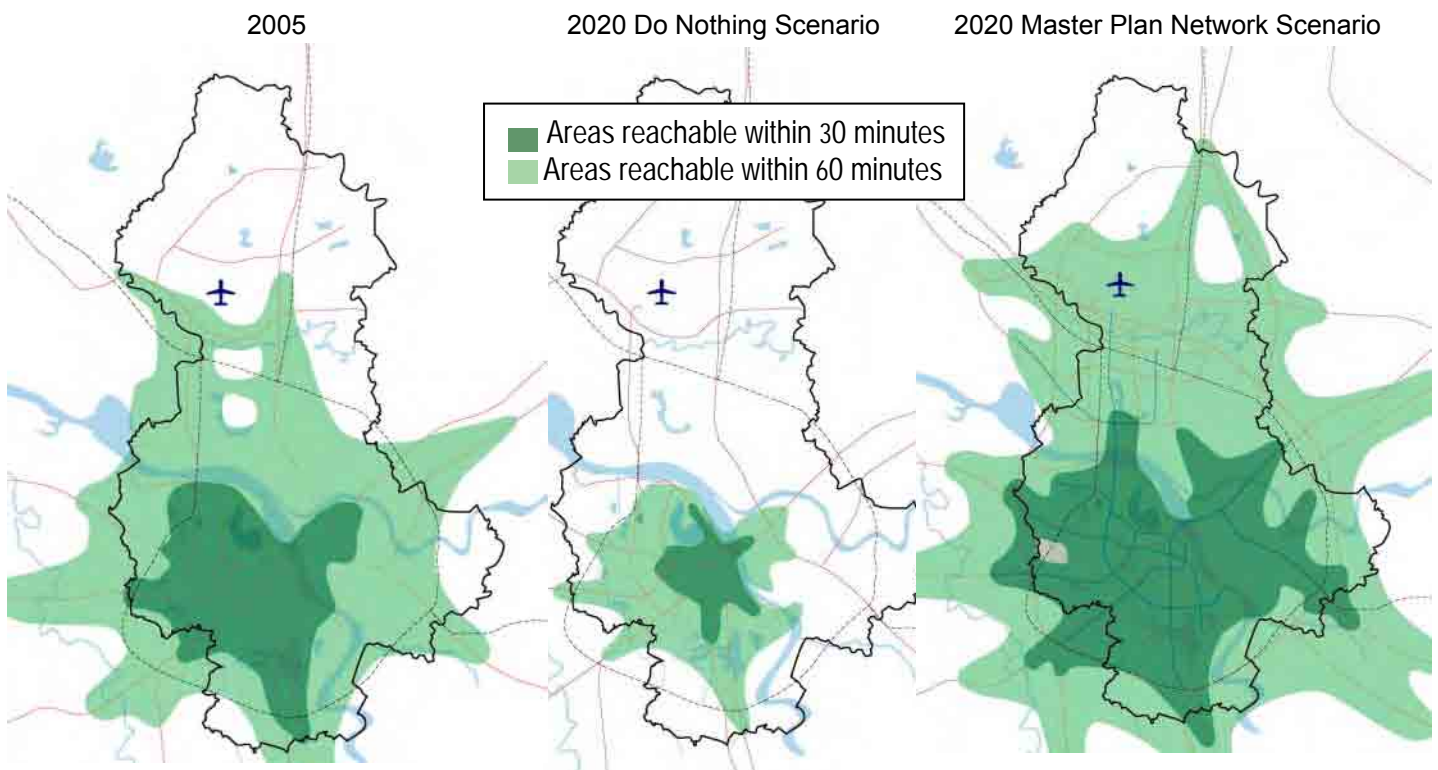
**Table 9.6 Performance of the Road Network**

	2005	2020		
		Do-Something Network <sup>1)</sup>	HAIDEP Network	
			With UMRT	With UMRT & TDM
Average Travel Speed (km/h)	26.0	9.4	22.0	35.2
Average Volume/ Capacity Ratio	0.40	1.13	0.69	0.52

Source: HAIDEP Study Team

1) Including ongoing and committed projects.

**Figure 9.19 Areas Reachable within 30- and 60-Minute Travel to/from Hoan Kiem Lake**



Source: HAIDEP Study Team.

## 9.8 Urban Transportation Development Strategies

9.53 Transportation development is a very important component in urban and regional development because: (i) it affects the locations of industries, the pattern of land uses, and socio-economic activities; and (ii) it requires large amounts of public funding. In Hanoi and its metropolitan area, the supply-demand gap in transportation infrastructure and services is widening due to the rapid progress of urbanization, industrialization, and economic growth, resulting in worsening congestion, increased traffic accidents, and deteriorated environment. The provision of efficient transportation infrastructure and services holds a casting board to sound socio-economic development in the region. For this purpose, the following strategies and actions were identified (see Table 9.7):

- (i) D1 Establish coordinated urban transportation policy
- (ii) D2 Enhance public awareness and understanding of urban transportation issues
- (iii) D3 Promote realization of mass transit-oriented urban development
- (iv) D4 Expand attractive public transportation system
- (v) D5 Strengthen effective management of traffic and demand
- (vi) D6 Focus on need for comprehensive development of transportation space and environment
- (vii) D7 Strengthen capacity for effective transportation sector administration and management

9.54 Of the numerous actions that must be considered to improve the transportation sector, those with strategic importance were selected, as follows:

- (i) Establishment of coordinated mechanism for preparation, monitoring, updating of the urban transportation master plan
- (ii) Development and conduct of capacity building program on transportation planning and management
- (iii) Strengthening of traffic management and safety improvement capacity
- (iv) Completion of key sections of main roads in Hanoi
- (v) Development of urban roads in integration with urban development
- (vi) Comprehensive improvement/development of sidewalk network and space
- (vii) Expansion and improvement of bus services
- (viii) Establishment of clear policy and support measures for paratransits including taxis, xe om, and other services
- (ix) Integrated development of UMRT network
- (x) Establishment of comprehensive parking policy and facility development
- (xi) Comprehensive improvement of traffic environment in CBD
- (xii) Comprehensive improvement of transportation and urban environment in key corridors
- (xiii) Development of water transportation services in Hanoi
- (xiv) Improvement of inter-city public transportation services between Hanoi and satellite cities/urban areas
- (xv) Improvement of public transportation services between rural and urban areas

**Table 9.7 Proposed Urban Transportation Development Strategies and Actions**

Strategy	Action	Monitoring Indicator
D1 Establish coordinated urban transportation policy	D11 Establish effective modal policy to ensure sustainable urban transportation including management of private transportation D12 Establish clear strategy for effective interface of urban and regional transportation network and services D13 Establish rational and transparent framework for prioritization transportation policy and projects D14 Establish workable mechanism for effective coordination among relevant sectors and organizations D15 Establish sustainable funding mechanism to promote private sector participation	<ul style="list-style-type: none"> <li>• A coordinated/integrated policy statement issued by government</li> <li>• Standard project management information system shared by relevant ministries/departments</li> <li>• Roadmap for each action and their progress</li> </ul>
D2 Enhance public awareness and understanding of urban transportation issues	D21 Expand transportation education, campaigns and public information to appeal to mind and heart of the people D22 Implement various experimental projects for policy test with the involvement of communities and transportation users D23 Strengthen research and studies on urban transportation issues	<ul style="list-style-type: none"> <li>• Improved attitude of road users</li> <li>• Response of the people</li> <li>• Progress of projects/actions.</li> </ul>
D3 Promote realization of mass transit-oriented urban development	D31 Develop mass transit and public transportation system in full integration with urban growth strategy, land use and urban development D32 Integrate transportation master plan with overall urban /regional master plan as one coordinated statutory plan D33 Establish effective institutional framework and practical development methods for transit-oriented development (TOD)	<ul style="list-style-type: none"> <li>• Necessary institutional arrangements done</li> <li>• Concrete arrangement for integration of transportation plan with urban/regional plan</li> <li>• Shared understanding of the strategy among stakeholders</li> </ul>
D4 Expand attractive public transportation system	D41 Develop UMRT network as the city's public transportation backbone D42 Expand and strengthen bus system and services in a coordinated manner with UMRT to provide public transportation services in the entire city D43 Develop supplementary public transportation services including taxi, xe om, cyclo, water transportation, school buses, company buses, etc.	<ul style="list-style-type: none"> <li>• No. of public transportation users</li> <li>• Coverage of bus services</li> <li>• People's satisfaction</li> </ul>
D5 Strengthen effective management of traffic and demand	D51 Strengthen traffic control and management to regulate traffic flow for enhanced safety, comfort, and efficiency D52 Enhance enforcement capacity in parallel with social awareness (D2) D53 Establish workable parking policy D54 Introduce phased TDM measures D55 Expand introduction of information technology (IT) for effective transportation management	<ul style="list-style-type: none"> <li>• Changes in road users' attitude</li> <li>• No. of traffic accidents</li> <li>• Road users' satisfaction</li> <li>• Revenue generated</li> <li>• Degree of traffic congestion</li> </ul>
D6 Focus on need for comprehensive development of transportation space and environment	D61 Establish shared concept of comprehensive development of transportation space and environment D62 Strengthen comprehensive management and improvement of transportation corridors D63 Establish comprehensive management of traffic and transportation related issues in CBD D64 Provide adequate transportation environment for pedestrians bicycle users D65 Provide adequate transportation services and environment at district and community levels both in urban and rural areas	<ul style="list-style-type: none"> <li>• Length and area of sidewalks with improved pavements, pedestrian shade, and street lighting</li> <li>• Responses of road users and communities</li> </ul>
D7 Strengthen capacity for effective transportation sector administration and management	D71 Strengthen planning and project preparation capacities including database, planning tools and human resources D72 Develop alternative methods for smooth acquisition of lands for infrastructure development D73 Expand participation of private sector and communities	<ul style="list-style-type: none"> <li>• Availability of database, planning tools</li> <li>• No. of qualified transportation planners, engineers</li> <li>• Land and compensation costs</li> <li>• Extent of private sector involvement</li> </ul>

Source: HAIDEP Study Team.



## 10 URBAN WATER AND SANITATION

### 10.1 Water Supply

#### Planning Conditions

10.1 In formulating the water supply plan, HAIDEP referred to Decision No. 50 issued in 2000, the *Hanoi Metropolitan Area Development Plan* by MOC (July 2005), and the National Strategy for Environment Protection until 2010 and Vision toward 2020 by MONRE (July 2004) for the basic orientation.

10.2 It was assumed that urban water supply services would cover 100% of the future urban areas (590km<sup>2</sup>) including 231km<sup>2</sup> in the southwest, 123km<sup>2</sup> in the southeast, and 236km<sup>2</sup> in the north of the city. Rural areas will also be provided with rural water supply services.

10.3 Water demand in Hanoi was estimated based on the population in the service area and unit water consumption. Results showed that the current total demand of 555,000 m<sup>3</sup>/day would increase to 1.3 million m<sup>3</sup>/day by 2020, 70% of which would come from new urban areas. Domestic use would share 62%, while nondomestic and industrial use would each account for 19% (see Table 10.1).

10.4 The daily maximum distribution of urban water necessary to estimate supply capacity was calculated based on demand, physical loss, and peak factor. Results showed that the total requirement would increase from 872,000 m<sup>3</sup>/day in 2005 to 1.8 million m<sup>3</sup>/day by 2020, or 62% from the southwest, 22% from the north, and 16% from the southeast (see Table 10.2).

**Table 10.1 Estimated Water Demand in Hanoi**

Item		2005			2020		
		Area A	Area B	Total	Area A	Area B	Total
Planning Factors	Population (000)	1,569	1,169	2,738	1,567	2,983	4,550
	Service Coverage (%)	100	80		100	100	
	Unit Consumption (l/c/d)	160	135		190	180	
Water Demand (000m <sup>3</sup> /day)	Domestic	251	127	378	298	538	836
	Non-domestic <sup>1)</sup>	75	38	113	89	162	251
	Industrial <sup>2)</sup>	8	56	64	9	242	251
	Total	334	221	555	396	942	1,338

Source: HAIDEP Study Team.

1) Nondomestic demand was estimated using 30% of domestic demand.

2) Industrial demand was estimated using 3% and 45% to domestic demand for Area A (current service area) and Area B (future urban areas), respectively.

**Table 10.2 Required Daily Maximum Distribution of Urban Water by Service Area**

	2005				2020			
	Southwest	Southeast	North	Total	Southwest	Southeast	North	Total
Net Demand (000m <sup>3</sup> /day)	427	64	64	555	807	212	319	1,338
Physical Loss (%) <sup>1)</sup>	16				15			
DAD (000m <sup>3</sup> /day) <sup>2)</sup>	508	76	76	660	950	248	374	1,572
Peak Factor <sup>2)</sup>	1.35 / 1.10				1.30 / 1.10			
DMD (000m <sup>3</sup> /day) <sup>3)</sup>	674	100	98	872	1,124	292	394	1,810

Source: HAIDEP Study Team.

1) Administrative loss of 21% in 2005 and 10% in 2020 are not considered.

2) DAD = daily average distribution, DMD = daily maximum distribution.

3) Peak factor for domestic and non-domestic use/ industrial use.

#### Selection of Most Appropriate Water Source

10.5 While the policy is to shift water sources from groundwater to surface water, alternative sources were identified and compared. For the Red River basin these include the main stream of the Red River, the Da River, and the Lo River, and for the Thai Binh River basin these

include Cau River, Cong River, and Ca Lo River. A comparison of the water quality of these rivers showed that the Red River water meets all aspects of the Vietnamese standards except for turbidity. Among the Red River, the Lo River, and the Da River, the latter has the lowest turbidity, but exploiting its water would need about 60km of transmission pipeline. The Lo River with higher turbidity than the Da River would also require a transmission pipeline albeit at about 10km shorter than that required for the Da River. The shift to surface water must be done in conformity with the other planned water supply projects including that for the Da River.

10.6 At present, groundwater potential is limited to 700,000 m<sup>3</sup>/day in the south of the Red River and 142,000 m<sup>3</sup>/day in the north of the Red River, as stated in Decision No. 50. Although a more in-depth study is necessary to confirm this potential, it can be said that since groundwater pollution has exceeded the standards in the south<sup>1</sup> further extraction is not recommended. On the other hand, in the north 40,000 to 50,000 m<sup>3</sup>/day can still be extracted.

### Water Supply Plan

10.7 **Water Treatment Plant Capacity Expansion:** In order to meet the future demand, capacity expansion of water treatment plants is necessary. Five such projects which would have a total capacity of 750,000 m<sup>3</sup>/day when completed are proposed. Three projects which will be completed by 2011 will have a total capacity of 500,000 m<sup>3</sup>/day, while the remaining capacity of 250,000 m<sup>3</sup>/day will be completed by 2020 (see Table 10.3). This additional capacity will be allotted to Hanoi's southwest, southeast, and north at 200,000 m<sup>3</sup>/day, 250,000 m<sup>3</sup>/day and 300,000 m<sup>3</sup>/day, respectively. A transmission pipeline network will be provided in five identified service areas (see Figure 10.1). With the completion of the five water treatment plants, the future water demand would be met effectively (see Table 10.4).

10.8 In parallel to the physical improvements, the operation and management of the water treatment plants must be improved through the following:

- (i) Reduction in water leakage and loss through the installation of new pipes, adoption of modern technologies, and use of reliable materials.
- (ii) Establishment of a water quality monitoring system in the Red River and the Duong River to take prompt measures in case of water pollution.
- (iii) Further improvement of the operation and management system.

10.9 The rural water supply system likewise needs strengthening especially in areas which cannot be covered by a piped water system due to difficult topography. The establishment of a committee to promote rural water supply is necessary.

**Table 10.3 Water Treatment Plant Development**

Stage	Plant Name/Location	Capacity (m <sup>3</sup> /day)
First Stage (2006 - 2011)	WS-1 Thanh Tri	150,000
	WS-3 Thuong Thanh	150,000
	WS-5 Dai Mach	200,000
	Subtotal	500,000
Second Phase (2012 - 2020)	WS-2 Lien Mac	50,000
	WS-4 Thuong Thanh	100,000
	WS-6 Dai Mach	100,000
	Subtotal	250,000
Total (up to 2020)		750,000

Source: HAIDEP Study Team

<sup>1</sup> Based on earlier studies and on the HAIDEP water quality survey results, the use of groundwater in some southwestern parts of Hanoi as raw water for domestic use is no longer viable due to heavy pollution.

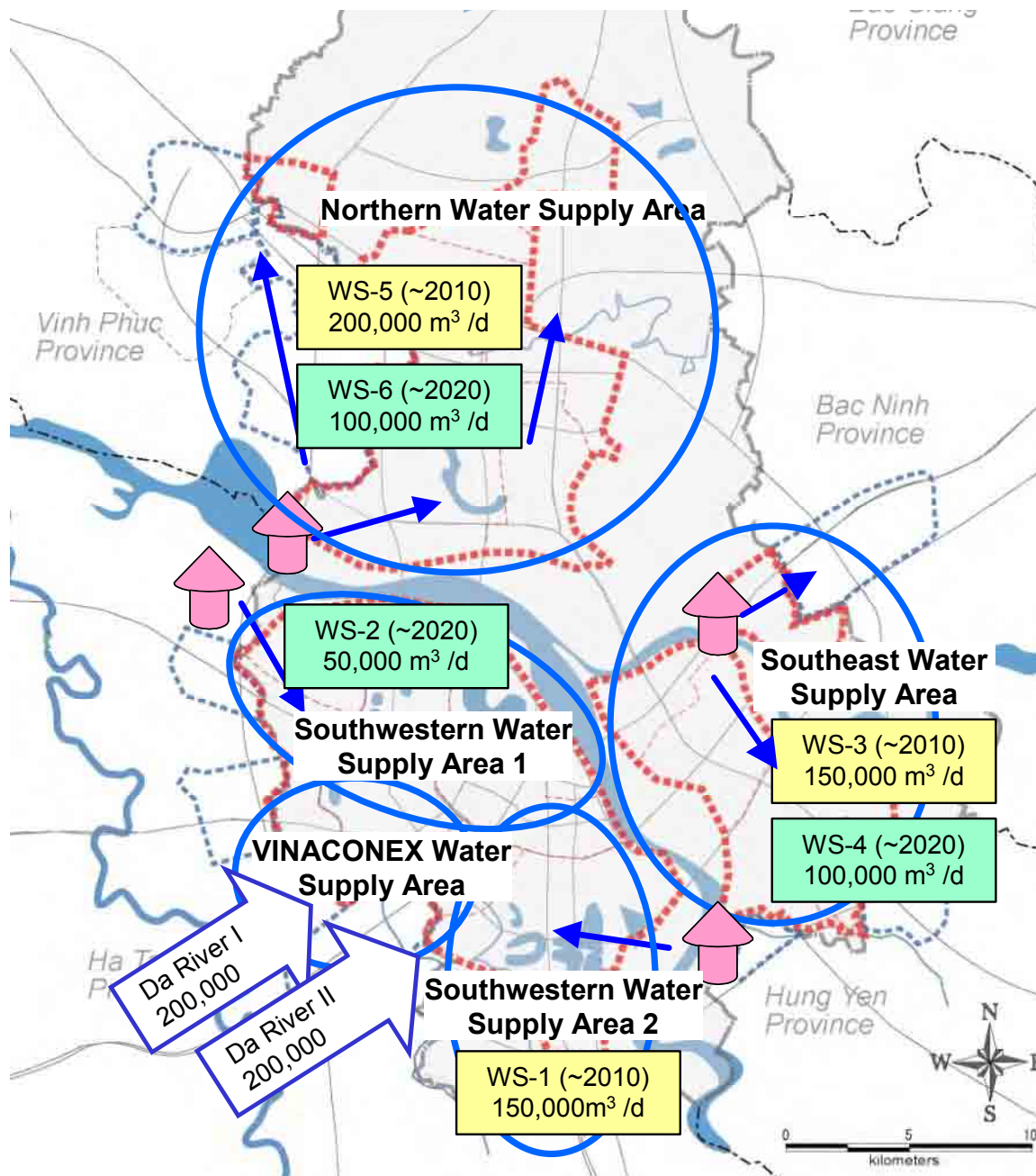
**Table 10.4 Water Treatment Facilities Development Plan**

Target Year	Development Project	Daily Maximum Demand	Supply by Source			Balance
			Ground-water	Surface Water	Total	
Present	Existing Capacity	873	616	-	616	
	Reduction <sup>1)</sup>		(99)	-	(99)	
2010	Ongoing project		204	-	204	
	VINACONEX - 1		-	200	200	
	HAIDEP - 1, 3, 5		-	500	500	
	Subtotal	1,155	721	700	1,421	260
2015	VINACONEX - 2	1,477	-	200	1,621	145
2020	HAIDEP - 2, 4, 6	1,810	-	250	1,874	64

Source: HAIDEP Study Team.

1) Abandonment of groundwater intake.

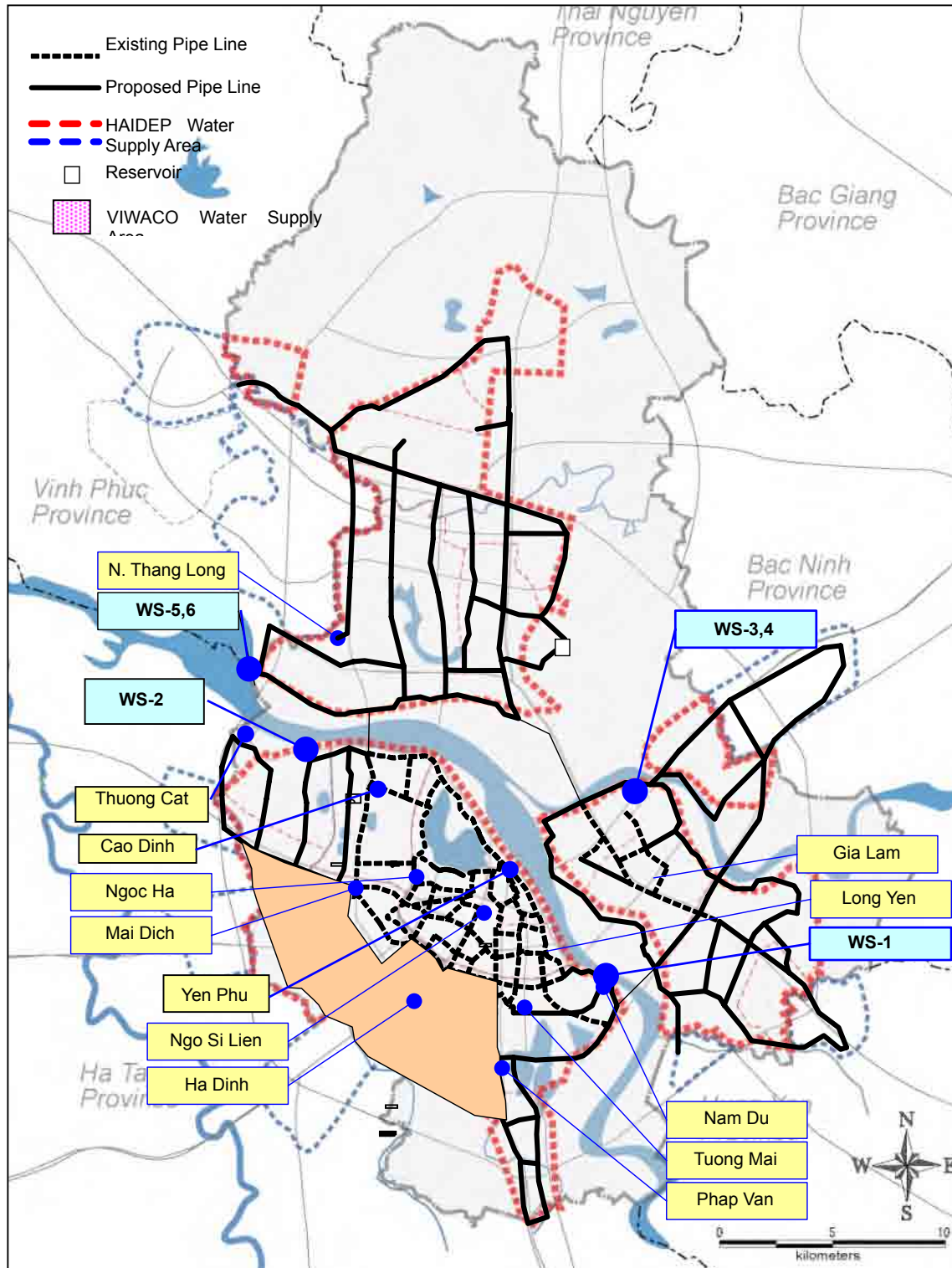
**Figure 10.1 Proposed Water Treatment Plants and their Service Coverage**



Source: HAIDEP Study Team.

10.10 **Transmission Improvement:** Transmission pipelines which will be required in 2020 are outlined in Figure 10.2.<sup>2</sup>

**Figure 10.2 Proposed Transmission Pipeline Network**



Source: HAIDEP Study Team.

<sup>2</sup> The outline of the proposed transmission pipeline network was prepared in late 2005 when the master plan was formulated; therefore the VIWACO water service area shown is separated from the HAIDEP system. The area will be incorporated in the service area of the new water company being formed through a reorganization.

## Organizational Improvement

10.11 The Prime Minister's Decision No. 94/2005/QĐ-TTg, of 5 May 2005, is a road map for some SOEs in the urban water and sanitation sector of Hanoi City. The Decision ratifies the restructuring and reorganization of various SOEs under the HPC, including HWBC and HWBC No. 2. Reorganization plans for the HWBC and HWBC No. 2 have been prepared, following a parent-subsidiary company model. The rationale for this conversion is for SOEs to operate in areas with extraordinary economic and social disadvantages and where the private sector is not interested in investing in. The reorganization is expected to result in less intervention from TUPWS in the water sector. However, the HPC's control over the new company will be retained.

10.12 Under the reorganization plan, HWBC's current administrative section and production units (i.e. WTPs) will be under the parent company which will have three subsidiary groups: (i) single-stockholder companies, (ii) joint-stock companies, whose majority voting powers lie with the parent company; and (iii) associated companies, in which the parent company has a minor stake. Water distribution companies will comprise the single-stockholder subsidiaries. Construction and materials procurement companies will form the joint-stock companies. Associated companies will include VIWACO, a water distribution company that covers part of the southwestern area, which will use water supplied by VINACONEX.

10.13 The organizational structure for the new water company will depend on the progress of facility development and the expansion of service areas. In setting the size of its staff, the number of staff per 1,000 connections can be used as a basic unit. As of 2005, HWBC employed about six staffers per 1,000 connections. HWBC No. 2 has about nine staffers per 1,000 connections. The new water company is expected to have fewer personnel. Supposing that the number of connections will double by 2020 and the number of personnel per 1,000 connections will decrease to five, the number of personnel in 2020 should be around 3,500.

**Table 10.5 Cost of Water Supply Plan**

Area	Item	First Stage	Second Stage	Project Code	
Southwest	Design Capacity (m <sup>3</sup> /day)	150,000	50,000	WS-1 WS-2	
	Construction (US\$ 000)	Facilities <sup>1)</sup>	83,127		27,709
		Land/Compensation	7,500		2,500
		Subtotal	90,627		30,209
O&M <sup>2)</sup> (US\$ 000/yr)	1,643	2,162			
Southeast	Design Capacity (m <sup>3</sup> /day)	150,000	100,000	WS-3 WS-4	
	Construction (US\$ 000)	Facilities <sup>1)</sup>	102,066		34,920
		Land/Compensation	6,900		33,124
		Subtotal	108,966		68,044
O&M <sup>2)</sup> (US\$ 000/yr)	1,643	2,679			
North	Design Capacity (m <sup>3</sup> /day)	200,000	100,000	WS-5 WS-6	
	Construction (US\$ 000)	Facilities <sup>1)</sup>	144,337		72,168
		Land/Compensation	9,200		4,600
		Subtotal	153,537		76,768
O&M <sup>2)</sup> (US\$ 000/yr)	2,160	3,196			
Total	Construction	353,130	179,621		
	O&M	5,446	8,037		

Source: HAIDEP Study Team.

1) Including treatment plant and transmission and distribution line.

2) Including chemical, labor, and miscellaneous costs.

## 10.2 Drainage System

### Planning Conditions

10.14 All future urban areas with 400 km<sup>2</sup> will be provided with a drainage system that can protect them from inundations of up to 310 mm/2 days of rainfall or equivalent to a 10-year return period intensity. This level of rainfall requires a total of 1,026ha of regulating reservoir calculated based on a maximum drainage flow of 2.97 m<sup>3</sup>/s/km<sup>2</sup>.<sup>3</sup>

10.15 In formulating the drainage plan, the Decision No. 35 was referred to, which set a 90% to 100% coverage of Hanoi's urban centers by 2020. Other plans referred to include the 1998 Master Plan, the Urban Drainage and Wastewater Disposal Master Plan and the Urban Environment Improvement Master Plan separately prepared under a 1995 and 2000 JICA studies. Ongoing projects for the To Lich River basin (77.5km<sup>2</sup>) and the North Thang Long area (29.5km<sup>2</sup>), both of which include pumping facilities, regulating reservoirs, drainage channel improvement, and sewer construction, were also reviewed.

10.16 The development of an adequate drainage system in Hanoi requires large regulating reservoirs and pumping stations due to the city's flat topography and the rivers' high water levels, and these require huge investments.<sup>4</sup> On the other hand, regulating reservoirs are used several times a year during the rainy season. In order to use the space more effectively and at the same time maximize the investments, multiple uses of the regulating reservoirs must be considered. In other countries the reservoir space is also used as parks and recreation areas.

### Drainage System Plan

10.17 The To Lich River basin includes the urban core of Hanoi City and the West Lake (about 930ha). Storm water in this basin naturally drains into the Nhue River through four rivers (To Lich, Kim Nguu, Lu, and Set). Following the completion of the new drainage system, storm water will be drained into the Red River by pumps with a 90 m<sup>3</sup>/s capacity through two regulating reservoirs (Yen So Lake and Linh Dam totaling 224ha). Stage 1 of the drainage project in the basin has been completed. Stage 2 will be completed in 2010.

10.18 The Nhue River basin in Hanoi City covers about 9,400ha. Traditionally, the Nhue River is used for irrigation and drainage. According to MARD, the allowable discharge amount is limited to 0.6 m<sup>3</sup>/s/km<sup>2</sup> only because of the river's limited water-holding capacity. Multipurpose regulating reservoirs with large capacities are required to hold excessive storm water.

10.19 When the water level of the Bac Hung Hai River becomes lower than three meters, most of the storm water from Long Bien and Gia Lam districts naturally flows into it. However, when the water level is higher than three meters, storm water in the basin will be pumped into it, the Red River, or the Duong River

10.20 The urban development area in Dong Anh District is planned to be 86.8 km<sup>2</sup> and is divided into four basins. Storm water from two basins located at a relatively high elevation will be discharged either through the Tay canal into the Cau River by pumps or into the Ca Lo River by gravity. In parts of the lower basins, when the water levels in Thiep and Ngu Huyen rivers are 6.5m or less, storm water can naturally drain into the said rivers and because of the basins' relatively high elevations, inundations, even during high water levels, will not be

<sup>3</sup> JICA (1995), Drainage Master Plan Study.

<sup>4</sup> Investments for the ongoing and committed projects up to 2010 total US\$ 170 million. An additional US\$ 100 million for land acquisition will be needed in the next 10 years.

serious. However, downstream of the Ngu Huyen River outside Hanoi City, serious inundations will occur. Proposed drainage measures for the downstream areas in cases where the water level will rise more than 6.5m include the construction of a regulating reservoir and a drainage pump station to drain water from the Ha Bac River into the Red River.<sup>5</sup>

10.21 The urban development promotion area for Soc Son District by 2020 is planned to be 6,090ha. Most of the area is located at relatively high elevations of about 10 to 15m. Storm water in the area is expected to be drained into the Ca Lo River by gravity. A large-scale regulating reservoir is not required in this area but drainage sewers and channels will be installed along the roads.

**Table 10.6 Proposed Drainage System**

Area	Basin	Area (km <sup>2</sup> )	Regulating Reservoir (ha)	Required Pump Capacity (m <sup>3</sup> /sec)	Discharge Point
South of Red River	1. To Lich	77.5	244	90	Red River
	2. Nhue River Left Basin <sup>1)</sup>	53.0	266	36	Nhue & Red
	3. Nhue River Right Basin <sup>1)</sup>	40.0	212	24	Nhue & Branch
	4. Thanh Tri	13.6	-	-	Old To Lich
	Subtotal	184.1	722	150	
North of Red River	5. Dong Anh <sup>1)2)</sup>	86.8	118	44	Ca Lo, Red, Ngu Huyen
	6. Long Bien-Gia Lam <sup>1)</sup>	90.3	186	98	Red, Bac Hung Hai, Ngu Huyen
	7. Soc Son	38.9	-	-	Ca Lo
	Subtotal	216.0	304	142	
Total		400.1	1,026	292	

Source: HAIDEP Study Team.

- 1) Nhue River's left and right basins, Dong Anh and Long Bien-Gia Lam districts have 5, 4, 4, and 3 subbasins, respectively.
- 2) Work is ongoing on 2,950ha under the JBIC-funded North Thang Long-Van Tri Urban Infrastructure Project.

**Table 10.7 Proposed Projects on Drainage System Development up to 2020**

Code	Project Title	Service Area (km <sup>2</sup> )	Project Cost (US\$ million)	Completion
WD-1	Drainage Project for To Lich River Basin (Stage 2)	77.5	239.7	- 2010
WD-2	Drainage Project for Nhue River Left Basin	53.0	456.4	- 2015
WD-3	Drainage Project for Nhue River Right Basin (Phase 1)	28.3	249.5	- 2015
WD-4	Drainage Project for Nhue River Right Basin (Phase 2)	11.7	113.3	- 2020
WD-5	Drainage Project for Long Bien & Gia Lam (Phase 1)	37.3	250.0	- 2015
WD-6	Drainage Project for Long Bien & Gia Lam (Phase 2)	53.0	309.9	- 2020
WD-7	Drainage Project for Dong Anh (Central Part)	57.3	274.2	- 2020
WD-8	Drainage Project for Soc Son	38.9	142.1	- 2020
WD-9	Drainage Project for Thanh Tri	13.6	49.4	- 2020
Total		370.6 km <sup>2</sup>	2,198.8	

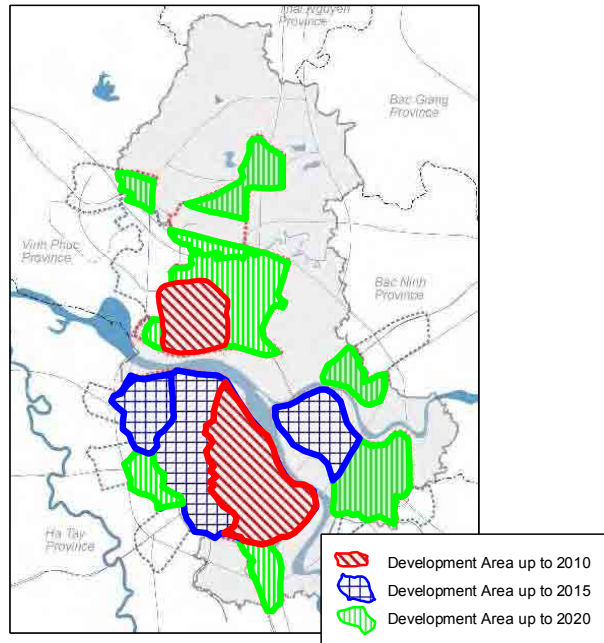
Source: HAIDEP Study Team.

Note: Land acquisition and compensation cost. is estimated about US\$ 656 million, which is 30% of the project cost. Physical contingency and price contingency are not included.

<sup>5</sup> It is expected that after the completion of the North Thang Long - Van Tri Urban Infrastructure Development Project, the drainage condition will improve.

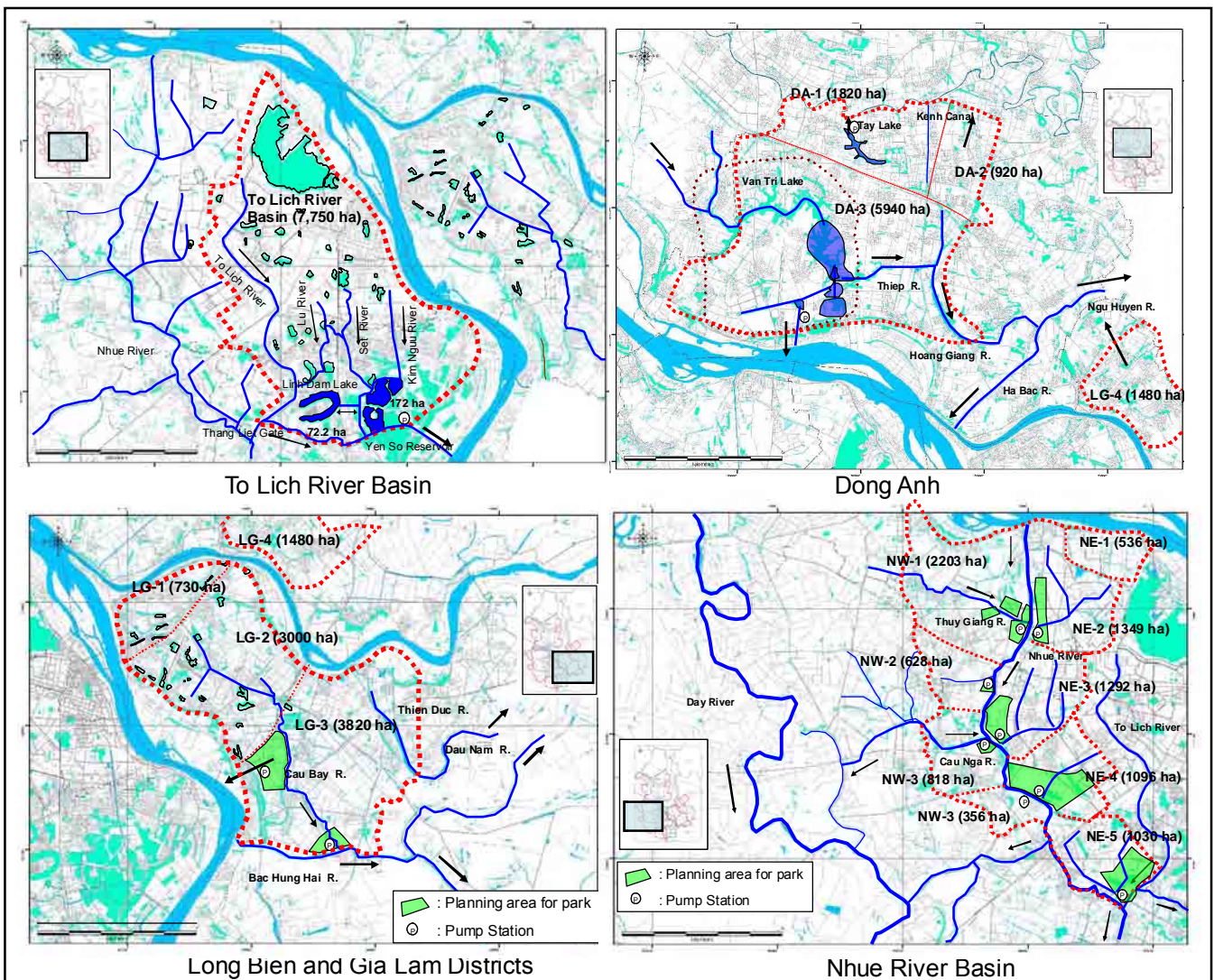


**Figure 10.3 Implementation of Drainage System Development Plan**



Source: HAIDEP Study Team.

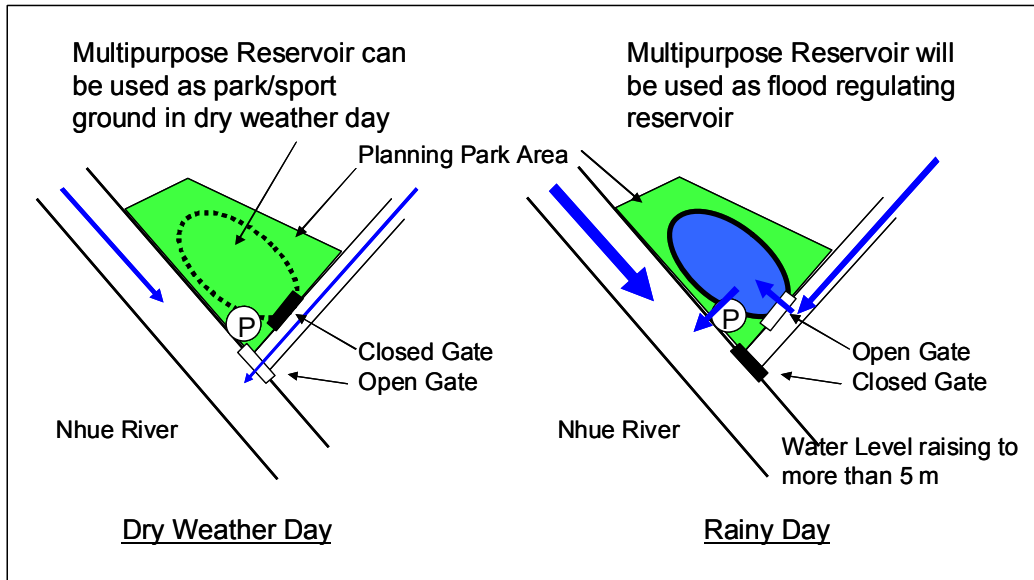
**Figure 10.4 Proposed Drainage System Development**



Source: HAIDEP Study Team.

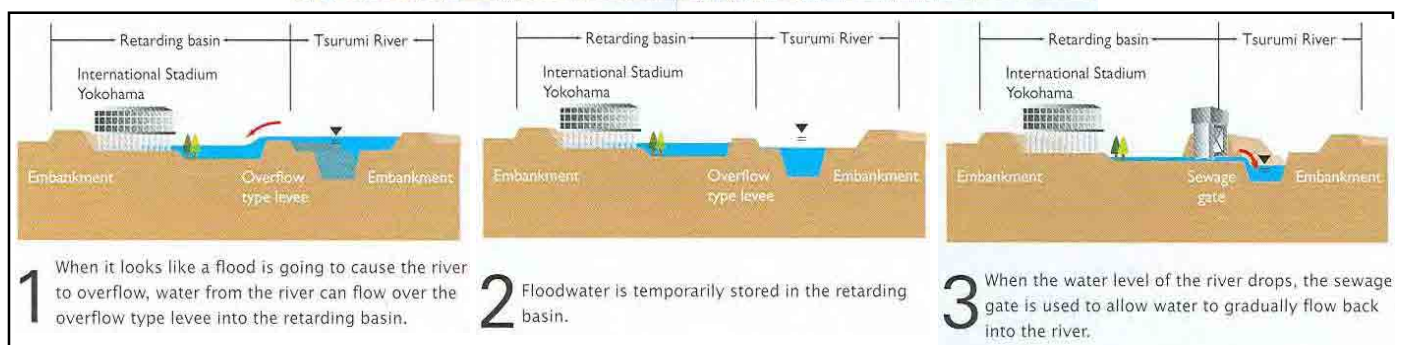


**Figure 10.5 Image of Multipurpose Reservoir**



Source: HAIDEP Study Team.

**Figure 10.6 Example of Multipurpose Flood Regulating Reservoir in Japan**



Source: HAIDEP Study Team.

## 10.3 Sewerage System

### Planning Conditions

10.22 As the development of an adequate sewerage system requires huge investments and a lengthy implementation time<sup>6</sup>, setting priorities and clear criteria for investments is important. Urban areas with an expected population of 100 persons/ha or more will be given initial priority, but final prioritization will be based on factors such as water supply amount, affordability of user charges, environmental standards to be met, groundwater use, and so on.

10.23 **Development of Two Levels of Wastewater Treatment:** A large number of buildings have already been constructed as of now even before a sewerage system could be provided. Hence, as a realistic measure, the development of two types of treatment process is proposed. One is a sewerage system (a centralized wastewater treatment system) with secondary or more advanced treatment processes, and the other is a septic tank for primary treatment as an initial measure which can later be switched to the advanced system after its completion.

10.24 **Collection System:** In the urban core, storm water and wastewater pipes are combined. It is hardly possible to separate them. Hence sewerage systems will be developed by connecting the existing combined drainage system with wastewater interceptors. In the dry season, wastewater will be transported to wastewater treatment plants (WWTPs), and during storms, it will be mixed with rain water and drained into rivers. In the new urban areas, a separated sewerage system is proposed to manage wastewater and storm water separately. The system will require a separated sewer network to directly connect to households.

10.25 **Social and Environmental Considerations:** In general, wastewater treatment plants have negative effects on their surrounding communities either through the emission of odors or by their mere unsanitary conditions, although both can be improved or remedied through suitable designs and operation. In August 2005, two pilot projects located in residential areas of Truc Bac and Kim Lien were constructed with deodorization facilities. Experiences from these pilot plants can be used in the design and operation of new plants.

**Table 10.8 Proposed Sewerage System up to 2020**

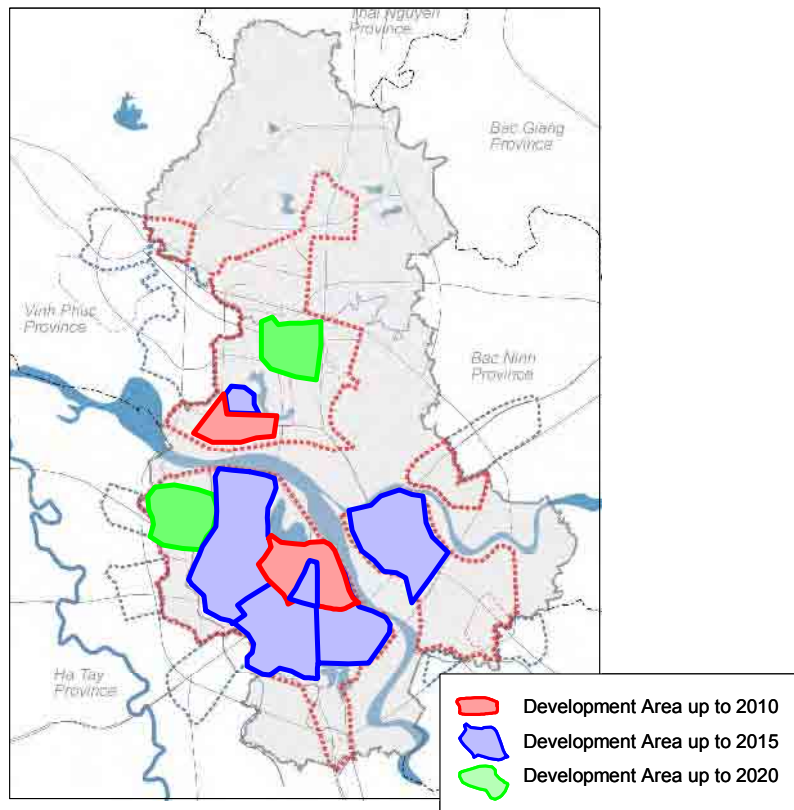
Locatio	Project Code	Basin	Area (ha)	Proposed collection System	Population in Service Area, 2020 (000)	Wastewater treatment Capacity (m <sup>3</sup> /day)	Investment Cost (US\$ mil.)
South of Red River	WW-1	West Lake	310	Separated	42	12,300	28.9
	WW-2	Bay Mau Lake	220	Combined	41	13,300	32.0
	WW-3	Upper Kim Nguu River	750	Combined	250	75,000	167.8
	WW-4	Lu River	470	Combined	142	45,000	137.8
	WW-5	Upper To Lich River	1,300	Combined	299	90,000	231.1
	WW-6	Lower Kim Nguu River	1,700	Combined	287	90,000	138.2
	WW-7	Lower To Lich River	2,500	Separated	441	140,000	53.2
	WW-8	Nhue River Left Basin	3,980	Separated	455	140,000	249.6
	WW-9	Nhue River Right Basin	1,700	Separated	190	60,000	132.1
		<b>Subtotal</b>	<b>12,930</b>		<b>2,147</b>	<b>665,600</b>	<b>1,170.7</b>
North of Red River	WW-10	Long Bien & Gia Lam	3,730	Separated	343	110,000	204.0
	---	North Thang Long	1,300	Separated	100	38,000	-
	WW-11	North Thang Long Extension	500	Separated	60	20,000	36.4
	WW-12	Central Dong Anh	2,200	Separated	198	60,000	145.7
		<b>Subtotal</b>	<b>7,730</b>		<b>701</b>	<b>228,000</b>	<b>386.1</b>
		<b>Total</b>	<b>20,660</b>		<b>2,848</b>	<b>893,600</b>	<b>1,556.8</b>

Source: HAIDEP Study Team.

- 1) The North Thang Long Project was completed with 38,000 m<sup>3</sup>/day of treatment capacity and a service area of 1,300ha
- 2) Priority projects to be completed by 2010.

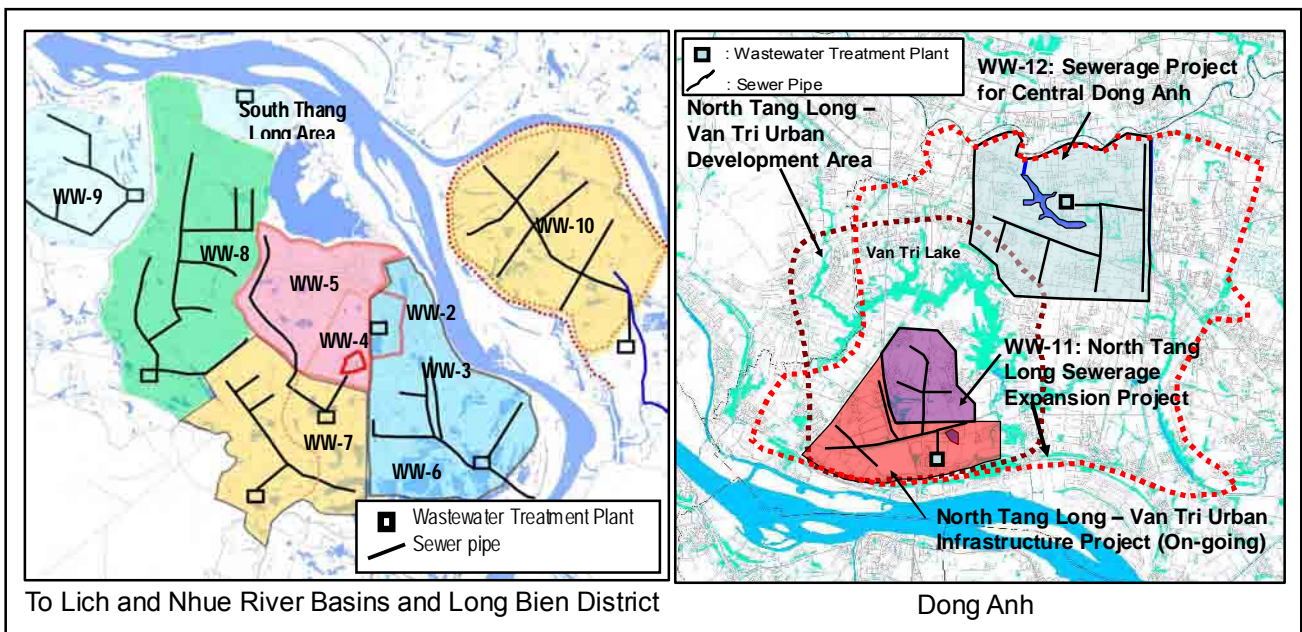
<sup>6</sup> For example, Tokyo took almost 100 years to complete its sewerage system with a secondary treatment level.

**Figure 10.7 Implementation of the Sewerage System Development Plan**



Source: HAIDEP Study Team.

**Figure 10.8 Proposed Sewerage System Development**



Source: HAIDEP Study Team.



## 10.4 Lake Improvement

### Main Issues

10.26 There were 900 lakes and ponds in Hanoi with areas larger than a hectare. But this number and their areas have decreased due to various development projects and encroachments which have also caused the deterioration of hygienic conditions around the lakes, lake water quality, and surrounding landscape.<sup>7</sup> Wastewater interceptor systems have been introduced only in some lakes (see Figure 10.9).

10.27 Lakes and ponds are very important to Hanoi. They have storm water retention function, enhance landscape, and provide amenities, recreational space, aquaculture, agriculture, and as open space in congested urban areas. They are valuable potential resources to promote enhanced environment and image of the city. However, they are inadequately managed except for the major ones. While many organizations are involved in lake management such as HSDC, district and commune offices and various companies, there is no comprehensive and integrated lake improvement plan.

### Improvement Plan

10.28 Lake and pond management program must involve the following objectives:

- (i) Protect lakes from illegal construction, encroachments, solid waste dumping, etc.
- (ii) Develop lakefronts with promenades/walkways, green spaces, and other amenities around the lakes.
- (iii) Increase storm water retention capacities of the lakes by increasing their effective depths.
- (iv) Improve water quality of the lakes.

10.29 A lake improvement strategy was worked out for main areas including the To Lich and the Nhue river basins, as well as for Long Bien, Gia Lam, and Dong Anh districts in integration with the overall drainage system development plan. In order to keep water flowing in rivers and lakes, it is proposed that they be linked and that the Red River water be diverted to provide environmental maintenance (see figures 9.10 and 9.11).

10.30 Necessary measures for improved lake management include the following:

- (i) Control of water levels to regulate floods through pumps and gates in the lakes.
- (ii) Maintenance of lake structures such as revetments, pumps, and gates.
- (iii) Monitoring and improvement of water quality.
- (iv) Cleaning of lake water surfaces and surrounding areas.
- (v) Management of commercial, cultural, and tourism activities in/around the lakes.
- (vi) Strengthening of lake management organization and institutional arrangements.



Lake Condition before Restoration ( 25 August 2003).

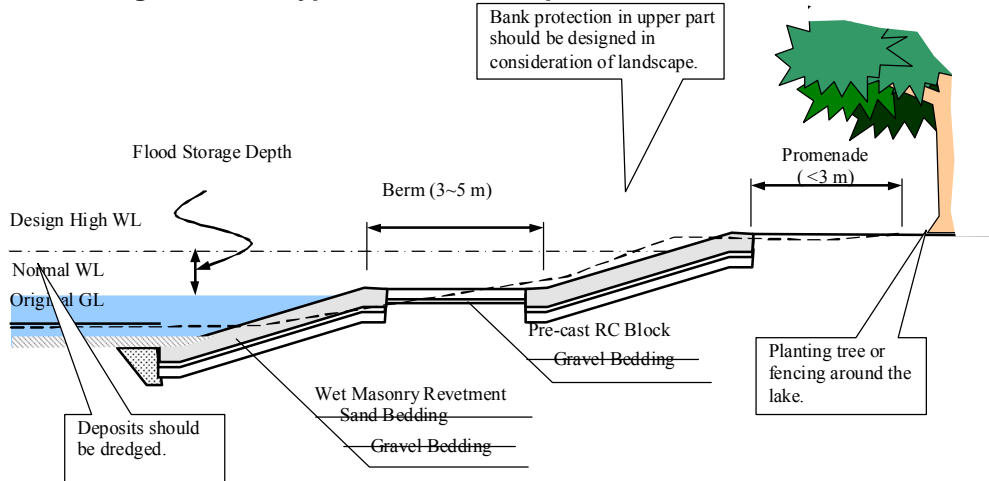


Lake Condition after Restoration (12 July 2005).

Note: Pictures taken by the HAIDEP Study Team.

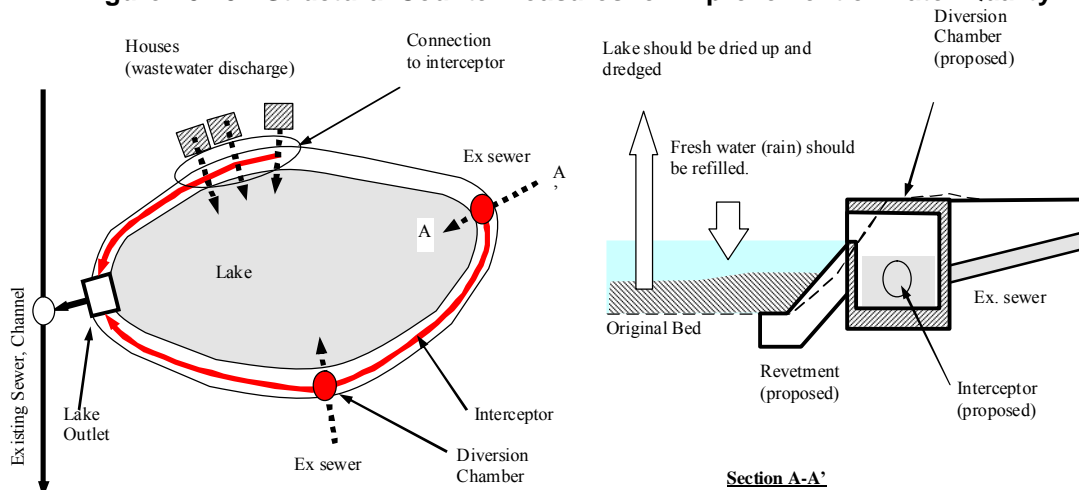
<sup>7</sup> Results of a water quality survey conducted in HAIDEP on 50 lakes in existing urban areas indicated that water quality in 23 lakes is substandard.

**Figure 10.9 Typical Structural Improvement of a Lake**



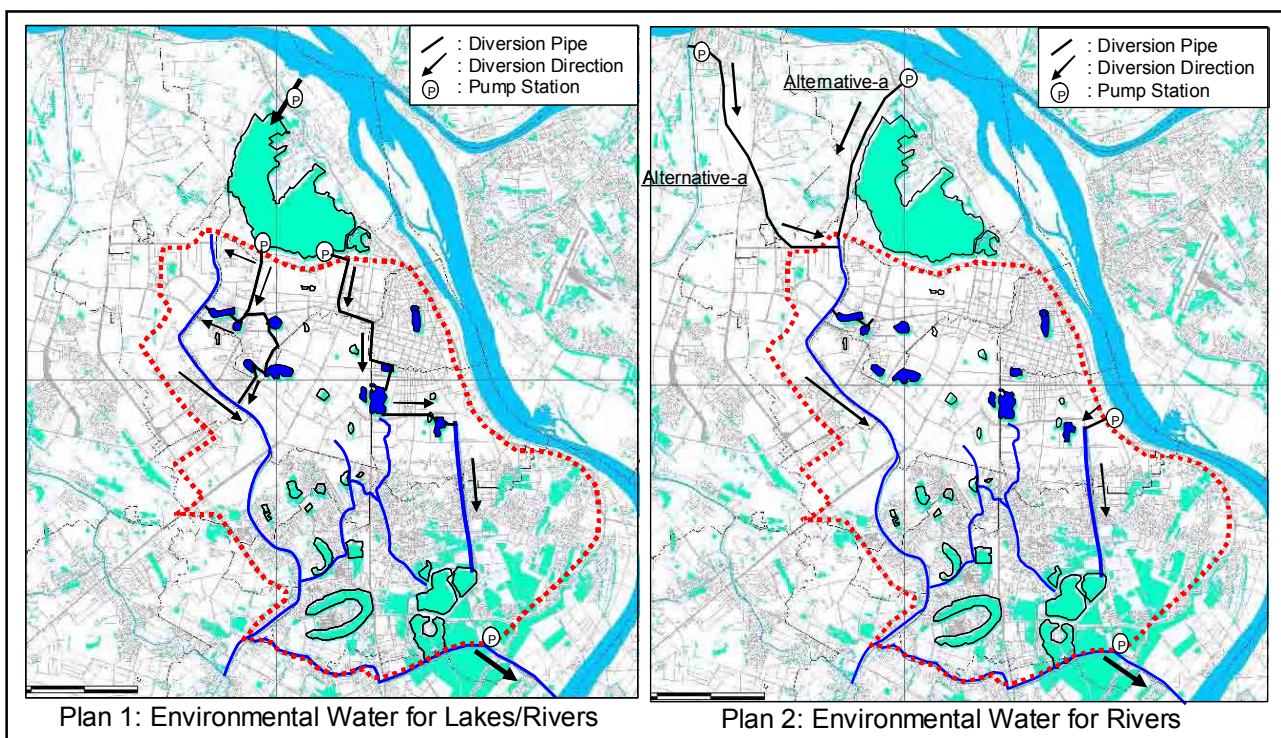
Source: HAIDEP Study Team.

**Figure 10.10 Structural Countermeasures for Improvement of Water Quality**



Source: HAIDEP Study Team.

**Figure 10.11 Layout of the Diversion of Environmental Maintenance Flow**



Plan 1: Environmental Water for Lakes/Rivers

Plan 2: Environmental Water for Rivers

Source: HAIDEP Study Team.

## 10.5 Flood Protection

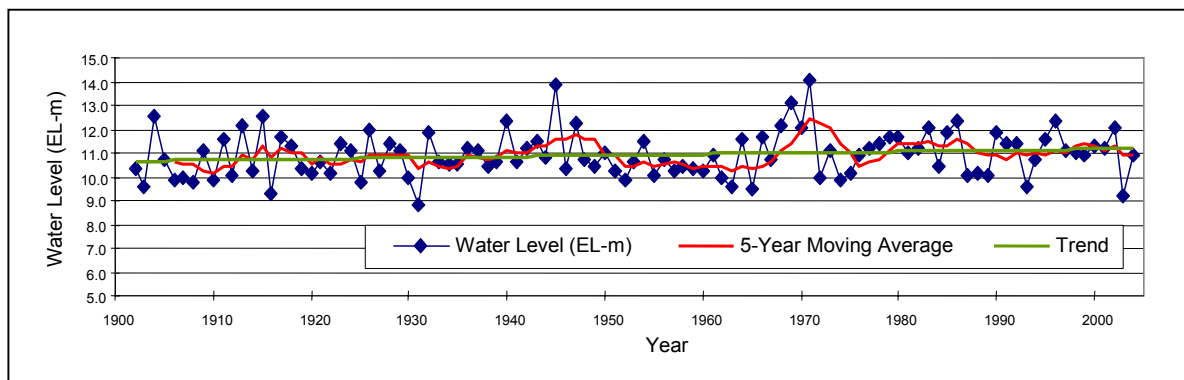
### Main Issues

10.31 Floodwaters from the Red River are a constant threat to the city. While the average highest water level during the last century reached around 11m, the height of urban areas is about 9m in Hoan Kiem. The 1971 flood reached 14m high and caused serious damage to the city.

10.32 From 1998 to 2002 dyke strengthening projects were carried out on the right bank of the Red River with ADB financing and consisted of the following: (i) constructing walls and placing additional soil at the foot of dykes; (ii) pavement improvement; and (iii) grouting to fill voids in embankments, etc. The freeboard (difference between crest elevation and design water level) was also increased in these sections. Dyke portions not covered by the project have been left as they were, including those along the Duong River. This flood protection component aimed to prevent flooding in Hanoi through structural/physical and nonstructural/nonphysical measures.

10.33 However, about 160,000 people residing in areas outside the dyke remain vulnerable to flooding. And as even as they are potential flood victims, they also cause various negative impacts such as riverbank erosion and water pollution.

**Figure 10.12 Annual Highest Water Levels of the Red River in Long Bien, 1902-2004**



Source: HAIDEP Study Team.

**Table 10.9 Dimensions of Dykes along the Red and Duong Rivers**

Description	Red River		Duong River	
	Left Bank	Right Bank	Left Bank	Right Bank
1. Beginning Point (Location)	km49+100 (WH-1)	km48+575 (Dong Da)	Km0+600 (WH-13)	km1+241 (Gia Thuong)
2. Ending Point (Location)	Km76+615 (Bat Trang)	Km85+492 (WH-34)	Km21+919 (Thin Liet)	Km20+795 (Chi Dong)
3. Total Length	27.515km	36.917km	21.319 (22.547km)	19.554km (21.447km)
4. Crest Elevation	EL.14 to 14.5m	EL.14 to 14.5/15.2m	EL.11.6 to 15.2m	El.12.2 to 14.5m
5. Crest Width	6m	6m	5m	5-7m
6. Slope				
– Riverside	1/2 - 1/3	1/2 - 1/3	1/2	1/2 - 1/3
– Landside	1/2 - 1.3	1/2 - 1/3	1/3	1/2 - 1/3

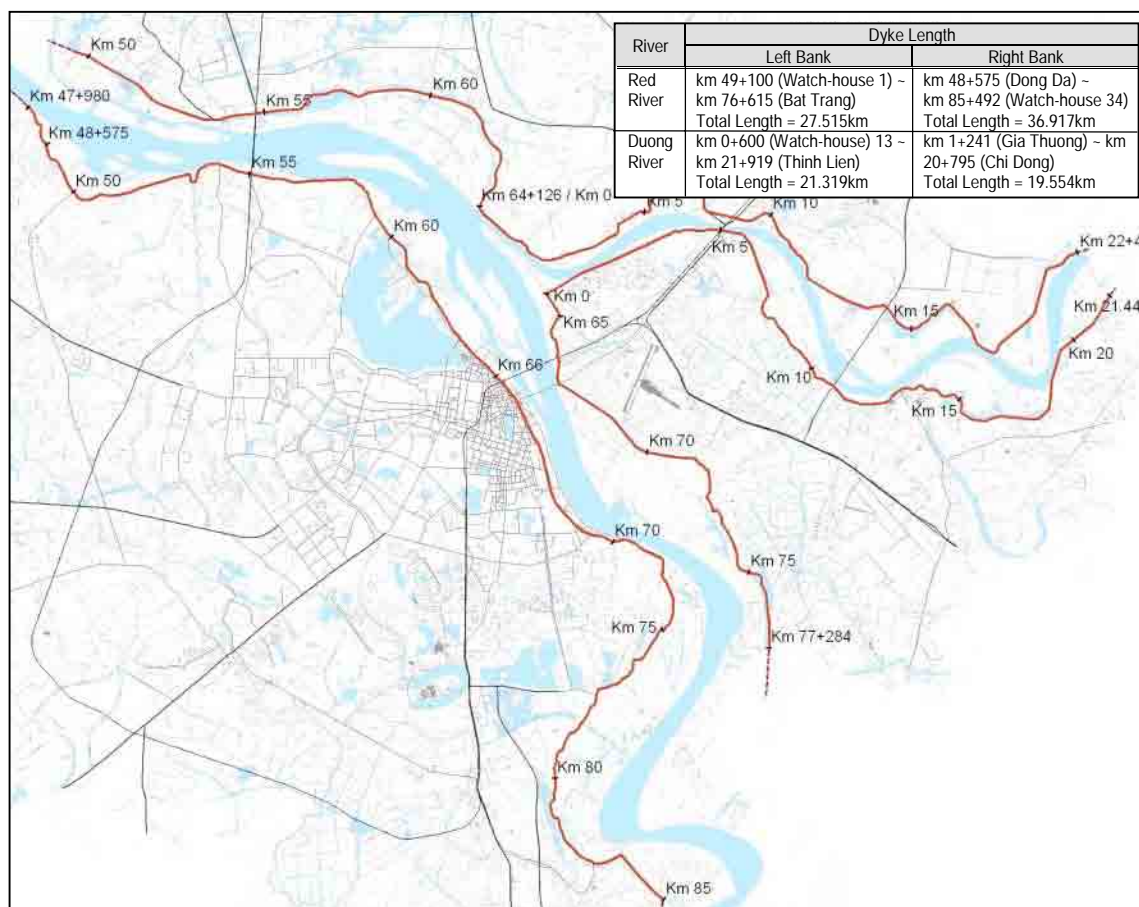
Source: HAIDEP Study Team.

Notes: 1) Total length was calculated by the Study Team by referring to the 1994 dyke system map with a scale of 1:100,000. Those in parentheses were abstracted from the 1998 Master Plan.

2) WH = watch-house.



**Figure 10.13 Dyke Alignment around Hanoi City**



Source: HAIDEP Study Team.

### Impact of Outside-the-Dyke Area Development on Red River Water Flow

10.34 Flood flow or flood discharge capacity of the areas was assessed through a conventional method. The width of the Red River, between the Long Bien and Chuong Duong bridges, were estimated based on a topographic map with a scale of 1 to 10,000. The depth was based on the lowest water level. Ground elevation was also estimated as explained above on the elevation of high water channels.

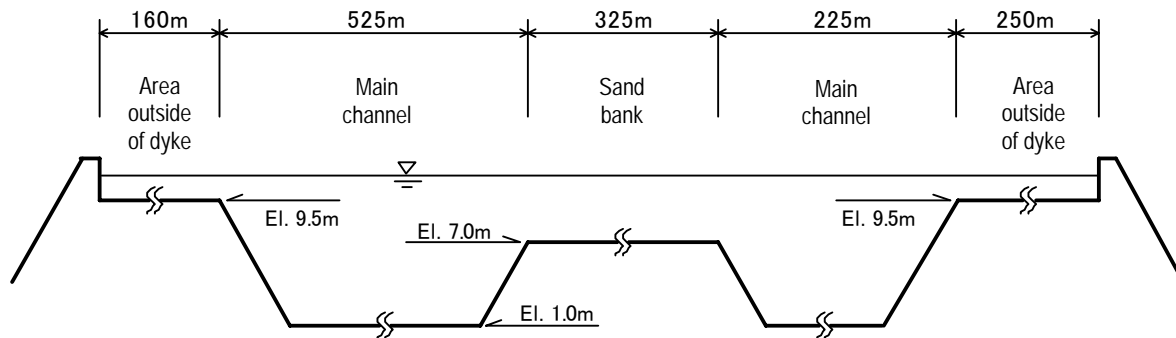
10.35 The impact of development in areas outside the dyke on flood flow in the Red River will be most critical at the narrowest section of the Red River between the Long Bien and Chuong Duong bridges. The river cross-section in this area was estimated based on a topographic map and the record of water levels (see Figure 10.14). The discharge of the flood flow with the highest water levels recorded in 1969 and 1971 was estimated for this section and for the areas outside the dyke (see Table 10.10). Results indicate that only 2 to 3% of flood waters in the Red River flow to areas outside the dyke.

10.36 Although the developments in areas outside the dyke will likewise not hinder flood flow in the Red River significantly, there are some critical issues that must be addressed comprehensively from the urban development and management viewpoints, such as the:

- (i) Unhygienic conditions due to frequent inundations.
- (ii) Difficulty in answering to emergency situations.
- (iii) Erosion of slopes between high and low water channels due to high water velocity.



**Figure 10.14 Assumed Cross-section of Red River between Long Bien and Chuong Duong Bridges**



Source: HAIDEP Study Team.

**Table 10.10 Estimated Discharge during Floods in High Water Channels and between Whole Sections**

Date	Water Level (m)	Estimated Discharge (m <sup>3</sup> /sec)		(B)/(A) (%)	WSG <sup>1)</sup>
		Section between Long Bien & Chuong Duong Bridges (A)	Areas Outside the Dyke (B)		
Aug.19,1969	13.12	17,300	345	2	1:23,000
Aug.22,1971	14.02	19,600	500	3	1:23,500

Source: HAIDEP Study Team.

1) Water surface gradient (WSG) was obtained through trial estimates of given water levels and discharges in the section between Long Bien and Chuong Duong bridges.

### Proposed Improvement Direction

10.37 The proposed measures are: (i) to strengthen dykes around Hanoi, secure remaining heights, and strengthen deteriorated embankments, (ii) to develop an early warning and flood fighting/evacuation system to ensure a timely and periodic warning system, (iii) to conduct a study on the redevelopment of the Day River flood diversion channel to divert flood upstream and help protect Hanoi.

**Table 10.11 Potential Flood Protection Projects**

Project No.	Project Title	Project Purpose/Profile
WF-1	Red River Dyke Strengthening Project (stage 2)	This project aims at strengthening works with the same specifications as those in the ADB project to ensure safety against flood on the right bank of the Red River.
WF-2	Duong River Dyke Strengthening Project (stage 1)	Following the project (WF-1), strengthening works with the same specifications as those in the ADB project to ensure safety against flood on the right bank of the Duong River.
WF-3	Duong River Dyke Strengthening Project (stage 2)	Following the project (WF-2), strengthening works with same specifications as those in the ADB project to ensure safety against flood on the left bank of the Duong River.
WF-4	Redevelopment of Day River Flood Diversion Channel	This project aims at the regeneration of the function of the Day River including a diversion scheme from the Nhue River to the Day River.
WF-5	Development of Flood Early Warning System	This project aims at introducing methods and techniques for the timely dissemination of flood alarms from the middle to the lower reaches as well as increasing the capabilities in early flood warning.

Source: HAIDEP Study Team.

## 10.6 Solid Waste Management

### Main Issues

10.38 There are two master plans on solid waste management (SWM), the 1998 Master Plan and the Environment Master Plan up to 2020 prepared by JICA (JICA EMP). Except for some points, the contents of both master plans are almost identical due to the similarities in the prepared terms. Estimates on the total amount of waste generation were 696,613 tons/year for 2005 and 1,421,868 tons/year for 2020 in the 1998 Master Plan. Under the JICA EMP, the estimate is 1,173,110 tons/year in 2020 based on that year's population forecast of about 3.5 million. This estimate will increase if it is based on a population of 4.5 million, according to the HAIDEP Master Plan.

10.39 In Nam Son, a large-sized landfill has been constructed with a receiving capacity of 12.4 million m<sup>3</sup> (Phase 2). Although it has been estimated that the site's capacity could last until January 2018, it can be full even before that year because wastes are expected to increase more than what was forecasted in both master plans due to future population growths.

10.40 Regarding medical wastes, infectious wastes are disposed of in the existing incinerator in Cau Dien, whose capacity should be expanded.

10.41 A composting plant with an annual treatment capacity of 250,000 tons was proposed to reduce waste. However, only one with a capacity of 50,000 tons was constructed. Therefore, one of the most significant problems is that capacity for solid waste disposal would not be enough to handle the volume or quantity of waste generation in the near future. According to the above estimate, the Nam Son landfill will be closed by 2012 when no mitigating measure is put in place. This will be more than 5 to 6 years earlier than its original schedule of 2018. If some waste reduction alternatives, such as composting, materials recovery or incineration, will be introduced, the lifespan of the landfill may be prolonged by a few years.

### Strategies and Proposed Projects

10.42 Following the National Environmental Strategy, the waste reduction rate ( the rate of the amount of reused and recycled waste by the amount of total collected waste) should reach more than 30% until 2020 through the promotion of the three Rs (reduce, reuse, recycle).

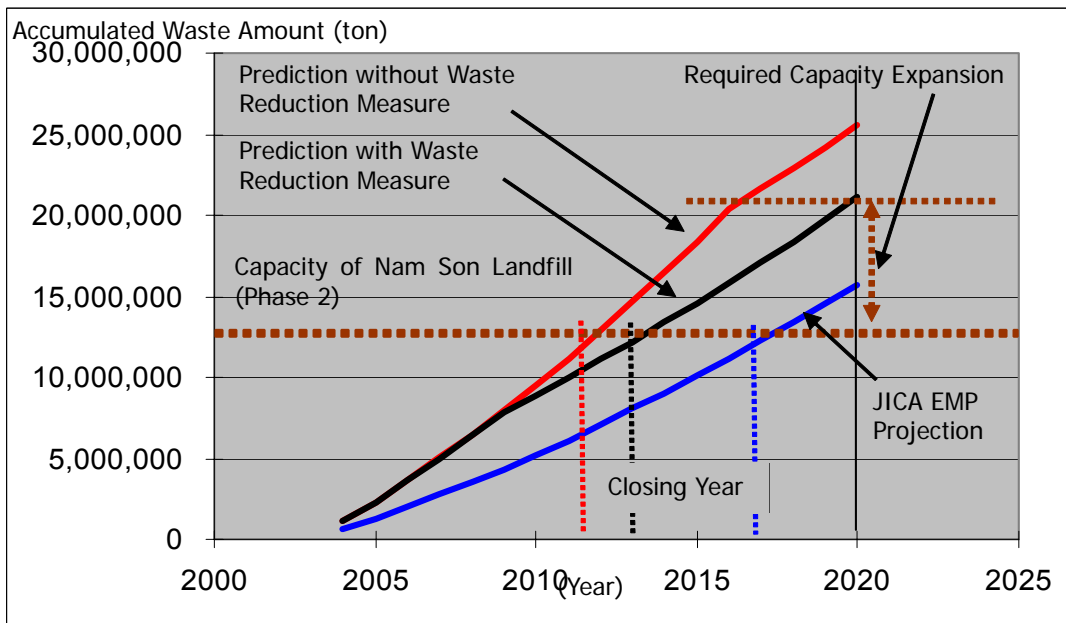
10.43 Based on the proposed waste flow, possible facilities may be needed to implement the measures on solid waste management (see Table 10.12) including transfer stations, recycling centers, composting plants, incinerators, or other intermediate treatment plants, although a detailed feasibility study on such treatment facilities is definitely needed.

**Table 10.12 Proposed Facilities for Solid Waste Management**

Objective	Proposed Project (Facility)
Effectively collect and transport waste	Construction of transfer stations with suitable equipment and vehicles.
Secure capacity for final waste disposal	Capacity expansion of Nam Son landfill (Phase 3).
	Construction of other landfill sites if the capacity of Nam Son landfill is not enough.
Reduce waste for collection and transportation or final disposal.	Construction of recycling center, which is mainly waste separation and compacting/packaging equipment for recyclable materials.
	Construction of intermediate treatment facilities such as composting facilities, incinerators or other facilities based on the pilot scale experiences or detail facility plan including feasibility study.
	Introduction of source separation system for efficient waste reduction at above facilities.

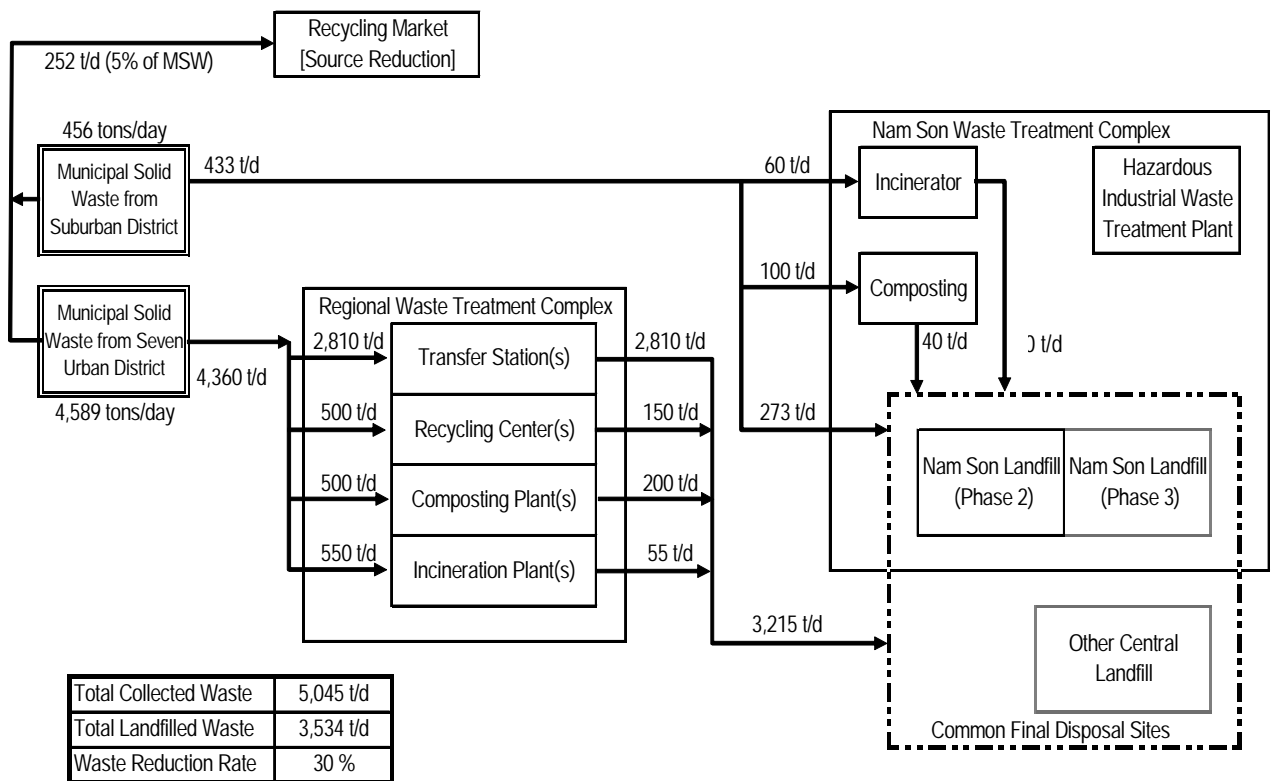
Source: HAIDEP Study Team.

**Figure 10.15 Forecasts on Accumulated Waste Volume in Nam Son Landfill**



Source: HAIDEP Study Team.

**Figure 10.16 Proposed Solid Waste Management Flow in Hanoi City, 2020**



Source: HAIDEP Study Team.

## 10.7 Cemetery

### Main Issues

10.44 In general, cemeteries are frowned upon in the city, and probably in the whole of Vietnam, since people look at them as unhealthy (eg they believe that ground burials pollute groundwater cemeteries), an outlook which is compounded by the traditional stark image of a cemetery. Therefore, securing land for new cemeteries around Hanoi, especially those near residential areas, has become very difficult due to objections from nearby residents. The main issues thus are as follows:

- (i) Limited capacity for new graves in the existing cemeteries in and around Hanoi City.
- (ii) Increasing number of existing graves that need to be relocated, which are presently scattered in and around the urban center, due to land requirements for future housing and infrastructure development.
- (iii) Increase in the residents in Hanoi City who desire to establish their family member's graves in and around Hanoi City rather than in their home provinces,
- (iv) Less available lands for cemeteries and graveyards in new settlements due to the high land value in such areas.

### Possible Measures based on Japan's Experiences

10.45 Referencing Japan's past experiences on cemetery development and urban growth, the following are the recommendations for cemetery development in and around Hanoi City:

- (i) Rational land use by relocating and integrating small cemeteries managed by local authorities and other graveyards scattered all over the city, especially those located in sites in and around the city center which are potential sites for future development.
- (ii) Involvement of potential project-affected communities, from planning the development of new cemeteries and/or the expansion of existing ones, should be actively promoted.
- (iii) Development of cemetery gardens/parks combined with environmental buffer zones should be promoted, especially for future urban development.
- (iv) Laws and regulations on technical and social standards for cemetery development, including necessary environmental conditions and measures, public involvement processes in the planning stage, as well as permission procedures, should be enacted.
- (v) The practice of cremation should be encouraged for its potential to prevent environmental pollution, e.g. the spread of infectious diseases through groundwater contamination in the case of ground burials. An added benefit from adopting cremation is the smaller land it requires compared with traditional burial practices. However, it should be considered that the selection of burial methods is still dependent on culture and religion.

### Proposed Options

10.46 It is proposed that the current practice of ground burials be modified in a way that common high-density, large-scale cemeteries are accepted and proper locations are found within reasonable distances from Hanoi. It is the HAIDEP Study Team's opinion that the cemeteries be provided in green belts as proposed in Chapter 12 Environment.

## 10.8 Urban Water and Sanitation Development Strategies and Actions

10.47 The proposed strategies and actions for urban water and sanitation development are explained in Table 10.13.

**Table 10.13 Proposed Urban Water and Sanitation Development Strategies and Actions**

Strategy	Action	Monitoring Indicator
E1 Enhance public awareness and understanding of water, sanitation and related environmental issues	E11 Establish "Water Forum" with participation of extensive stakeholders to discuss and disseminate water, water environment and related issues E12 Conduct regular media campaign on water and sanitation	<ul style="list-style-type: none"> <li>• Progress of actions</li> </ul>
E2 Ensure stable supply of safe water for all	E21 Address water pollution issues immediately E22 Expand water supply coverage E23 Shift gradually from groundwater to surface water as raw water source E24 Improve operational efficiency of water supply	<ul style="list-style-type: none"> <li>• Water quality</li> <li>• Water supply coverage</li> <li>• Water loss</li> <li>• % of surface water</li> </ul>
E3 Promote improvement of sanitary conditions in urban areas	E31 Improve drainage conditions E32 Develop sewerage systems E33 Improve solid waste management E34 Establish workable mechanism for consolidation of graveyards	<ul style="list-style-type: none"> <li>• Coverage</li> <li>• Degree of inundations</li> <li>• Progress of actions</li> </ul>
E4 Promote improvement of water quality of lakes, ponds, and rivers	E41 Monitor water quality of lakes, ponds, and rivers in Hanoi E42 Develop water quality improvement measures E43 Establish common guidelines on waterfront use and management in coordination with urban land use and communities	<ul style="list-style-type: none"> <li>• Water quality</li> <li>• Progress of actions</li> </ul>
E5 Protect urban areas from flood and promote disaster preparedness	E51 Ensure urban areas shall be protected from flood E52 Establish effective early warning system E53 Redevelop outside-of-dyke area	<ul style="list-style-type: none"> <li>• Degree of floor</li> <li>• No of households in outside of dyke area</li> </ul>

Source: HAIDEP Study Team

10.48 Of the proposed actions, those with strategic importance are the following:

- (i) Development of surface water resources and related water distribution systems
- (ii) Development of drainage systems with multipurpose flood protection reservoir
- (iii) Development of sewerage system for the urban core
- (iv) Development of water flow diversion system for environmental maintenance of rivers and lakes