

1.3.6 Parks, Open spaces and Greenery

(1) Definition of Parks, Open spaces and Greenery

In this section, various types of public parks and open spaces in urban spaces will be discussed as illustrated in Figure 1.3.25. These urban spaces provide the citizens living in urban areas with some of important functions such as (a) providing spaces for recreation, (b) improving landscape, (c) mitigating disasters, and (d) conserving environmental conditions.



Source: JST

Figure 1.3.25: Definition of Public Parks, Open spaces and Greenery

Table 1.3.37: Functions to be expected of Public Parks, Open spaces and Greenery in Urban Areas

Important Functions	Details
(a) Providing spaces for recreation	-For being relax or exercising for the citizens -For tourism
(b) Improving Landscape	-For better landscape and scenery -For beauty
(c) Mitigating Disasters	-For flood control -For avoiding fire spread
(d) Conserving Nature Conditions	-For wildlife living -For mitigating environmental pollutions

Source: JST

Generally, urbanized areas are covered mainly with artificial surfaces such as asphalt and concrete, used for buildings, roads and so on. Therefore, public parks, open spaces and greenery should be provided to cater important functions mentioned above, which are otherwise scarce in urban areas. Considering the urban development in the future, it is essential to improve public parks, open spaces and greenery in order to achieve the balanced and sustainable urbanization and economic growth.

Table 1.3.38 shows the important functions that are normally expected in each type of space in urban areas. Public parks must provide all functions, but in general it is difficult to construct new public parks due to land acquisition and high land price. Therefore other types of open spaces need to be considered from the view point of all functions in balance.

Table 1.3.38: Functions expected in each type of spaces

Type of spaces		(a) Providing Spaces for Recreation	(b) Improving Landscape	(c) Mitigating Disasters	(d) Conserving Nature Conditions
Public Park		Much Expected	Much Expected	Much Expected	Much Expected
Public Spaces which have equivalent functions to Public Parks	Zoo, Botanical Garden	Much Expected	-	-	Expected
	Stadium	Much Expected	-	-	-
Public Institutions which provide large open spaces	Roadside	Expected	Much Expected	Much Expected	Expected
	Roundabout	-	Much Expected	-	-
	Riverside	Expected	Much Expected	Much Expected	Much Expected
	School	Expected	-	-	-
	University	Expected	-	-	-
	Government Office, etc.	Expected	Expected	-	-
Private Spaces which have equivalent functions to Public Parks (accessible)	Temple	Much Expected	Expected	-	-
	Golf Course	Much Expected	-	-	-
	Fishing Pond	Much Expected	-	Expected	-
	Sports Ground	Much Expected	-	-	-
	Restaurant, Hotel, etc.	Expected	Expected	-	-
Private Spaces which provide large open spaces (not accessible)	Protected Area	-	-	Much Expected	Much Expected
	Specific Land Use Area	-	-	Much Expected	Much Expected
	Other Important Area (Marsh)	-	-	Much Expected	Much Expected

Source: JST

(2) Current Urban Master Plan

In the current urban master plan issued in 2001, a map of “Public Park and Green Area” is specified and some areas are regulated as “NE” areas concretely as one of the land use zones. Some large-scale areas of “NE” are That Luang Marsh, Don Chan Island”, Xiengxou Island, Nongping Marsh, Nongtha Marsh and so on. The total area is 1,407 ha which corresponds to approximately 7% of the whole urban area. This area seems to include public parks, paddy field and marsh, exclude natural green space and forest preservation as shown in Table 1.3.39.

Other Relevant Laws, Regulations and Plans can be referred to the Appendix-3.1.

Table 1.3.39: Public Park and Green Area

Type of spaces	The number	The area (ha)
Public Park	13	66.84
Natural Green Space	2	230.50
Paddy Field	7	550.25
Marsh	13	788.00
Forest Preservation	3	-

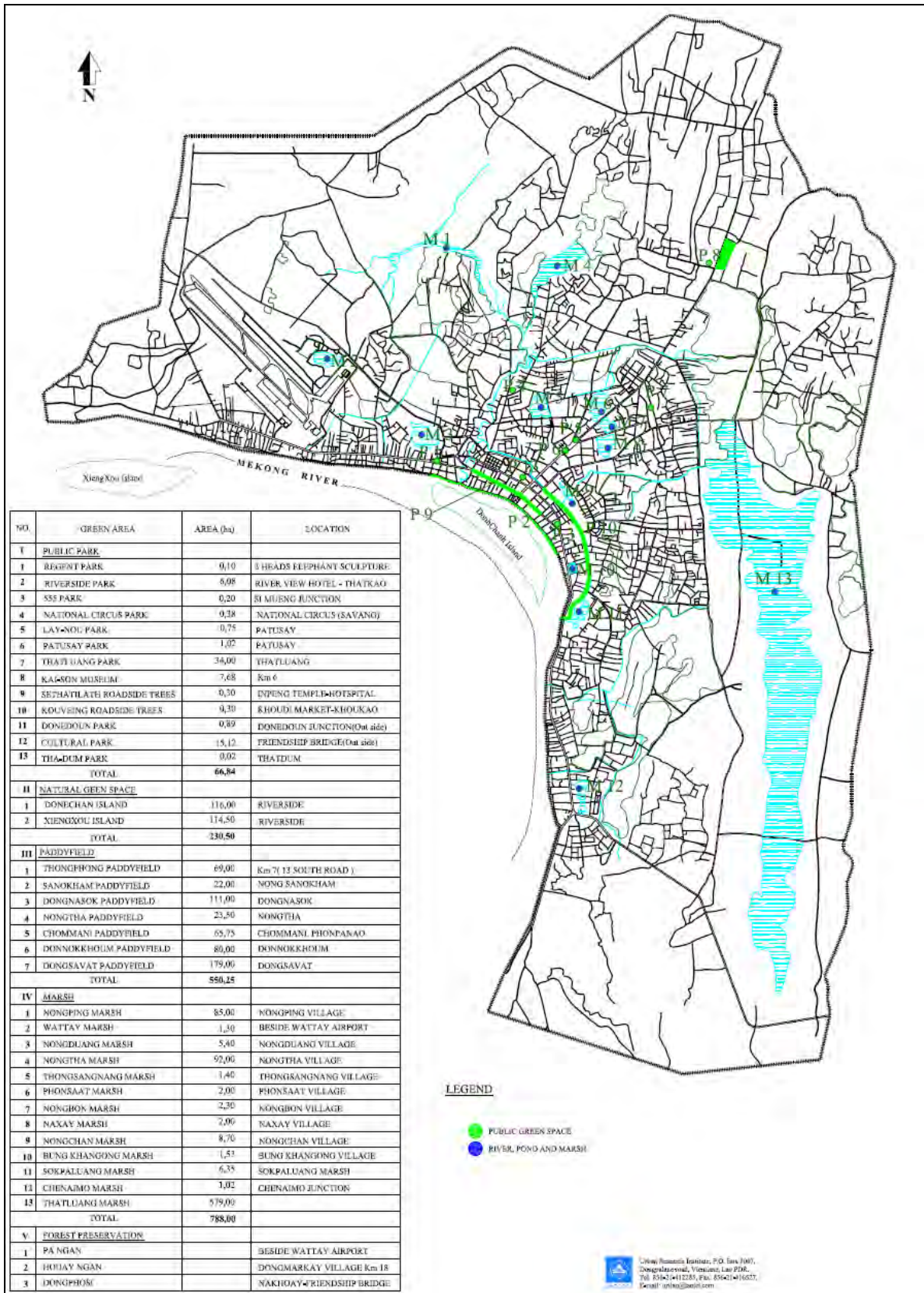


Figure 1.3.26: Map of "Parks and Green Area" in Current Urban Master Plan

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(3) Current Conditions of Parks, Open spaces and Greenery

1) Current Conditions in Vientiane Capital

Table 1.3.40 summarizes the numbers and the areas of public parks, open spaces and greenery in the whole Vientiane Capital. Some of the areas are calculated tentatively according to some sample data.

Table 1.3.40: Summarized Table of Public Parks, Open spaces and Greenery in Vientiane Capital

Type		The number	The total area	Remarks
Public Park		9	20.6 ha	VUDAA manages 6 parks DIC manages 3 parks
Public Spaces which have equivalent functions to Public Parks	Zoo, Botanical Garden	0	0 ha	
	Stadium	4	132 ha * ³	SEA Games Stadium, National Stadium, 2 University Stadiums
Public Institutions which provide large open spaces	Roundabout	28	2 ha * ²	
	Roadside	12	4 ha * ⁵ (3,694 trees * ²)	
	Riverside	(Uncountable)	(Uncountable and Changeable)	
	School	535 * ¹	590 ha * ⁴	
	University	1	82 ha * ³	National University of Laos
	Government Office, etc.	1	14 ha * ³	National Assembly Open Space
Private Spaces which have equivalent functions to Public Parks (accessible)	Temple	282	258 ha * ⁴	
	Golf Course	3	387 ha * ³	SEA Games, 14 April, KM6
	Fishing Pond	(Uncountable)	(Uncountable)	
	Sports Ground	(Uncountable)	(Uncountable)	
	Restaurant, Hotel, etc.	(Uncountable)	(Uncountable)	
Private Spaces which provide large open spaces (not accessible)	Protected Area	6	82,839 ha	2 National 4 Local
	Other (NE zone)	5	1,407 ha * ⁶	
	Other (Marsh)	13	788 ha * ⁶	

*1 Source: 431 primary + 104 lower and upper secondary from “Social Economic Development Plan of Vientiane Capital (2006-2010)”

*2 Source: VUDAA Service Sector

*3 Source: PTI (GIS calculation)

*4 Source: PTI (GIS calculation) based on 10 random sampling. The area of school is 1.1 ha and temple is 0.9 ha in average.

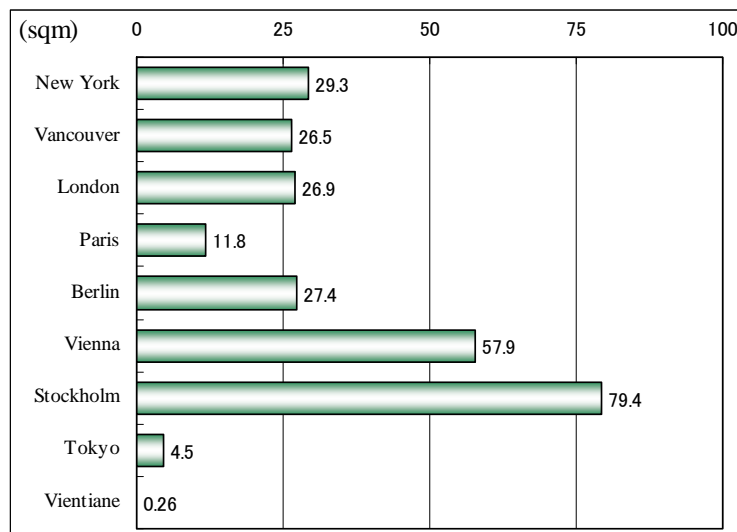
*5 Source: Total areas is based on assuming that one tree can provide 10m² green space in average.

*6 Source: Current Urban Master Plan

There are only 9 public parks with a total area of 20.6ha. This total area seems to be much in shortage for the capital city which has a population of 795,000. The area of public parks divided by the population gives a parameter of public park area per person. For Vientiane Capital, it becomes only 0.26m² per person. Figure 1.3.27 shows comparison with other capital cities in the world. From the viewpoint of comprehensive open spaces, other open spaces/greenery such as stadiums, roadside trees, roundabouts, and schools are added to the public parks, and the area becomes 845ha, or equal to 10.6m² per person.

Table 1.3.41: The Areas of Public Parks, Open spaces and Greenery per person

Type	The Total Area	Ratio to the whole Capital area (3,920km ²)	The Area per person
Public Parks	20.6 ha	0.01 %	0.26 m ²
Including other Public Spaces	845 ha	0.22 %	10.6 m ²
Including Accessible Private Spaces	1,490 ha	0.38 %	18.7 m ²
Including Protected Area	84.329 ha	21.51 %	1060.7 m ²



Source: Public Parks Census of Tokyo Metropolitan (2006)

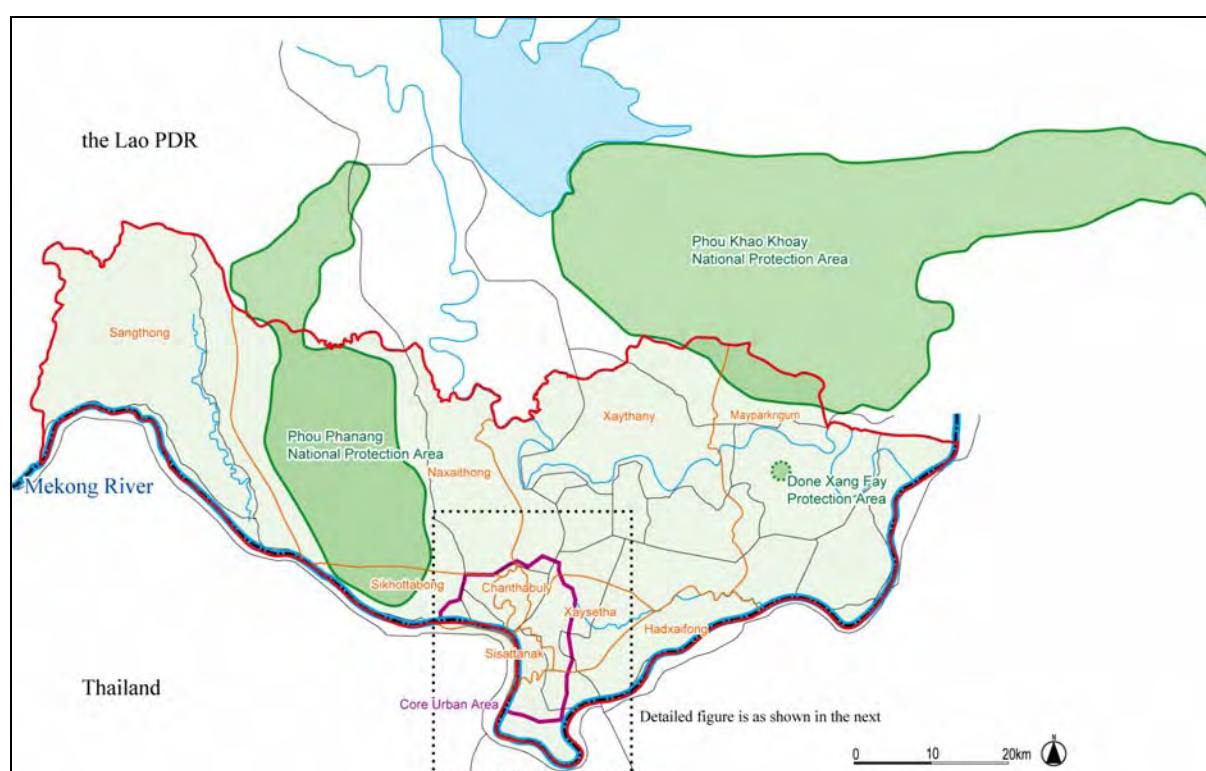
Figure 1.3.27: Park Area per Person in Comparison with Cities around the World

Table 1.3.42 shows the areas divided into the urban areas and the suburbs. According to this data and Figure 1.3.28 and 1.3.29, extensive green open spaces are still remaining in the suburbs particularly in two national protected areas. On the other hand, green open spaces which are located around the outskirts of the present urban area are decreasing due to urbanization pressures.

Table 1.3.42: The Divided Areas into urban areas and suburbs

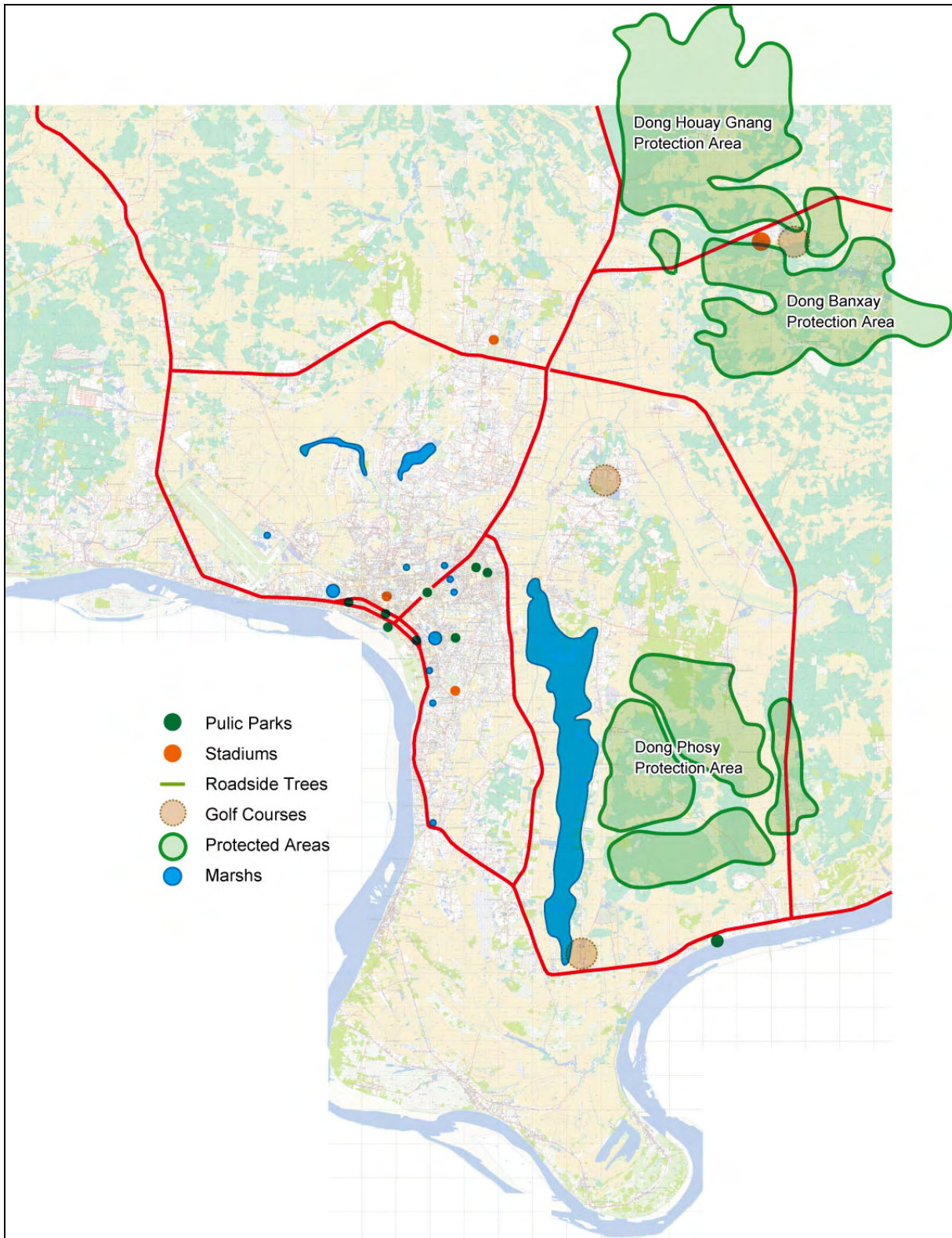
	The number	The total areas in Urban areas	The total areas in suburbs
Public Park	9	20.6 ha	0 ha
Zoo, Botanical Garden	0	0 ha	0 ha
Stadium	4	132 ha	0 ha
Roundabout	28	2 ha	0 ha
Roadside	12	4 ha	0 ha
Riverside	(Uncountable)	(Uncountable)	(Uncountable)
School	535	590 ha	
University	1	82 ha	0 ha
Government Office, etc.	1	14 ha	0 ha
Temple	282	258 ha	
Golf Course	3	387 ha	0 ha
Fishing Pond	(Uncountable)	(Uncountable)	(Uncountable)
Sports Ground	(Uncountable)	(Uncountable)	(Uncountable)
Restaurant, Hotel, etc.	(Uncountable)	(Uncountable)	(Uncountable)
Protected Area	6	3,390 ha	79,449 ha
Other (Specific Land Use Area)	5	1,407 ha	0 ha
Other (Marsh)	13	788 ha	0 ha

Source: JST



Source: JST

Figure 1.3.28: Locations of Public Parks, Open Spaces and Greenery in the Whole Vientiane Capital



Source: JST

Figure 1.3.29: Locations of Public Parks, Open Spaces and Greenery in Urban Areas of Vientiane Capital

Table 1.3.43: Management Authorities of each open spaces

	Management Authority
Public Park	VUDAA (6 parks) DIC (3 parks)
Zoo, Botanical Garden	---
Stadium	Sport Committee
Roundabout	VUDAA (Central city area) OPWT (Suburbs)
Roadside	VUDAA (Central city area) OPWT (Suburbs)
Riverside	Mekong River Committee (Mekong River)
School	Ministry of Education Department of Education Vientiane Capital
University	Ministry of Education
Government Office, etc.	Each organizations
Temple	Private Owner
Golf Course	
Fishing Pond	
Sports Ground	
Restaurant, Hotel, etc.	
Protected Area	Private Owner or Public land (National Land Management Authority)
Other (Specific Land Use Area)	
Other (Marsh)	

Source: JST


2) Public Parks


a) General

Table 1.3.44 shows a list of public parks in the whole Vientiane Capital. As there is no regulation directly governing the public parks, there is no accurate definition of “public park” and thus no comprehensive data of public parks are available. For example, VUDAA which is one of major management authorities of public parks has only the data of “Daily Record for Management” which include roadside trees and round about flowers as well as public park trees, mixed up of all data.

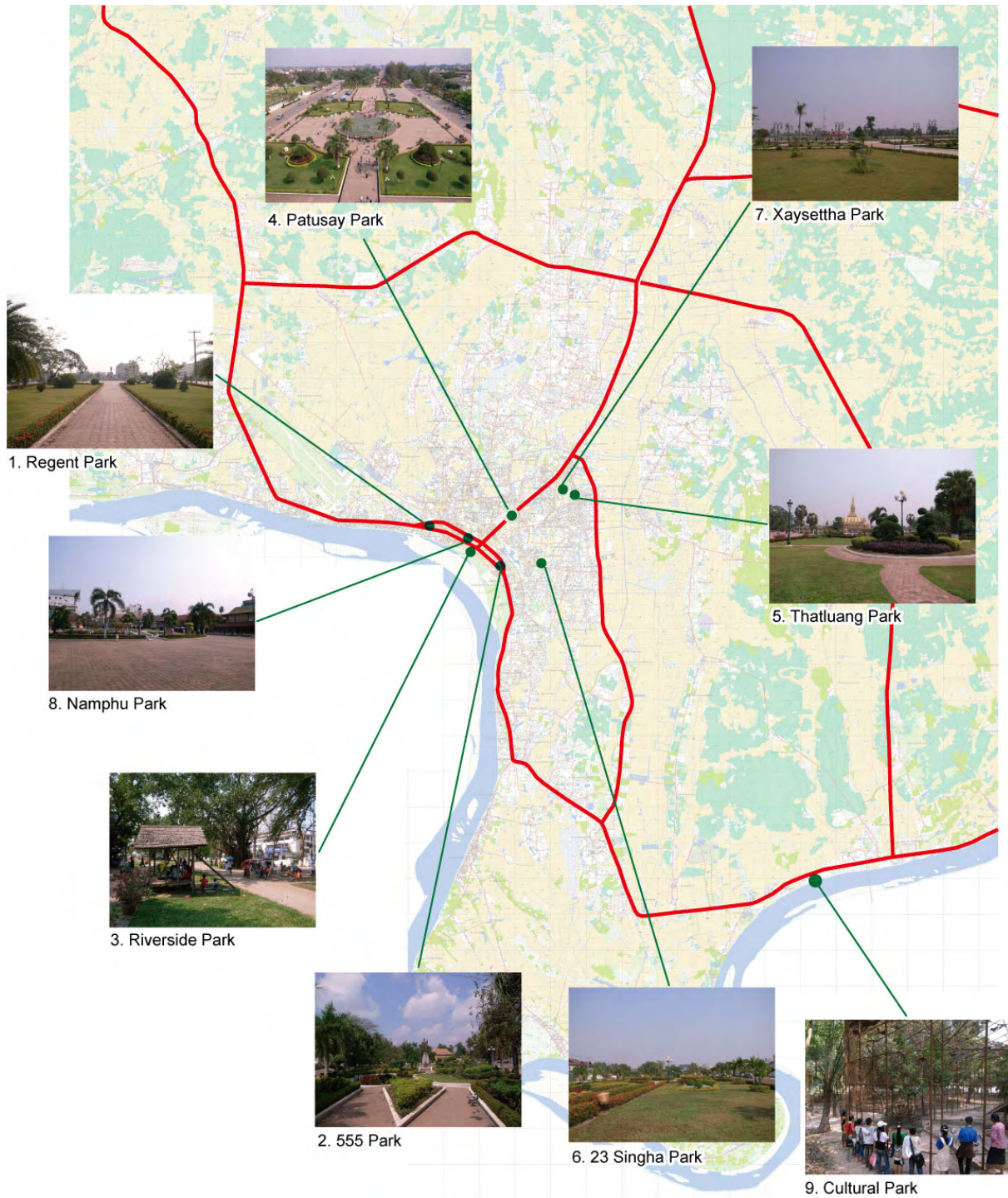
The list as below is prepared by JST according to the information from some sources based on a definition that “public park” should be owned by public authorities and be accessible and usable by all citizens without any permissions and privileges. As a result, there are only 9 public parks in the whole Vientiane Capital, and all of them are located only in urban areas which correspond to the target area of current urban master plan.

Table 1.3.44: Public Parks in Vientiane Capital

No	Name	Landscape	Area(ha) *	Established Year	Organization Established by	Organization Managed by
01	Regent Park (Chao Fangoum Park)		1.2	2003	MIC proposed Central Government approved MIC constructed	DIC

No	Name	Landscape	Area(ha) *	Established Year	Organization Established by	Organization Managed by
02	555 Park (Simeung Park)		0.3	2000	VUDAA proposed Vientiane Capital Government approved Vientiane Capital constructed	VUDAA
03	Riverside Park (Khemkhong Park)		1.6	1997	DPWT proposed Vientiane Capital Government approved ?? constructed	VUDAA
04	Patu Xay Park (Laynou Park Park) (Patu Xay Park)		2.7	2003	Vientiane Capital proposed Central Government approved China constructed	VUDAA
05	That Luang Park		1.9	2001 (Renovating now)	VUDAA proposed Vientiane Capital Government approved Vientiane Capital constructed	DIC
06	23 Singha Park		0.6	2000 (Renovating now)	VUDAA proposed Vientiane Capital Government approved Vientiane Capital constructed	VUDAA
07	Xaysetha Park		2.8	2009	DPWT proposed Vientiane Capital Government approved Vietnam constructed	VUDAA
08	Namphu Park		0.4	2001 (Renovating now)	VUDAA proposed Vientiane Capital Government approved Vientiane Capital constructed	VUDAA
09	Cultural Park (Outside of Central Area)		9.1	1994	MIC proposed Central Government approved Government constructed	DIC

* Source: PTI (GIS calculation with Quick Bird base map)



Source: JST

Figure 1.3.30: Locations of Existing Public Parks

b) Management

For the management of the public parks, 3 organizations share the responsibility, of which, one is VUDAA which manages 6 parks, the other is DIC which manages 3 parks, and OPWT which manages no parks at the moment.

A basic idea of demarcation for managing public parks is that Urban Cleaning and Decoration Service under Implementation Unit of VUDAA manages the whole area of current urban planning areas and OPWT in each district manages the area of suburbs, while there is no public park in the suburbs so far. Some public parks in urban areas with a special purpose for tourism are managed by DIC under MIC.

According to VUDAA, normal works for the management of public parks are as follows;

- watering, putting organic and chemical fertilizer, and spraying insecticide,
- weeding and soil digging,
- cutting and decorating for flower garden,
- cutting (grass field), and
- sweeping and cleaning in flower garden.

And the frequency of the work in the large-scale public parks is basically every day for cleaning and sweeping the sites.

c) Construction

For the construction of new public parks, responsible authorities of proposal, approval and construction may be different in each case as shown in Table 1.3.44. In many previous cases, at first VUDAA or DPWT proposed new public parks, and the government of Vientiane Capital approved it, and finally Vientiane Capital or other donors constructed it. When new parks are proposed, some factors will be considered according to VUDAA. These are as follows;

- population density,
- easy and comfortable access to the site, ;
- no or little impact to living area.

New public parks should consist of a moisture area, a grass area, trees and a small garden that have colorful flowers. Currently, “Nongsaphanglen Park” which is located next to That Luang Temple is under construction. This park was proposed and designed by PTI and now is preparing to be approved by the government of Vientiane Capital. After the official approval, it is said that a certain private company will pay for construction of this park and enter into concession for 5 or 10years.



Source: JST

Figure 2.3.31: Site of New (Nongsaphanglen) Park construction

d) Facility and Equipment

According to a survey of public parks carried out by JST, facilities and equipments in all the public parks are as shown in Table 1.3.45. Most public parks are made mainly for tourism, such as Patu Xay park and That Luang park in collaboration with major sightseeing spots. This leads to a tendency that facilities and equipments for sports and playground which are basically utilized by the citizens are seldom provided in these parks.

Table 1.3.45: Facilities and Equipments in Public Parks

No	Name	Area (ha)	Restricted Use	Basic Facilities			Plant			Pave		Additional Facilities						
				Toilet	Bench	Car Parking	Lighting	Flowers	Small Trees	Big Trees	Natural (Grass)	Artificial	Sports Equipments	Playground Equipments	Shade by Trees	Fountain	Shops	Restaurants
01	Regent Park	1.2	-	-	○	-	○	○	○	○	○	-	-	-	○	-	-	-
02	555 Park	0.3	-	-	○	-	○	○	○	○	○	-	-	○	○	-	-	-
03	Riverside Park	1.6	-	○	○	○	○	○	◎	○	-	-	○	○	-	○	-	-
04	Patu Xay Park	2.7	-	○	○	○	○	◎	○	◎	○	○	-	-	○	○	○	-
05	That Luang Park	1.9	-	○	○	○	○	◎	○	◎	○	○	-	-	○	-	○	-
06	23 Singha Park	0.6	-	-	○	-	○	○	○	○	○	-	-	-	-	-	-	-
07	Xaysetha Park	2.8	-	○	○	-	○	○	-	○	○	-	-	-	-	?	-	-
08	Namphu Park	0.4	-	-	○	○	○	○	○	-	-	○	-	○	-	-	-	-
09	Cultural Park	9.1	Restrict ed	○	○	○	○	-	-	○	○	○	-	-	○	-	○	○

Analysis: “○” existing, “◎” existing excellently, and “-” no existing

Source: Survey by JST

e) *Function*

As mentioned earlier, the public parks must contribute in 4 important functions, but the current 9 public parks in Vientiane Capital do not seem to provide their full requirements in terms especially of mitigating disasters and conserving nature conditions.

In addition, shade of trees is an important element for relaxation of the citizens such as seen in Riverside park. Also, Cultural park has original features which keep animals in cages and provide the function as a zoo with admission fee.



Source: JST

Figure 2.3.32: Shade produced by Trees provide good spaces for relaxation

Table 1.3.46: Contributing Functions by Public Parks

No	Name	(a) Providing Spaces for Recreation	(b) Improving Landscape	(c) Mitigating Disasters	(d) Conserving Nature Conditions
01	Regent Park	Contributing	Contributing	-	-
02	555 Park	Contributing	Contributing	-	-
03	Riverside Park	Contributing	Contributing	Contributing	-
04	Patu Xay Park	Contributing	Contributing	-	-
06	That Luang Park	Contributing	-	-	-
08	23 Singha Park	-	Contributing	-	-
09	Xaysetha Park	Contributing	Contributing	-	-
10	Namphu Park	Contributing	Contributing	-	-
11	Cultural Park	Contributing	-	-	Contributing

Source: JST








3) Other Public Spaces






a) *General*

Some other types of public spaces are also important to provide functions equivalent to public parks, such as stadiums mainly for recreation and roadside trees mainly for landscape. In Vientiane Capital at present, while there is neither zoo nor botanical garden, there are 4 stadiums. One of them is the SEA Games Stadium which was constructed in recent years and is located along National Road No.13.

Table 1.3.47 shows roadside trees in Vientiane Capital and a result of a survey conducted by JST. Total 3,694 trees are planted and managed by VUDAA.

Table 1.3.47: Roadside Trees in Vientiane Capital

No	Name (Planting length)	Landscape	Total Quantity of Trees	%	Tree Species	
01	Kaison Phomvihone Road (10.4 km)		1,063	45	<i>Lagerstroemia macrocarpa</i>	
				45	<i>Lagerstromia calyculata</i>	
				5	<i>Acacia auriculaefomis</i>	
				5	?	
				JST Asses sment	Height Density Scenery	Approximately 5m Low Not Good
02	Dongdok Road (1.8 km)		180	60	<i>Delonix regia</i>	
				35	<i>Lagerstroemia macrocarpa</i>	
				5	?	
				JST Asses sment	Height Density Scenery	Approximately 3m Low Not Good
				03	Khampengmeuang Road T4 Road (10.9 km)	
30	<i>Lagerstroemia macrocarpa</i>					
10	?					
JST Asses sment	Height Density Scenery	Approximately 5m Low Not Good				
04	13 Singha Road (1.5 km)		126			
				40	<i>Cassiafistula</i>	
				5	?	
				JST Asses sment	Height Density Scenery	Approximately 7m Medium Normal
				05	Dongpayna-Cosco Road (1.2 km)	
15	<i>Lagerstroemia macrocarpa</i>					
5	?					
JST Asses sment	Height Density Scenery	(Seldom) (Seldom) -				
06	Kouvieng Road (3.5 km)		526			
				30	<i>Swietenia macrophlla</i>	
				20	<i>Oreodoxaregia</i>	
				10	<i>Samanea Saman</i>	
				5	?	
				JST Asses sment	Height Density Scenery	More than 10m High Good
07	Lane Xang Road (1.2 km)		524	40	<i>Lagerstroemia macrocarpa</i>	
				40	<i>Plumiria acutifoliapoir</i>	
				15	<i>Acacia auriculaefomis</i>	
				5	<i>Terminalia catappa</i>	
				JST Asses sment	Height Density Scenery	Approximately 10m High Good

No	Name (Planting length)	Landscape	Total Quantity of Trees	%	Tree Species	
08	Settha Thirath Road (3.0 km)		268	90	<i>Swietenia macrophlla</i>	
				10	<i>Terminalia catappa</i>	
				JST Asses sment	Height	More than 10m
					Density	High
Scenery	Excellent					
09	Samsenthai Road (3.3 km)		68	80	<i>Terminalia catappa</i>	
				15	<i>Acacia auriculaefomis</i>	
				5	?	
				JST Asses sment	Height	Approximately 5m
Density	Low					
Scenery	Not Good					
10	Nongbone Road (3.0 km)		180	45	<i>Lagerstroemia macrocarpa</i>	
				45	<i>Cassiafistula</i>	
				10	?	
				JST Asses sment	Height	Approximately 5m
Density	Low					
Scenery	Not Good					
11	OB Road (1.0 km)		68	100	<i>Lagerstroemia macrocarpa</i>	
				JST Asses sment	Height	Approximately 5m
					Density	Medium
Scenery	Normal					
12	Asean Road T2 Road (4.3 km)		45	75	<i>Delonix regia</i>	
				25	?	
				JST Asses sment	Height	Approximately 5m
					Density	Low
Scenery	Not Good					

*Source: VUDAA and JST (Assessment of height, density and scenery)

VUDAA is in charge of total 13 roads. One of them, National Road No.13 south, has no tree.

There are two types of trees that can provide excellent landscape and shade because of its large-size of canopy and height. One is *Swietenia macrophlla* (called Big Leafed Mahogany in English) which are planted along Settha Thirath road. The other is *Samanea saman* (called Rain Tree) along Koubieng road. According to a survey by JST roadside trees are managed in good conditions, along Settha Thirath road, Kouvieng road and Lane Xang road..



Swietenia macrophylla (Big Leafed Mahogany)

Source: JST



Samanea saman (Rain Tree)

Figure 1.3.33: Roadside Trees which can become tall and big canopy

In addition to roadside trees, a number of roundabouts and road islands along streets are managed by VUDAA as shown in Table 1.3.48.

Table 1.3.48: Roundabouts and Road islands in Vientiane Capital

Type	Name
Roundabout	D Donnou (Xaysavang) 2,902 m ² , Chinaymo 148 m ² , That Dam 148 m ² , Thorrakhong 108 m ² , Anousavali 108 m ² , Naxay 105 m ² , Phaxay 90 m ² , Sokpaluang 62 m ² , Nongbone Post 46 m ² , That Luang 14 m ² , Phonthan 14 m ² , Comcenter 12 m ² , Dongpalan 12 m ²
Roadisland Roadside	Kaysone Island road (Kayson Museum) 6,344 m ² , Lanexang roadside 2,300 m ² , Lanexang Island road 2,270 m ² , Bus station at Morning Market 1,200 m ² , Saylom roadside 998 m ² , T Junction Parkphasack 529 m ² , To airport 526 m ² , To Km6 426 m ² , T Junction Khuakhao 350 m ² , Bohe traffic light 280 m ² , T Junction Kayseusan 280 m ² , Phonsaad Traffic 230 m ² , Phonkheng Traffic 150 m ² , Thongkhankham Island road 102 m ² , Beside VUDAA 95 m ² , Khouvieng roadside 67 m ² , Sibounheung Island road 50 m ² , Kayasin Island road (National Circus) 40 m ² , T junction dongpasak 30 m ² , Number 1 Roadside (Rout Samsenthai, Setthathilath, Luang Phabang) (No data), Lao-Thai Roadside (No data), Front of Horphakeo Roadside (No data), T Junction Sithong roadside (No data), Souphanouvong Island road (No data), Unknown Soldiers Monument roadside (No data), Nongbon roadside (No data)

Source: JST



Donnou Roundabout

Source: JST



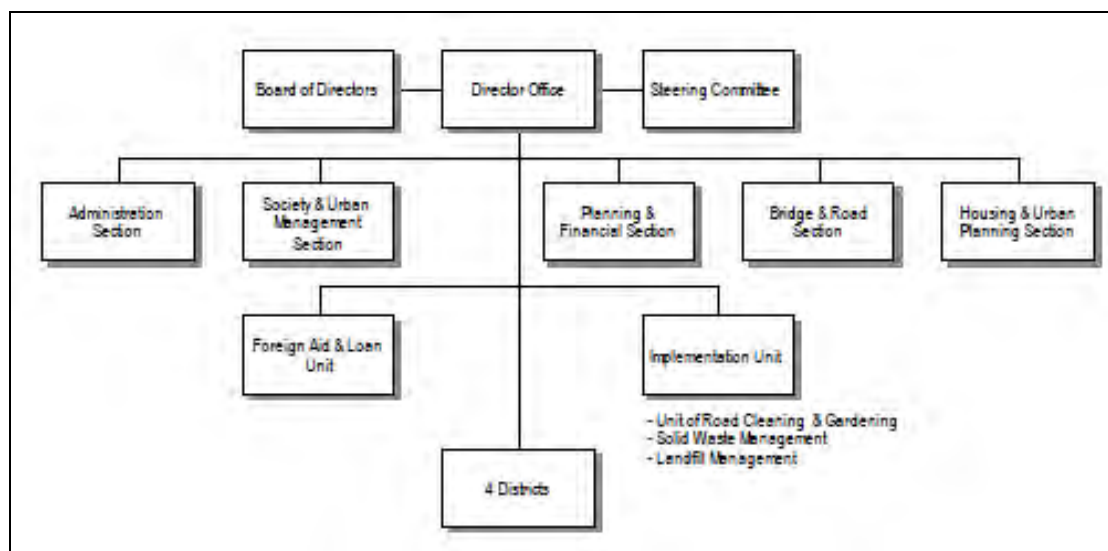
That Dam Roundabout

Figure 1.3.34: Main Roundabouts in Vientiane Capital

b) Organization

Most of public parks, all roadside trees, roundabouts and road islands in urban areas are managed by VUDAA. The organization structure of VUDAA is as shown in Figure 1.3.35. Housing and Urban Planning Section has a responsibility to manage and construct public parks, roadside trees and so on, while daily management are conducted by Implementation Unit, Urban Cleaning and Decoration Service under VUDAA. This service sector has a staff with 257 members to manage trees and flowers and clean the streets. Roadside trees and roundabouts are normally managed by a scheme of 1 person / 2 times / 1 place / 1month according to the information from VUDAA. This scheme corresponds to 1,600m² / 1 person / 1 month on an average. In management of roadside trees, main works are as follows;

- cutting, decorating of tree branches which are danger to adjacent area
- cutting of old tree branches, and
- watering.



Source: VUDAA

Figure 1.3.35: Organization Structure of VUDAA

Total budget in 2009 for the management of public parks and roadside trees by VUDAA is LAK 2,836,355,235 (USD 337,616).

In addition, white painting around tree trunk is put only for decoration on special days (holidays) for Lao people.



Source: JST

Figure 1.3.36: White Painting for decorations along Settha Thirath Road

4) Private Spaces

a) Protected Areas

For protecting the existing forestry, the Government of Lao PDR stipulates 21 National Protected Areas and 2 Corridors on the national level, and Provincial Protected Areas and District Protected Areas on the provincial level. Their total sphere amounts to about 5.3 million ha, or 22.5% of the total national land. Those National Protected Areas and Corridors are designed for the preservation of natural resource with the abundance of nature and the beauty of natural scenery for leisure resorts, study and research. The list of protected areas at the national and provincial levels in Vientiane Capital is mentioned in Section 2.1.1.

In Dong Houay Gngang provincial protected area which is a well-preserved and managed forest, there is “Provincial of Agriculture and Forestry Office” built in 1988 with support by CIDA. This office has 13 staff and 2 volunteers and has a responsibility for the management of all protected areas including National Protected Areas in cooperation with the army (only for National Protected Area), local districts offices and so on. Their works are mainly two, of which, the one is patrol and the other is research and planting. Through the research, they identify 250 plant species in Dong Houay Gngang protected area. According to the information from the management office, Done Xang Fay provincial protected area in Mayparkngum district is also a well-preserved forest characterized by “Maypeg” which is rare tree species in the alluvial plain region.



Source: JST

Figure 1.3.37: Dong Houay Gngang Protected Area and a Office for management in protected areas

b) NE Land Use Zone (Specific Land Use Areas)

NE zone is one of the present land use categories for nature conservation. There are some special areas such as memorial museum, islands, ponds and natural marshes. In this zone basically all of building construction is prohibited unless it relates to recreation or relaxes activities. A regulation for greenery for new construction requires that greenery coverage is at least 45% of the site. This regulation is based on Land Use Management of Vientiane Capital 2006-2010, which are described in 10 articles for 19 zones.







c) Marshes







A survey has been carried out by JST to grasp the current conditions of marshes in urban area. Table 1.3.49 shows a result of the survey. A number of marshes have been decreasing the size, particularly those surrounded by private lands, while some marshes still remain in a good

condition such as Nongping marsh, Nongtha marsh and That Luang marsh. These three marches are located in the outskirts of the present urban area, while Nong Chan marsh is located in the central urban area. Therefore methods to be taken in order to conserve and utilize these marshes would be different.

Most of lands in That Luang marsh are mainly for agricultural use. These lands are owned by NLMA, and rights of land have been transferred to DAF. Therefore because these areas are designated as NE land use zones in current urban master plan, it is prohibited to use the land for purposes other than agricultural use.

Table 1.3.49: Remaining Marshes and Current Conditions in Urbanized Area

No	Name	Landscape	Large Scale for the Public	Nature Conditions	Accessibility for the Public	Comment by JST
01	Nongping Marsh		Huge	Excellent	Excellent	To be protected by land use restrictions
02	Wattay Marsh		Small	Poor	Good	
03	Nongduang Marsh		Large	Good	Good	
04	Nongtha Marsh		Huge	Excellent	Excellent	To be protected by land use restrictions
05	Thongsangnang Marsh		Small	Good	Poor	
06	Phonsaat Marsh		Small	Poor	Poor	
07	Nongbon Marsh		Small	Poor	Poor	

No	Name	Landscape	Large Scale for the Public	Nature Conditions	Accessibility for the Public	Comment by JST
08	Naxay Marsh		Small	Poor	Poor	
09	Nong Chan Marsh		Large	Good	Excellent	To be protected by designation for public park
10	Bungkhangong Marsh		Small	Good	Good	
11	Sokpaluang Marsh		Small	Good	Poor	
12	Chenaimo Marsh		Small	Good	Poor	
13	That Luang Marsh		Huge	Excellent	Excellent	To be protected by land use restrictions

Large Scale: "Huge" more than 10ha, "Large" more than 5ha, "Small" less than 5ha

Source: Evaluation by JST

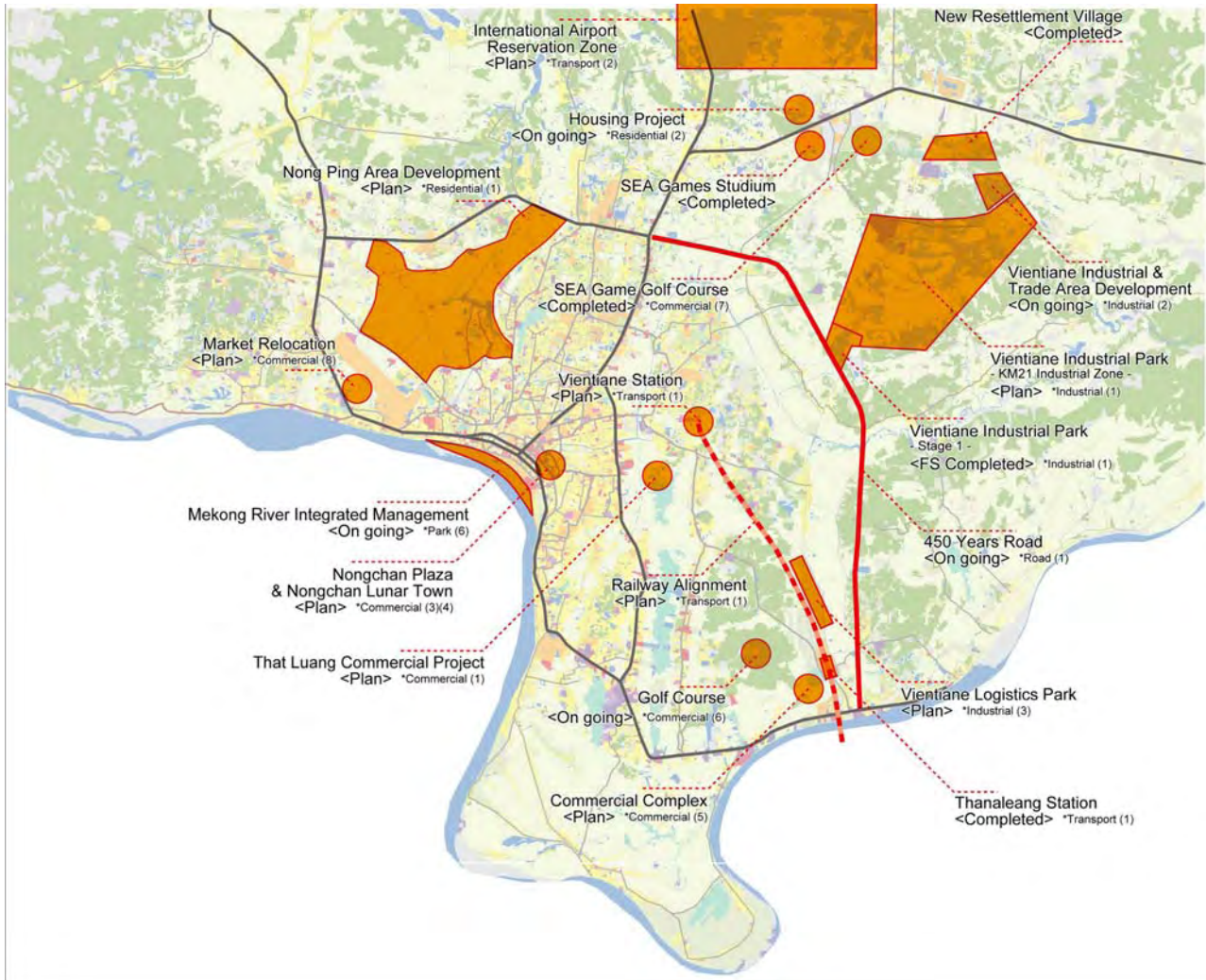


Source: JST

Figure 1.3.38: Locations of Remaining Marshes

1.4 Relevant Development Projects

1.4.1 Overview of Relevant Development Projects



Source: JST

Figure 1.4.1: Main Relevant Development Projects in Vientiane Capital

Table 1.4.1: Summary of Relevant Development Projects

Sector	Activity (Project) Name	Funded by	Year
Industrial (1)	Vientiane Industrial Park	Japan	2009-2010
Industrial (2)	Vientiane Industrial & Trade Area Development	Taiwan	2009-2010
Industrial (3)	Vientiane Logistics Park	Japan	2009-2010
Commercial (1)	That Luang Commercial Project *	China	-
Commercial (2)	Talatsao Mall Market Construction *	-	-
Commercial (3)	Nongchan Plaza *	Vietnam	-
Commercial (4)	Nongchan Lunar Town *	Korea	-
Commercial (5)	Commercial Complex *	-	-
Commercial (6)	Golf Course *	-	2010-
Commercial (7)	SEA Game Golf Club *	Korea	-2010
Commercial (8)	Market Relocation *	-	-
Residential (1)	Nong Ping Area Development *	-	-
Residential (2)	Housing Project *	-	-
Transport (1)	Nongkhai to Vientiane Railway Project *	KRTC	2002
Transport (2)	International Airport Reservation Zone *	-	-
Road (1)	450 Years Road Construction Project	-	2008-
Road (2)	SEA Games and 450 Years Road Connecting Road	-	2009-
Road (3)	SEA Games and Nakhua Road Connection Project	-	-
Road (4)	Development of R11 Road Project	NIDA, DPWT	2009-
Road (5)	Three Junctions near Radio Station and That Luang Bridge Road Connection Project	Chinese Private	-
Road (6)	Chinamo and Thanaleng Road Project	Chinese Private	2010-
Road (Other)	Vientiane Urban Infrastructure and Services Project	ADB	2001
Road (Other)	Vientiane Urban Infrastructure and Services Project	ADB	2006
Road (Other)	Vientiane Urban Development Management Ownership	EU, Paris, Brussels	-
Road (Other)	Transportation Development Plan and Vision Year 2020	GOL	2004
Road (Other)	Elaboration du Plan Strategique de Deplacements Urbanes	EU	2005
Road (Other)	Institutional and Regulatory Framework for Road Transport Services	ADB	2005
Road (Other)	Advisory Service on Upgrading Capability of the Transport Fleet	UN	2006
Road (Other)	Vientiane Sustainable Transport Initiative	GEF, WB	2006
Road (Other)	Study on Integration Distribution Center in Savanakheth and Vientiane	JETRO	2007
Road (Other)	The Study of Master Plan on Comprehensive Urban Transport	JICA	2008
Road (Other)	Sustainable Transport Initiative	ADB	2010
Road (Other)	Civil Aviation Master Plan, 2003 to 2013	ADB	2003
Road (Other)	Detailed design AND Preparation of tender documents for Thanaleng - Vientiane Railway Construction project	NEDA	2010
Road (Other)	Pilot Project of Shuttle Bus Service between Central Bus Station and Dongdok	JICA	2010
Water (1)	Construction of Kaolieo WTP	JICA	1963
Water (2)	Construction of Chinaimo WTP	ADB	1980
Water (3)	Rehabilitation of Kaolieo WTP	JICA	1983
Water (4)	Basic design for expanding Chinaimo WTP	JICA	1992
Water (5)	Expansion of Chinaimo WTP	JICA	1996
Water (6)	Master Plan on Vientiane Water Supply Development	JICA	2004
Water (7)	Basic Design for Vientiane Water Supply Development	JICA	2005
Water (8)	Capacity Development to Water Supply Company	JICA	2003-2006
Water (9)	Expansion of Kaolieo WTP and rehabilitation of Chinaimo WTP	JICA	2009
Water (10)	Construction of Dongmakkhay WTP	AFD	2009
Water (11)	Nongteng Project	AFD	2010
Water (12)	Construction of Don Bang WTP	Vietnamese Private	2010
Water (13)	B.Houaykham Water Supply	AIMF	2010
Water (14)	Parkngum District Water Supply	SEDIF	On going
Water (15)	11 Rural Water Supply Projects	France	On going
Water (16)	Groundwater Quality Monitoring Database	UNICEF	On going
Sewerage (1)	Rehabilitation of Sihom Area	UNCDF/UNDP	1991-1997

Sewerage (2)	Wastewater Management of That Luang Marsh	EU	1993
Sewerage (3)	Vientiane Integrated Urban Development Project (VIUDP)	ADB	1996-2000
Sewerage (4)	Vientiane Urban Infrastructure and Service Project (VUISP)	ADB	2001
Sewerage (5)	Improvement of Urban Environment in Vientiane, Lao PDR	Danida	2001-2004
Sewerage (6)	Integrating Wetland Ecosystem Values into Urban Planning: The Case of That Luang Marsh	IUCN/WWF	2004
Sewerage (7)	Urban Wastewater Strategy and Investment Plan (UWSIP)	ADB/NORAD	2009
Sewerage (8)	Preparatory Survey on Formulation of Basic Strategies for Regional Core Cities Development in Lao PDR.	JICA	2009
Sewerage (9)	The Study on Improvement of Water Environment in Vientiane City	JICA	2009-2011
Sewerage (10)	Decentralized Waste Water Treatment System Program in Lao	LIRE/Borda	2009-2010
Sewerage (11)	Rapid Assessment of Household Sanitation Services, Vientiane	World Bank	2010
Sewerage (12)	Hong Xeng and Hong Ke Wetland Treatment System	-	2010
Drainage (1)	Feasibility Study on Improvement of Drainage System in Vientiane	JICA	1990
Drainage (2)	Rehabilitation of Sihom Area	UNCDF/UNDP	1991-1997
Drainage (3)	Vientiane Integrated Urban Development Project (VIUDP)	ADB	1996-2000
Drainage (4)	Vientiane Urban Infrastructure and Service Project (VUISP)	ADB	2001
Drainage (5)	The Survey on Existing Road and Drainage Condition in Vientiane Municipality	JICA	2001-2002
Drainage (6)	The Project for the Improvement of Vientiane Road No.1	JICA	2005-2007
Drainage (7)	The Construction of Drainage System and T2 Road Improvement Project	Thailand	2006-2008
Drainage (8)	The Feasibility Study on Repair of River Bank and Construction of Riverside Park Along the Mekong River in Vientiane	KOICA	2006-2007
Drainage (9)	Preparatory Survey on Formulation of Basic Strategies for Regional Core Cities Development in Lao PDR.	JICA	2009
Drainage (10)	The Study on Improvement of Water Environment in Vientiane City	JICA	2009-2011
Drainage (11)	Mekong River Integrated Management Project	EDCF	2009-2013
Drainage (12)	Vientiane Integrated Development Project at That Luang Marsh	Chinese Investor	2009
Drainage (13)	Nongtha Reclamation and Development Project	Vietnamese Investor	2009
Drainage (14)	Village Planning and Design for Nong Ping Market	DPWT	2010
Drainage (15)	Nong Chan Development Project	Private Investor	2010
Drainage (16)	Improvement of T2 road and Drainage Storage Pond Project	NEDA- Thailand	2010
Drainage (17)	Nongtha Tai Development Project	DPWT	2010
Solid (1)	The Study on the Solid Waste Management System Improvement Project in Vientiane	JICA	1991-1992
Solid (2)	Basic Design Study on the Project for Improvement of the Solid Waste System in Vientiane Urban area	JICA	1995-1996
Solid (3)	Procurement of Collection and Haulage Equipment, Construction of a Final Disposal Site, Construction of a Maintenance Workshop	JICA	1998
Solid (4)	Participated Conscious Creation Project regarding the Solid Waste Management	Holland	2001-2002
Solid (5)	Participated Conscious Creation Project regarding the Solid Waste Management, PPPUE	UNDP	2003-2004
Solid (6)	Community Solid Waste Management Project, JFPR	ADB	2004-2007
Solid (7)	KM32 landfill construction project	-	2008
Park (1)	That Luang Marsh Project	WWF and WREA	2007-2009
Park (2)	That Luang Marsh Research	DPWT	2010-
Park (3)	Natural Resources and Environment Program (Resettlement)	DANIDA	2001
Park (4)	Water Park Project	Malaysian Private	2001
Park (5)	The Study on Improvement of Water Environment	JICA	2010-
Park (6)	Mekong River Integrated Management Project (Chao Anouvong Park)	EDCF and DPWT	2010-
Park (7)	Green School Project	D of Education	2006-

*: under research

Source: JST

1.4.2 Industrial and Urban Development

(1) Vientiane Industrial Park (Japan)

JICA conducted Industry Development Study for Lao PDR and feasibility study on Vientiane Industrial Park (VIP) from March 2009 to May 2010. VIP is located at the junction of 450-Year Road and District Road No 108 in the Industrial Zone KM21. In the study it was projected that necessary land for industrial estate would be 845ha in 2025, and Phase 1 of the industrial estate with an area of 140ha was studied for the feasibility study level. In the Phase 1 project which is expected to complete in 2015, 59 lots of factory land will be developed with roads, water supply and power supply facilities.

(2) Vientiane Industrial & Trade Area Development (Taiwan)

Vientiane Industrial & Trade Area (hereinafter referred as VITA) is developed by a joint venture company "Lao VITA Development Co., Ltd." The company is funded by Ministry of Industry and Commerce (30%) and Nam Wei Development Pte Ltd, a Taiwanese company (70%). The project is to develop an industrial estate and a free trade area with total area of 110ha. Location of the site is near the Industrial Zone KM21, and along the western side of the future railway which will be extended from Tanaleeng Station. The joint venture company was established on 30th October 2009, and construction of the phase 1 (around 50ha) has already started. It is expected that construction work of the phase 1 will be completed in this October.

(3) Vientiane Logistics Park (Japan)

JICA conducted a study to formulate national logistics strategy, and Vientiane Logistics Park (VLP) is proposed as well as logistics parks at Savannakhet and Champasak. Location of the VLP is in the north of Tanaleeng Railway Station to handle railway cargoes as well as truck and trailer cargoes. VLP will be take over the role of the existing Tanaleeng Warehouse, too. It is projected that handling volume will be 4,500 ton per day in 2025, or 5 times larger than the current volume. Total area of the VLP is 29.5ha. It is expected that construction work will start in 2011, and operation will start in 2015.

1.4.3 Road and Transport

(1) Four Hundred Fifty (450) Years Road Construction Project

This road section will be a part of the outer ring road that connects National Road 13 South and the Friendship Bridge, accompanied with Dongdok road. The construction work started at April 2008 and is planned to complete within 28 months.

- Section: Dong Pho Si - Dongdok
- Length: 20.3km
- Width: 33m (4 lanes)
- Pavement: Mainly asphalt pavement, concrete pavement for intersection part only

(2) SEA Games and 450 Years Road Connecting Road

This project was completed before 9th December 2009 in time for the opening date of SEA Games.

- Section: Xok Gnai - Xok Noy
- Length: 6.23km
- Width: 9m (2 lanes)
- Pavement: Asphalt pavement and concrete pavement

(3) SEA Games - Nakhuay Road Construction Project

- Section: National Road 13 South - Bang Nakhuay
- Length: 14.10km
- Width: 25m (4 lanes), ROW 40m
- Pavement: Asphalt concrete pavement

(4) Development of R11 Road Project

For this project, a feasibility study on the improvement of National Road 11 from Sikhai junction to Bang Nam Sang was carried out by NIDA (National Institute of Development Administration) in 2009. DPWT started the construction only for the following section June 2009 based on this study and it will be finished in October 2010.

- Section: Sikhai Junction - Tadthong Junction
- Length: 4.0km
- Width: 10m (4 lanes)
- Pavement: Concrete pavement

(5) Three Junctions near Radio Station and That Luang Bridge Road Construction Project

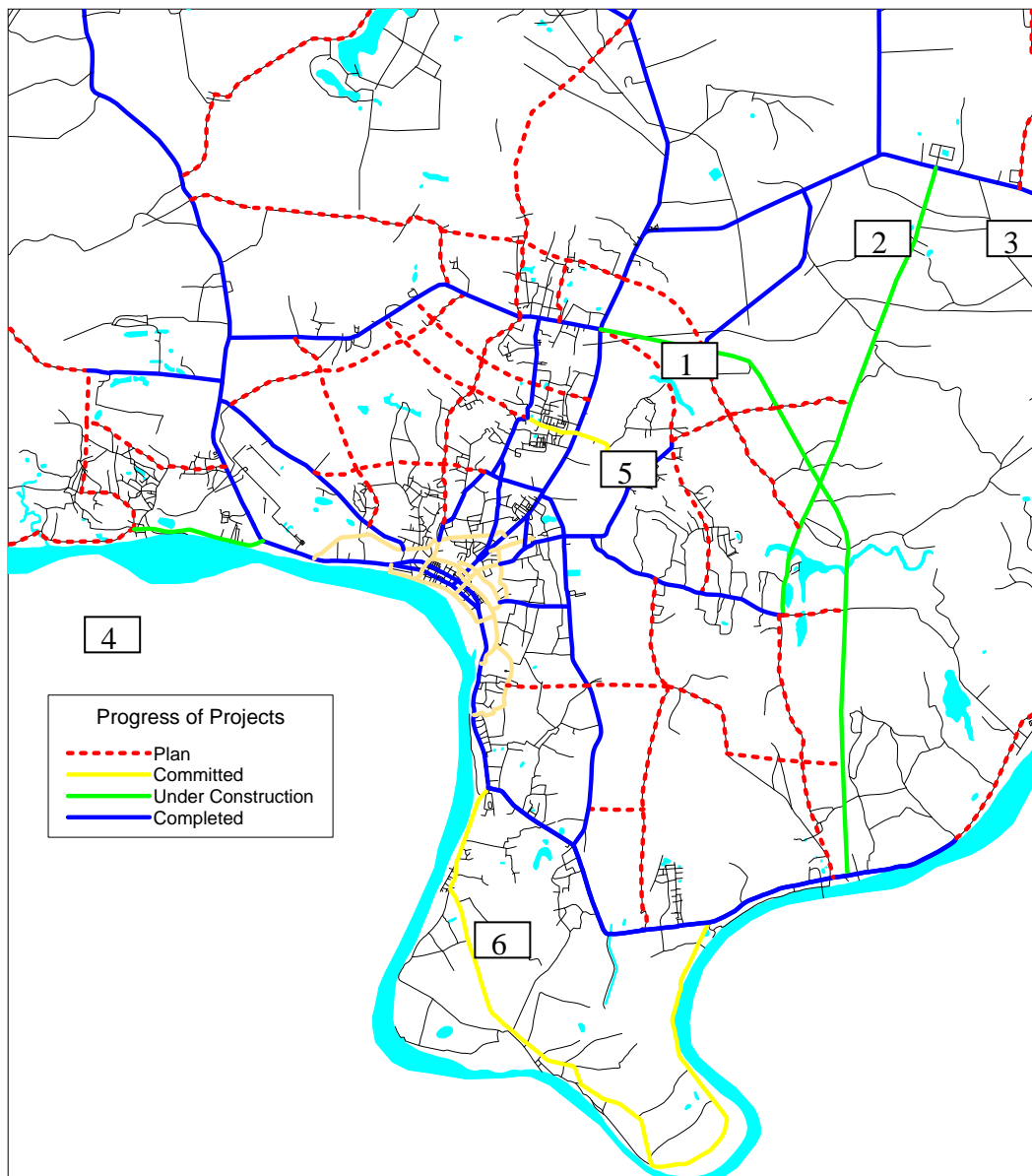
DPWT conducted a feasibility study for this project and decided to construct by a loan from the Chinese private sector fund. A negotiation is in progress.

- Section: Bang Chommai Nua - That Luang Bridge
- Length: 5.9km
- Width: 12m (4 lanes)
- Project Type: Widening and pavement improvement by asphalt concrete
- Cost estimates: USD 11.5 million

(6) Chinaimo - Thanaleng Road Project

The negotiation on loan agreement with a Chinese private sector for the construction will start May 2010, and the construction shall be completed within 36 months.

- Section: B. Chinaimo - B. Haddockeo - B. Horm - Thanaleng
- Length: 28km (outer ring road) + 11km (inner ring road)
- No. of Lanes: 2 lanes
- Pavement: concrete pavement for the outer ring road and DBST (Double Bitumuls Surface Treatment) pavement for the inner ring road
- Including river bank protection: 1,369m and a bridge construction: 50m



Source: JST

Figure 1.4.2: Progress of Road Projects

1.4.4 Water Supply

(1) Construction of Kaolieo WTP (JICA)

Kaolieo WTP (20,000m³/day) and distribution pipe were constructed in 1963 as Grant Aid by JICA.

(2) Construction of Chinaimo WTP (ADB)

Chinaimo WTP (40,000m³/day) and distribution pipes were constructed in 1980 by ADB.

(3) Rehabilitation of Kaolieo WTP (JICA)

Rehabilitation of Kaolieo WTP (20,000m³/day) was carried out in 1983 by JICA.

(4) Basic design for expanding Chinaimo WTP (JICA)

Basic design for expanding Chinaimo WTP (40,000m³/day) to be (80,000m³/day) and construction of transmission and distribution pipe was carried out in 1992 by JICA.

(5) Expansion of Chinaimo WTP (JICA)

Expansion of Chinaimo WTP (40,000m³/day) to be (80,000m³/day) and construction of transmission and distribution pipes, and elevated tank were carried out in 1996 by JICA.

(6) Master Plan on Vientiane Water Supply Development (JICA)

Master plan on Vientiane water supply development for the target year 2020 and Feasibility study for the priority projects were carried out in 2004 by JICA.

(7) Basic Design for Vientiane Water Supply Development (JICA)

Basic design for Vientiane water supply development was carried out in 2005 by JICA.

(8) Capacity Development to Water Supply Company (JICA)

JICA made a technical cooperation to Water Supply Division (WSD) of DHUP under MPWT, WASA, NPVC and other water supply company on planning, designing, plant operation and piping work at Lao PDR, Thailand and Japan with revised manual from 2003 till 2006.

(9) Expansion of Kaolieo WTP and rehabilitation of Chinaimo WTP (JICA)

Expansion of Kaolieo WTP (20,000m³/day) to be (60,000m³/day), rehabilitation of Chinaimo WTP and construction of transmission and distribution pipe, and rehabilitation of a booster pumping station were carried out in 2009 as grant aid by JICA.

(10) Construction of Dongmakkhay WTP (PPP)

Construction of Dongmakkhay WTP (20,000m³/day) was carried out in 2009 by PPP.

(11) Nongteng Project (AFD)

The project is called AEP2 and aims at expanding the water supply network (about 100km of pipes, with parts in Nongteng and Viengkham area) with Viengkham elevated tank as grant aid by AFD. The project is worth 5.5 Million Euros.

AFD also supported the construction of a training center just next to Chinaimo WTP from 2004 to 2009. The project was worth 2.6 Million Euros.

(12) Construction of Don Bang WTP (PFI/ Vietnamese Mai Dong Company)

Dongbang WTP with a capacity of 20,000 m³/d is planned for water supply a northeast area of urban part of Vientiane to be newly developed, such as Vientiane Industrial Zone and new town.

The Dongbang WTP project was implemented under a PFI scheme. An outline of the project is summarized below:

- Developer: Ha Dao Company jointed between NPVC with a 20% share and Vietnamese Mai Dong Company with an 80% share
- Investment cost for Phase I: LAK 42 billion (equivalent of USD 5 million) financed by Lao-Viet Bank
- Selling price of treated water to NPVC: LAK 1,200-1,350 / m³
- Location of WTP: Dongbang Village along the Nam Ngum River
- Water Source: the Nam Ngum River
- Capacity of Dongbang WTP: 20,000 m³/d
- WTP: Manufactured units made of steel product
- Pump Pressure: 6 bar
- Pipe laying length: 7200m
- Phase I: construction of Dongbang WTP, installation of distribution main with DN500mm along the Thadindeang Road from WTB to NR 13S and distribution main with DN250mm along NR 13S to the SEA Game Stadium
- WTP of 10,000m³/day was completed in June 2010, WTP of remained 10,000m³/day will be constructed within 2010. Transmission pipe was completed.
- Phase II: installation of distribution main with DN400mm along District Road No.108 Road from NR 13S to the Xamkhe Reservoir and distribution main with DN300mm along District Road No.108 to Doungkang Village,
- Construction plan of Phase II is unknown.



Source: JST

Figure 1.4.3: Construction Site of Donbang WTP

(13) B.Houaykham Water Supply (AIMF)

AIMF (*Association Internationale des Maires Francophones*: International Association of Francophone Mayors) constructed water supply facilities consisted of a water treatment plant 240m³/day and pipes at Houaykham Village in Sangthong District. Water source is surface water stored at dam constructed for agricultural purpose. Project cost is around USD 342,000, based on NPVC.

(14) Parkngum District Water Supply (SEDIF)

SEDIF (*syndicat des eaux d'Ile de France*: union of the waters of Ile de France) is conducting a feasibility study of water supply using surface water in Parkngum District with a PPP (Public Private Partnership) scheme. The above information is obtained from NPVC.

(15) 11 Rural Water Supply Projects (France)

11 rural water supply projects are under operation with French assistance in year 2010. The project cost is provided 90% by France and 10% by Lao PDR. The above information is obtained from DPWT.

(16) Groundwater Quality Monitoring Database (UNICEF)

Nam Saat is getting assistance from UNICEF for preparing database for groundwater quality. Arsenic is detected from groundwater at some southern provinces and it is observed that groundwater of some wells/boreholes in two provinces, Champasak and Attapeu in Lao PDR are over the drink water quality in terms of Arsenic content.

1.4.5 Sewerage/Wastewater

(1) Rehabilitation of Sihom Area (UNCDF/UNDP)

The Vientiane Master Plan identified priority areas suffering from environmental problems related to poor drainage, household sanitation, and access to services such as waste management. The priorities of the project were to improve living conditions of the population of the Sihom area through rehabilitation and upgrading, improvement of the sanitation and storm water drainage, and

strengthening institutional capacity. One of the biggest successes of the project was to establish a village credit system to improve housing, small business and livelihoods.

(2) Wastewater Management of That Luang Marshes (EU)

The That Luang wastewater management project was designed to improve wastewater treatment and drainage out of the central Vientiane area. The project built a system of stabilization ponds at That Luang Marsh designed to serve an estimated population of 44,590 for 2005 with a per capita BOD of 45g/capita/day assuming the 50% of the pollutant load would reach the treatment plant. A trunk sewer main was also constructed, intercepting sewage from Hong Thong drain to be pumped to the stabilization ponds.

(3) Vientiane Integrated Urban Development Project – VIUDP (ADB)

The overall objective of the Vientiane Integrated Urban Development Project was to improve access to basic services and infrastructure, thus providing benefits to the urban environmental and health population of Vientiane. The project supported the formation of the Vientiane Urban Development and Management Committee (VUDMC) to institutionalize urban planning and strengthen the development control system. Project activities included construction and upgrading of primary drainage and associated secondary drainage infrastructure, provision of household septic tanks, soakage pits, and construction of a sewage treatment plant adjacent to the stabilization ponds in That Luang Marsh, and community awareness to promote community involvement in local planning and operation and maintenance.

(4) Vientiane Urban Infrastructure and Service Project – VUISP (ADB)

This project was a continued of the VIUDP to improve the quality of life of the urban residents and enhance urban productivity and economic growth in the Vientiane urban area. The Project components consist of i) part A: citywide urban infrastructure and services, comprising critical missing links of primary and secondary roads and drainage, efficiency improvements in solid waste management, traffic management and safety, and institutional infrastructure and maintenance improvements; ii) part B: village area improvements (VAI), adopting a demand-led and participatory approach, seeking as a prerequisite the willingness of village communities to participate in and contribute to a portion of the cost of the improvements, and combining community infrastructure and services with community-level capacity building and awareness raising in environmental health, participatory local planning and community-based infrastructure development and service delivery; and iii) part C: a comprehensive capacity building program to support the accomplishment of the urban policy and institutional reform agenda, and enhance the planning, operation and maintenance, revenue mobilization, and financial management capabilities of VUDAA.

(5) Improvement of the Urban Environment in Vientiane, Lao PDR (Danida)

The project aimed at continuing support to municipal planning with development of linkages between green and brown environmental issues and increased village involvement in environmental planning, implementation, and monitoring. Specific project activities included a series of small bore sewers, a number of communal septic tanks including connection of all households in the immediate project area, a new trunk bore sewer along the drainage channel connected to the existing sewer established during the above project and establishment of green park areas around Nong Chanh wetland and along the Hong Thong channel.

(6) Integrating Wetland Ecosystem Values into Urban Planning: The Case of That Luang Marsh (IUCN/WWF)

This was a joint study conducted by IUCN, WWF, the Lao National Mekong Committee, and the Science Technology Environmental Office of Vientiane Municipality for an economic assessment of the goods and services provided by That Luang Marsh in an attempt to examine the economic value of urban wetland biodiversity and its importance to people living around the wetland as well as the larger urban area of Vientiane. The goal of the study was to demonstrate the importance of sustainable management of wetland areas and the need to incorporate them into urban planning and decision-making. The direct benefits of the wetland to local people in flood retention and natural wastewater treatment pond make up 40% of the total value of the wetland, demonstrating the importance of the resource to local people and to the poverty eradication goals of the Government of Lao PDR. The high value of the wetland services provided by That Luang Marsh reveal the importance of incorporating these functions into urban planning and capitalizing on wetland services for the larger area of Vientiane.

(7) Urban Wastewater Strategy and Investment Plan – UWSIP (ADB/NORAD)

The plan is one of the outputs in the Study: Northern and Central Regions Water Supply and Sanitation Sector Project - Package A Consultant. The plan will be for National urban wastewater strategy in all related aspects as well as National urban wastewater investment plan for future action. The UWSIP will be a part of the National Urban Sector Development Strategy and Investment Plan (NUSDSIP) which refers to the National Sixth Five-Year Socio-economic Plan (2006–2010).

(8) Preparatory Survey on Formulation of Basic Strategies for Regional Core Cities Development in Lao PDR. (JICA)

The project was to study and formulate basic development strategies of the Regional Core Cities in Lao PDR, in which Kaysone Phommavithane City and Pakse City were the target areas. The overall situations were investigated in other important core cities such as Vientiane, Luang Prabang and Thakhek. New landuse concept, plans and projects for the two target cities were prepared after surveying and examination of the current issues including the sewerage and drainage systems as well as future population density forecast. Urgent action projects were also proposed to prepare for future assistant programs to develop the two cities to be regional economic centers.

(9) The Study on Improvement of Water Environment in Vientiane City (JICA)

This is an on-going project started in early year 2009 and will be finished by the middle of year 2011. The project is to consider the existing conditions of water environment in the whole drainage basin of the Makhiao River and 8 districts, and formulate a master plan for water environmental management to improve the hygienic environment and to conserve the natural purification function of the Makhiao River Basin with an intention to transfer the knowledge and techniques in formulation of water environment management plan to the Lao counterparts. The study results will be closely related and incorporated to the Vientiane urban development master plan.

(10) Decentralized Waste Water Treatment System (DEWATS) Program in Lao (LIRE/Borda)

The project is a pilot study and implement project to construct the small scale communal treatment plant in the selected community. The first plant is under construction for the wastewater treatment from dormitory compound in the Faculty of Engineering in Vientiane with the concept in community participation along the planning and construction with expectation in sustainable operation and

maintenance afterwards. At present LIRE, BORDA's partner in Laos has been chosen by the Japan International Cooperation Agency (JICA) as their country partner to integrate the Community Based Sanitation (CBS) and School Based Sanitation (SBS) programs into JICA's Water Environmental Improvement Study in Vientiane with another 2 plants and expecting to expand more in the future.

(11) Rapid Assessment of Household Sanitation Services, Vientiane (World Bank)

The study is to conduct some field survey on the current household sanitation together information on the adequacy of existing domestic sanitation facilities in Vientiane from selected survey samples. The study will entail investigations at city and district/ neighborhood level, plus a sample survey of existing household sanitation facilities and related maintenance practices in middle- and low-income areas, based on a total sample of at least 500 households in a minimum of 6 locations. This currently started study in June 2010 is expected to provide valuable information to guide both ongoing and proposed initiatives to improve services in the capital.

(12) Hong Xeng and Hong Ke Wetland Treatment System (DST and VUDAA)

The project was the joint study between the Department of Science and Technology (DST) Vientiane Capital and VUDAA followed the study in "Integrating Wetland Ecosystem Values into Urban Planning: the Case of That Luang Marsh" by IUCN/ WWF to construct additional wetland system to the existing drainage of Hong Xeng and Hong Ke to reduce pollution load discharging to the That Luang Marsh. By using various kinds of water plants inside the series of wetland, it is expected to reduce pollution load from domestic waste, industrial waste and agriculture for approximately 55,000 m³/day hydraulic loading. The designed has been finished recently and waiting for foreign fund in implementation.

1.4.6 Drainage

(1) Feasibility Study on Improvement of Drainage System in Vientiane (JICA)

The study were to formulate a basic plan up to the target year in 2020 for storm water drainage system improvement in the urbanized area of Vientiane with the area of 56.2 km² and to identify the priority projects with the feasibility study. The result of the priority projects in the study were improvement of Hong Ke system, 5 shortcut channels in Hong Pasak, improvement of Hong Kai Keo with Nong Bone marsh and Lateral canals in the area enclosed by Hong Xeng.

(2) Rehabilitation of Sihom Area (UNCDF/UNDP)

This study is previously described in item 2.4.5 (1).

(3) Vientiane Integrated Urban Development Project – VIUDP (ADB)

This study is previously described in item 2.4.5 (3).

(4) Vientiane Urban Infrastructure and Service Project – VUISP (ADB)

This study is previously described in item 2.4.5 (4).

(5) The Survey on Existing Road and Drainage Condition in Vientiane Municipality (JICA)

The project was to survey the present conditions of existing drainage laterals in Vientiane Municipality during year 2001 and 2002 to establish a database of drainage laterals that can be used as guide in the operation, maintenance, rehabilitation and/or improvement of the drainage facilities; and to analyze problems in the laterals of the drainage system of Vientiane City. The survey area for the inundation conditions covers the urbanized area of 27 km² of Vientiane City but the survey area for inventory of manholes and drainage laterals for database was limited to the core area of Vientiane City of 3.3 km² only.

(6) The Project for the Improvement of the Vientiane Road No. 1 (JICA)

The objective of the project was to achieve safe and smooth traffic of No.1 road from Sikhai Junction near Wattay Airport to Thanaleng near the friendship bridge by improvement of the road and drainage. In this project rehabilitation with widening of road surface as well as new drainage pipe along the road was constructed resulting in more safety as well as better drainage in the Road no.1 area.

(7) The Construction of Drainage System and T2 Road Improvement Project (Thailand)

The project funded by Thailand to improve the T2 Road and the subsidiary roads for better surface with widening as well as new drainage pipe and channel. Resulting from this project together with the previous improvement drainage projects, less flood problem occurs in most of the urban area in Vientiane centers.

(8) The Feasibility Study on Repair of River Bank and Construction of Riverside Park along the Mekong River in Vientiane (KOICA)

The project was to survey, investigate, study and preliminary design for the proper river bank protection along the Mekong River in supplement to the findings from the previous JICA study on Mekong River Bank protection around Vientiane Municipality by taking into account updated social and macroeconomic criteria and technology. Preliminary design on river side park development with relating infrastructure and miscellaneous facilities were also included in the study.

(9) Preparatory Survey on Formulation of Basic Strategies for Regional Core Cities Development in Lao PDR. (JICA)

This study is previously described in item 2.4.5 (8).

(10) The Study on Improvement of Water Environment in Vientiane City (JICA)

This study is previously described in item 2.4.5 (9).

(11) Mekong River Integrated Management Project (EDCF)

The project is also on-going to mitigate flood hazard and prevent riverbank erosion in the Mekong River at Vientiane City area, the project comprises the construction of dike and flood control embankment of 12.2 km road alongside the Mekong River from Kaoliao to KM 3. Bituminous Riverside road of 2.7 km on the top of dike including connection roads is planned with the 16 ha. development river side park and landscaping is being constructed as tourism resource and recreation area in Vientiane.

(12) Vientiane Integrated Development Project at That Luang Marsh (Private Investor)

The Lao Government initiated the “new town” project a few years ago after agreeing with Chinese authorities to provide land for the project in return for assistance to construct a sports stadium for the 25th SEA Games, which were held in Vientiane at the end of 2009. Under the agreement, the Lao Government provided land at Km16 for a Chinese investor to build the National Sports Stadium, and at That Luang to build a new urban area consisting of schools, hotels, a hospital, shopping centre and some light industry which will deteriorate the use of That Luang Marsh as wetland by filling some areas. The new development town in That Luang Marsh has faced strong public criticism about the project as well as high compensation cost in relocation of the people living in the area. Therefore the Lao Government has recently announced in cancelling the Chinese development project in That Luang and will provide the other area to develop instead. In addition the other organization has proposed to preserve the 20 square km of That Luang wetland with the stated aims of protecting existing hydrology, fauna and flora, livelihoods, cultural and historical values of the area as well as performing large storage of storm drain retention for the city.

(13) Nongtha Reclamation and Development Project (Private Investor)

The project was proposed and studied by the Vietnamese Investor in developing the Nongtha wetland and surrounding area, which covers 75 ha of land in Chanthabouly district to be a hotel, restaurant, guesthouse and tourism facilities incorporated into a leisure park. This will have some effect to the current drainage retention capacity to the Hong Xeng catchment system. But at this moment the project is still pending for actual investment.

(14) Village Planning and Design for Nong Ping Market (DPWT and Private Investor)

The project was proposed and studied by DPWT to develop some area of Nong Ping to be a well organized market from the relocation of the Thong Khankham market to cope with the urban expansion. The project development will have some effect to the current drainage retention capacity to the Hong Xeng catchment system from the filling up of the current drainage retention area.

(15) Nong Chan Development Project (Private Investor)

The development for Nong Chan has 2 site locations at both sides of Hong Ke: Nong Chan Nuea near Khouadine Market and Nong Chan Tai next to the water park. Nong Chan Nuea will be developed by Lao private investor at the area of 5.5 ha. to be hotel and shopping center whereas Nong Chan Tai is under planning from Korean Investor to be a public park and recreation area with the agreement between Lao Government and Korean Government in grant aid. Both projects will preserve the existing water area without filling up, the development will be along the area around the reservoirs and is expected to start in year 2011.

(16) Improvement of T2 road and Drainage Storage Pond Project (NEDA- Thailand)

The project is the continuation from the previously improvement project to improve of 6.5-km long T2 Road stretches from the traffic light at Akard village, (Air Force quarter) via Nongduang traffic light to the Kaysone Phomvihane Road and the 23 August Road with widened to 12 metres and upgraded as a four-lane road. The drainage and streetlight will also be improved. This project will also construct two water catchment areas in Thongsangnang and Nongduang villages to hold water in case of heavy rainfall. The detail plan of the project is under improvement to be more appropriate prior to implementation.

(17) Nongtha Tai Development Project (DPWT and Private Investor)

The project is now under survey and study by DPWT for the development of 52 ha. area of Nongtha Tai, which receives the discharging water from Nongtha, to be an IT School in Vientiane. The project will have to fill some part of Nongtha Tai and will have effect to the drainage system of Nongtha area and large drainage pipes have to be provided in order that existing pond be filled.

1.4.7 Solid Waste

- (1) The Study on the Solid Waste Management System Improvement Project in Vientiane (JICA)
- (2) Basic Design Study on the Project for Improvement of the Solid Waste System in Vientiane Urban area (JICA)
- (3) Procurement of Collection and Haulage Equipment, Construction of a Final Disposal Site, Construction of a Maintenance Workshop (JICA)
- (4) Participated Conscious Creation Project regarding the Solid Waste Management (Holland)
- (5) Participated Conscious Creation Project regarding the Solid Waste Management, PPPUE (UNDP)
- (6) Community Solid Waste Management Project, JFPR (ADB)
- (7) KM32 landfill construction project

The removal of landfill at KM18 towards the road No. 13 south, Naphasouk Village, Xaythany District in 2008.

1.4.8 Parks, Open spaces and Greenery

- (1) That Luang Marsh Project (WWF and WREA)

WWF, WREA and Vientiane City implemented “That Luang Marsh Project” from 2007 to 2009 and created artificial wetlands as structural measures for water quality improvement Vientiane City. They are scheduled to carry out the phase 2 of this project thereafter with the concept to create more large-sized artificial wetlands.

- (2) That Luang Marsh Research (DPWT) (on-going as of 2010)

Currently, DPWT is conducting a survey and examination to resolve the problem of intrusion to the land of local people by a new development project.

(3) Natural Resources and Environment Program (Resettlement) (DANIDA)

More than 700 households were resettled out from Nong Chan marsh in 2001. They moved to a new resettlement area of Nong Taeng, 11km north of Vientiane center. In addition Nong Chan marsh had been in a bad condition with overgrown weed until that time.

(4) Water Park Project (Malaysian Company)

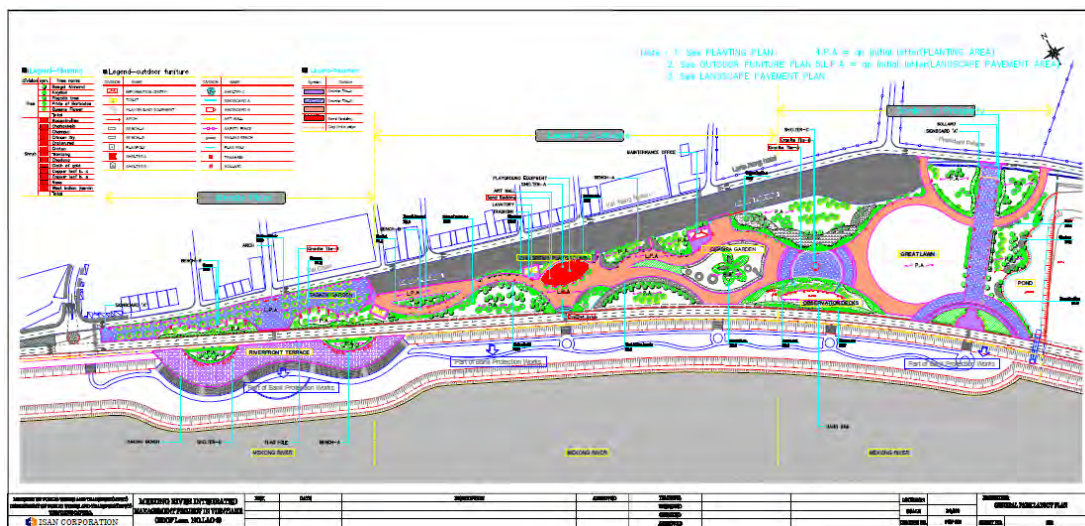
A company from Malaysia which has constructed “Water Park” next to Nong Chan marsh proposed to make the whole Nong Chan marsh area a large park at first. However the proposal was rejected by the Government of Lao PDR, and the company got a concession only for the current area of Water Park for 20 years.

(5) The Study on Improvement of Water Environment (JICA)

In JICA Study “The Study on Improvement of Water Environment in Vientiane City, some pilot projects and priority projects are proposed. The pre-feasibility study shall be conducted for in-stream treatment facilities at three locations in the next fiscal year 2010/2011 as a priority project.

(6) Mekong River Integrated Management Project - Chao Anouvong Park (EDCF and DPWT)

This project was commenced in 2009 and it will be completed by 2013. It is funded by the Economic Development Cooperation Fund (EDCF) of Korea and implemented by DPWT with the construction cost of USD 30,855,000. In order to mitigate the flood hazard and prevent riverbank erosion in the Mekong River in Vientiane City area, the project comprises the construction of a dike and bank protection of 12.2 km from Kaoliao to KM3. The dike and bank protection are designed for 100-year probable discharge. A 2.7 km long riverside road on top of the new dike and connection roads are planned. The road will be surfaced with a bituminous pavement. In response to the need to create good riparian environment for tourism and recreation, a riverside park (Chao Anouvong Park) is planned. The park is to be developed on a site of 16 ha.



Source: JST

Figure 1.4.4: Layout Plan of Chao Anouvong Park

(7) Green School Project (Department of Education, Vientiane City)

Department of Education, Vientiane City has been carrying out “Green School project” which performs tree-planting of school grounds as an environmental beautification activity since 2006. A total of 107 primary, junior high, and senior high schools (86 public and 21 private) selected in the City have conducted the activity. DOE evaluated the activity result of each school in three-steps, and commended the top nine schools (3 primary, 3 junior high and 3 senior high schools) which obtained excellent results.

1.5 Overview of Constraints and Planning Issues

1.5.1 Industrial Development

(1) Competition and Corporation with Cities in GMS

Regional economic integration such as implementation of AFTA and ASEAN Community, will lower border impediments among the concerned countries. This is a chance for Lao PDR in promoting economic development based on an idea that their market is not only Lao PDR but a wider area such as GMS or ASEAN as a whole. The economic integration is a new challenge also for Vientiane Capital. Previously, Vientiane Capital enjoys the merits of being the national capital of Lao PDR. Population and economic activity has been concentrated here. However, Vientiane Capital might have to compete with other competitive cities in GMS in accordance with the economic integration.

In particular, since Lao PDR and Thailand have similar culture and language, cities in the north and northeast Thailand as indicated in Table 1.5.1 would be potential rivals for Vientiane Capital. Exchange of goods, money and personnel has been in progress, such as observed in manufacturing sector. In accordance with economic development in Bangkok and the surrounding provinces, labor-intensive processes such as transport machine processing and electrical machine processing are transferred to the north and northeastern provinces from the Bangkok Metropolitan Region. Lao PDR is also receiving such investment in recent years.

Table 1.5.1: Cities in North and Northeast Thailand

City	Area (km ²)	Population (persons)	Province
Chiang Mai	40.0	147,504	Chiang Mai
Nakhon Ratchasima	37.5	146,244	Nakhon Ratchasima
Udon Thani	47.7	141,751	Udon Thani
Khon Kaen	46.0	118,667	Khon Kaen
Ubon Ratchathani	29.0	84,866	Ubon Ratchathani
Chiang Rai	60.9	69,726	Chiang Rai
Lampang	22.2	59,172	Lampang

Note: Population as of October 2008; Total area of the central 3 districts (Chanthabouly, Sisattanak and Xaysetha) is 207km² and total population these was 267,862 persons in 2009

Source: Department of Provincial Administration, Ministry of Interior, Royal Thai Government

Table 1.5.2: GRDP and GRDP per Capita of the Northern and the Northeastern Provinces of Thailand in 2008

Province	GRDP (THB million)	GRDP per Capita (THB)	Provincial Population (000)
Chiang Mai	127,602	80,241	1,590
Nakhon Ratchasima	158,677	56,872	2,790
Udon Thani	74,911	46,517	1,610
Khon Kaen	139,706	74,487	1,816
Ubon Ratchathani	72,279	39,089	1,849
Chiang Rai	64,571	53,815	1,200
Lampang	47,535	58,210	817
Mukhudahan	35,999	37,354	964

Source: Office of National Economic and Social Board, Royal Thai Government

Table 1.5.2 shows GRDP and GRDP per capita of the northern and the northeastern provinces of Thailand. GRDP and GRDP per capita of Vientiane Capital calculated by Thai Baht were THB

40,087 million and THB 52,608 in the same year. Although provincial population was quite different, GRDP per capita of Vientiane Capital was higher than neighboring cities such as Mukhadahan, Ubon Ratchathani and Udon Thani. Such difference in GDP per capita seems to come in part from low percentages of population in city area to province in Cities in Thailand. Vientiane Capital enjoyed benefit of being a national capital in which urban functions such as economic center, political center and social service center are accumulated.

In order to compete with these cities, it is necessary for Vientiane Capital to identify its characters clearly and prepare definite future visions and strategies.

On the other hand, Vientiane Capital relies on the neighboring cities, in particular, Nong Khai and Udon Thani, in terms of commercial and medical services. Many residents in Vientiane Capital visit Nong Khai and Udon Thani for shopping, leisure and medical services. For example, a total number of beds in district hospitals in Vientiane Capital was only 95 in 2008. Nong Khai and Udon Thani provide urban services to residents in Vientiane Capital but urban services provided by Vientiane Capital to residents in these cities are almost nil to date¹.

(2) Development of Manufacturing and Service Sectors against a fear of Dutch Disease

On the national level, Lao PDR is expected to achieve a high level of GDP growth for the middle and long terms. It is projected that resource sector (hydropower development and mining) will provide a significant contribution to such high level of economic growth. Rapid development of resource might lead to "Dutch Disease." Dutch disease is a concept that explains the apparent relationship between the increase in exploitation of natural resources and a decline in the manufacturing sector². Stronger LAK against USD and THB in recent years might be a sign of the Dutch Diseases for Lao PDR. Such situation would be one of the constraints against developing agriculture which needs to change from self-sufficient agriculture to commercial agriculture, and the growth of manufacturing and service industry in Vientiane Capital. Due to stronger LAK against USD as well as the minimum wage stipulated in 2009, Lao PDR lost its appeal in terms of the wage level in USD compared with neighboring countries such as Bangladesh, Myanmar, and Cambodia.

(3) Development of a new economic relation between urban and rural areas

In accordance with the development of Vientiane Capital, concentration of population and economic activity to the central area of Vientiane Capital might be accelerated. As a result, a development gap between the urban and rural areas inside of Vientiane Capital would widen. In order to avoid such disparity, it is necessary to develop a new economic relation between the urban and rural areas. The new economic relation would be a key to achieve balanced regional economic development in Lao PDR.

In this regard, promotion of commercialized agriculture is important in rural villages. Although a rapid increase in income in Vientiane Capital provides a chance for promoting commercial agriculture, farmers in Vientiane Capital may not be able to catch up with such situation. They do may not have enough capacity in capital investment and know-how to develop commercial agriculture. As a result, a part of agricultural products such as vegetables and fruits is imported from the surrounding countries. Support to development in commercial agriculture will contribute to narrowing a gap between the urban and rural areas in the future.

¹ Some Thai residents visit Nam Ngum Dam in weekends. This is one of limited examples of urban service by Vientiane Capital.

² Regarding to Dutch Disease, please refer to "Back to Basics – Dutch Disease: Too much wealth managed unwisely," Finance and Development, A quarterly magazine of the IMF (March 2003, Volume 40, Number 1).

Another potential to develop a new economic relation between the urban and rural areas is tourism development at rural villages for holidays. In accordance with economic development, a part of traditional lifestyle and culture will disappear in urban area, and people in urban area will spend busy urban life during weekdays. Thus in weekends, people in urban area will visit rural villages and spend calm village life, and disburse money for accommodations and foods. Such new relation would be developed though supports in tourism development and promotion of local economies.

(4) Poor management and use of land resources

In accordance with economic development in recent years, some farmlands have changed to housing or industrial lands. Since there are no accurate statistical data about the reduction of farmland, the comparison of harvested areas is shown for the past 10 years in both Vientiane Capital and the whole country.

Table 1.5.3: Comparison of Harvested Areas of Major Crops in recent 10 years

(Unit: 000 ha)

Harvested Area of Major Crops*	Year									
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Vientiane Capital	73	80	85	86	93	91	88	87	90	79
Lao PDR	891	877	985	969	1,011	1,044	975	1,109	1,134	1,276

Note: *Total Area of Season Rice, Irrigated Rice, Upland Rice, Maize, Starchy Roots, Vegetable and Beans, Peanut, Soybean, Mungbean, Tobacco, Cotton, Sugarcane, Coffee and Tea.

Source: Basic Statistic, National Statistic Center

As presented in Table 1.5.4, the total harvested area of major crops in the whole country has steadily increased by 4% annually and increased by 143% in the past 10 years. The total harvested area of major crops in Vientiane Capital, however, has increased to 93,000 ha in maximum in 2003, and then it has kept level about 90,000 ha without much increase. (The area of 73,000 ha in 2008 is an exception due to serious damage by flood in the wet season in Vientiane Capital.)

It is said that in spite of increase of population, the farming area in Vientiane Capital has stayed constant and then reduced in recent years. The reasons for this are the following two points:

- Some farmlands have been changed to housing or industrial lands, and
- Some farmlands are not effectively used by the farmers due to engagement in other income activities.

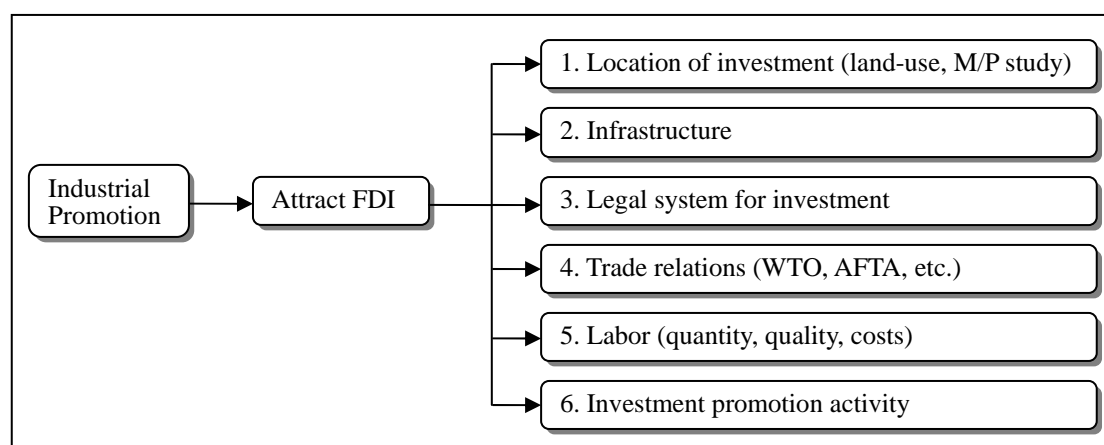
The Deputy Director of DAF of Vientiane Capital suggests that:

- it is impossible to stop changing the farm lands to housing and industrial lands in the 4 urban districts of Vientiane Capital; and
- DAF will focus on agricultural development and effective utilization of land of 5 surrounding districts of Vientiane Capital.

Landuse and Land Classification Center of National Agriculture and Forestry Institute (NAFRI), MAF conducted a survey of land use and land classification in each district in order to promote effective use of land for agricultural products. The results of the survey, however, have not been authorized by the government for managing the land use in each district. Since proper management and effective use of limited land resource is indispensable for sustainable agricultural development, such survey data should be made official for use in the future.

(5) Issues regarding the improvement in the investment climates

As described in the above section (1), FDI is essential for industrial promotion., It is, however, necessary to improve the investment climates for attracting FDI into Vientiane Capital. Figure 1.5.1 shows six issues for improving the investment climates.



Source: JST

Figure 1.5.1: Issues Regarding the Improvement in the Investment Climates

1) Location of investment

Good location is an important condition for investment promotion. As described in Section 2.1.2, PTI conducted a master plan study for development of industrial zone in Km-21 and its neighboring area of 70,000 ha. The area defined by the Master Plan Study is expected to be an economic center in future. It is necessary to investigate the land-use and infrastructure development in the entire area of Master Plan Study as well as the industrial zone in Km-21 in collaboration with Urban Development Master Plan Study being conducted by JST.

Since there is no specific regulation of land-use in Vientiane Capital, new factories could be constructed anywhere the investors desire, not necessarily in the industry zone in Km-21. As a result, the investors might as well build new factories with high environmental load in farmland or residential area.

2) Infrastructure

The manufacturing industry requires various infrastructure including road, electricity, telecommunication, water supply, sewerage, drainage, and, solid waste management, although the required volume of each infrastructure service depends on the industrial process of individual factories. If there is an industrial estate with well-developed infrastructure, FDI for industrial development shall be much encouraged.

JST for industrial development has conducted a feasibility study on Vientiane Industrial Park with a total area of 140 ha. It is necessary to develop the Vientiane Industrial Park in accordance with the feasibility study in order to attract investment.

3) Legal system for investment

The development of a legal system is necessary to promote FDI. The Government of Lao PDR issued the Law on Investment Promotion in July 2009 and announced it in March 2010. In the next step, the Government will issue a decree of the Prime Minister regarding the

implementation of the Law. It is quite important to improve the investment climates through the enforcement of the Law.

4) Trade relations

Through the mechanism of the common effective preferential tariff (CEPT), Lao PDR needs to enact zero tariff rates on virtually all imports from AFTA by 2015. In addition, The Government is in preparation for the accession to WTO, since Lao PDR is the only non-member country of WTO among ASEAN members at present. As a result of complete implementation of CEPT and accession to WTO, it is expected that FDI shall be encouraged, although the institutional reform is necessary, too.

5) Labor

Existing factories in Vientiane Capital are obliged to employ a substantial number of labor from other provinces, due to a shortage of young people in the area who are willing to work in the factories. With an increase in factories, further shortage of labor may occur; and the investment in the manufacturing industry might be discouraged.

It is necessary to create a mechanism for stable supply of labor from other provinces where young people need jobs. In addition, it is necessary to develop decent living environment for these labors; to assist them to maintain relationship with their families, relatives, and friends in their hometown; and to provide opportunities of training.

6) Investment promotion activity

Vientiane Capital needs to compete with other countries in the region and other provinces in the country in order to attract FDI. First, it is necessary to address the issues described above so that Vientiane Capital could survive the competition for FDI.

In parallel with this, it is necessary to take investment promotion activities including dissemination of information for potential investors; getting feedback from potential investors; expediting the procedure for investment; and taking care of investors to resolve the problems that investors face during their operation.

1.5.2 Urban Development

(1) Implications from Visions and Framework

The development visions set out for Vientiane Capital can be summarized in enhancing the centrality of Vientiane Capital as the national center of Lao PDR as well as a regional hub city in GMS, and improving the livability as a hometown of the citizen of Vientiane Capital. The corresponding socio-economic framework indicates that the population and economy will drastically build up till 2030. Meanwhile, there is a strong desire to improve the quality and livability of the city with its own unique culture, good environment and traditional landscape of Vientiane Capital.

In general, population increase and economic growth will cause a growing demand for the land for living and work. Looking at the relationship between number of work force and GRDP, it is strongly recommended that productivity shall be improved in all economic sectors in Lao PDR for sustainable economic growth. The key concept for achieving this is “the improvement of the economic centrality” mentioned in the development visions. The agriculture sector will require improvement of the land productivity (yield), while the industrial and service sectors will require attracting much more foreign investment that would induce more and more effective and sophisticated operation and services and enlarge and strengthen the economic activities of Vientiane Capital

Urban development in this context should facilitate the requirements on space from socio-economic changes mentioned above. Future urban functions and activities of peoples should be efficiently accommodated in Vientiane Capital in a well-designed and effective urban structure. In this regard, the following five aspects are crucial for further urban development in relation to the future socio-economic changes/growth Vientiane Capital:

1) Provision of more land for the expected increase of population

It is necessary to accommodate the increasing demand for the land for residential use in accordance with the population projection. There are two basic ways to increase residential space; namely vertical and horizontal. Vertical expansion means to increase the land use intensity, while the horizontal expansion means to widen the urban areas outwards. It was concluded that mid-rise urban center with sub-center in the suburbs is selected which basically combines the vertical and horizontal expansions, in which the land use intensity of the existing urban area shall be controlled near the present condition, while in the sub-center areas in the suburbs higher buildings shall be tolerated.

2) Provision of land to promote the manufacturing and service (business) sectors

Increase of work force in particular for manufacturing and service sectors will require more space for working places such as factories, shops and offices. Expanding more land for industry and service sectors will strongly affect land use plan. Furthermore, strengthening of “centrality” is the indispensable key issue for Vientiane Capital. Improvement of “centrality” of urban economy will be important for Vientiane Capital to compete with other regional cities in the northern Thailand, since goods, people and money will move more freely beyond the borders under the ongoing initiative for market integration of ASEAN. In this sense, Vientiane Capital should have more sophisticated business environment to accumulate more business, especially in the urban center, and have a competitive industrial zone and an efficient international logistics zone in the suburban areas to attract foreign and domestic investors.

3) Maintenance of agricultural land with higher land productivity (yield)

Farm land tends to be gradually reduced due urbanization in Vientiane Capital. This tendency may be difficult to stop or even may have to be accelerated. Under such a circumstance, agriculture sector needs to improve the farm income to alleviate the rural poor. For this purpose, it is important to keep good agricultural land for farming activities in the land use plan. The good agricultural land refers to the land suitable for higher value added products and the land with higher land productivity (yield).

- 4) Avoidance of over-concentration and keeping the Lao traditional landscape in the suburbs as well as in the central area

There are uncountable cases of emerging mega-city in the world due to over-concentration of urban functions without adequate infrastructure provision under rapid economic growth. Vientiane Capital should not face the similar situation in near future by introducing effective control of urbanization as well as managing urban development.

- 5) Avoidance of disorderly development in suburban area

There will be latent development potential in suburban area of Vientiane Capital due to more land development demand. The land development tends to occur chiefly along the main roads, resulting in an urban sprawl and so-called ribbon developments. These usually fail to generate efficient land use, and leave unsafe, inconvenient and inadequate urban areas with bad environmental conditions.

(2) Urban Development Issues

Vientiane Capital area can be divided into three areas, namely 1) Inner urban, 2) Outer urban, and 3) Outskirts to easily clarify its characteristics and issues by area.

1) Inner Urban

Inner urban is defined as the area enclosed by the Inner ring road and the Mekong River and the inner ring road (Khampenmouang road). The core of the area is a historic area surrounded by commercial, business and administrative area and residential areas, which have approximately 5,000 ha in total. This is almost the same area as the “100 urban villages” described in the urban plan in 2000 which coincides with the service area of VUDAA.

Inner urban is anticipated to accommodate more office space to strengthen the regional business center function in GMS as well as more commercial space to provide for shops as a regional commercial center with the increased buying power of the people in the hinterland due to the economic development and population growth of Vientiane Capital. As there is not so much vacant land in the center of Vientiane Capital to cater to the demands for land, it is necessary to facilitate more intensive land use in the urban center or utilize suburban areas.

When all urban functions are concentrated in the urban center, this will result in heavy traffic congestion in the central city, land speculation and environmental deterioration as well as risk on safety.

Accordingly, there is a necessity to tackle the following issues:

- Avoidance of Over-concentration into urban center
- Conservation of historic landscape and buildings
- Intensive land use for commercial and business function in urban center

- Improvement of living environment

2) Outer Urban

Outer Urban refers to the suburbs of Vientiane Capital outside of the Inner Urban. The area is still underdeveloped with houses and shop-houses mainly along major roads, but still has plenty of farm land behind the houses along the main roads. It is almost the same area as that of 150 village areas under DPWT.

This area is also anticipated to accommodate more residential developments in future. In addition, the area is also to accommodate new sub-centers which will provide for relocating/creating new urban functions, such as Vientiane Industrial Park and Vientiane Logistics Park. The area still has plenty of land for development, while there are areas to be conserved such as high productive farm land, designated conservation area and wetland functioning as water retention ponds. Accordingly, it is important to maintain balance between development and conservation in this area. Meanwhile, the area in this area is available for a relatively reasonable land price compared with the lands in urban center. With high demand for the land for housing development as well as supporting infrastructure development, the land price in this area has been gradually rising and this will continue. It will be imperative to control land speculation, which will be an obstacle for future development.

Accordingly, there is a necessity to tackle the following issues such as:

- Expansion of urban area with control
- Conservation of current land use of important areas
- Avoidance of land speculation

3) Outskirts

Outskirts refers to the areas outside of the outer urban area of Vientiane Capital. The area includes local urban clusters and settlements in the rural area. An urban cluster is a traditional local trade and commercial center, usually located at an intersection of roads and a river

Other area is basically utilized as farm land with forest, paddy field and rural settlements. This area will mainly need to maintain its agricultural area. A higher productivity will be required to improve the income level of farmers, and accordingly, it will be required to keep high productive agricultural land. On the other hand, urban clusters will be important to balance the population between urban center and rural areas as well as to improve living standard in the local settlements.

Accordingly, there is a necessity to tackle the following issues such as:

- Creation of sub-centers
- Creation of urban clusters
- Conservation of higher productive agricultural land

1.5.3 Legal and Regulatory Framework

Table 1.5.4 below shows constraints, present condition and issues on legal and regulatory framework. Several constraints or problems were identified on institutional and legal aspect and organization for urban development and land use planning.

Table 1.5.4: Constraints, Present Condition and Planning Issues of Legal and Regulatory

Items	Present Condition and Constraints	Planning Issues
Institutional and Legal Aspect		
Soft Implementation of Building Permit and Monitoring	<ul style="list-style-type: none"> -Law on urban plan has Articles on judgment of drawings and permission of the building and the land development before construction, repair and/or development, certificate of conformity of the building constructed, repaired and/or the developed and drawings judged and permitted, and monitoring and inspection of the building and the development after construction. -Articles on measures against violators such as re-education, compensation, fines (an amount equal to 10% of the value of constructed or repaired buildings), punishment in accordance with the Penal Law, and other measures (suspension of business, withdrawal of license, and demolition of the unauthorized construction and repair) are also included in the Law. -However, many buildings against the law exist in the urban center. 	<ul style="list-style-type: none"> -Strict application of the Law including measures against violators is needed.
Illegal Construction and Development against Regulation of Land Use Zone	<ul style="list-style-type: none"> -Agriculture zone (NA) and conservation zone (NE) were designated at outside of urban surrounding zone (UD) in the urban master plan of Vientiane Capital. -Regulation of zoning provided for the urban master plan of Vientiane Capital mentions that construction of the building and development of land are basically prohibited at these zones. -However, construction of buildings and development of land have been implemented in these zones because of expansion of urbanization. -Moreover, many activities of building construction and land development at NA and NE located at outside of the urban master plan area can also be seen. 	<ul style="list-style-type: none"> -Area, boundary and type of zone in the urban planning area should be determined carefully in expectation of expansion of the urban area in the future. -Strict enforcement of regulation is needed. -Article on measures against violators should be added in the regulation. -Regulation of land use zone should be applied not only within the area of urban plan but also outside of the plan area.
No Law and Regulation on Landscape and Streetscape	<ul style="list-style-type: none"> -No law and regulation on protection, improvement and design of landscape and streetscape of the historical building and area exists in Laos. - Therefore, new buildings having a new design are constructed in this area. These buildings spoil atmosphere, landscape and streetscape of the area. 	<ul style="list-style-type: none"> -Guideline of landscape and streetscape should be added in the regulation of land use zone.
No Building Control (Code) provided	<ul style="list-style-type: none"> -Coverage ratio, plot ration, building height, setback are mentioned in the regulation of land use zone. -Checking, permission, certificate and monitoring of buildings are mentioned in the Law on urban plan. -However, nothing is mentioned on building safety such as building calculation, fire protection, lighting and ventilation in the law and the regulation. -DHUP provided the draft of the building control (code) and is now waiting for approval on the contents of the building control from relevant authorities. 	<ul style="list-style-type: none"> -The building control (code) should be approved and enforced as soon as possible.
No Guideline for Development	<ul style="list-style-type: none"> -Permission system of the building construction and the land development exists in Laos. 	<ul style="list-style-type: none"> -A guideline on procedure for obtaining development

Items	Present Condition and Constraints	Planning Issues
Permission	<ul style="list-style-type: none"> -However, different permissions based on Laws in Laos are needed from relevant authorities for the construction and the development. -Obtaining of permission on change in land category or use and acquisition of land use right is mentioned in the Land Law. -Obtaining of a foreign investment license, an enterprise registration certificate and a tax registration certificate is written in the Law on the Promotion of Foreign Investment. -Obtaining of permission on a building construction and land development is mentioned in the Law on Urban Plan and the Regulation of Vientiane Zoning Control. -Obtaining of an environmental compliance certificate is required by the Decree on Environmental Impact Assessment. - 	<p>permission should be prepared for convenience of contractors, developers and investors.</p>
Organization		
Few No. of Staff of Urban Planning	<ul style="list-style-type: none"> -More than 140 districts exist in Laos. -Of which, 115 districts have an urban master plan. -PTI, which is one of the organizations responsible for making an urban master plan, had provided 81 urban master plans from 1997 to 2007 (10 years) including the master plan of Vientiane Capital. -PTI has 57 staffs. Of which, 42 staffs are directly involved in making an urban master plan. -PTI had provided average 8 master plans in a year by 42 staffs. -DPWT and OPWT are also responsible for provision of an urban master plan. -However, only 30 urban master plans had been provided by these two authorities. -More than 20 districts having no master plan still exist. -More than 60 master plans had been provided more than 10 years ago and are needed for revision. 	<ul style="list-style-type: none"> -Increase of number of staffs and enhancement of function in authorities related to preparation of an urban master plan are indispensable for constant and regular provision and revision of an urban master plan of districts in Laos. -This contributes to provision of an urban plan of national, regional and provincial level which has not been provided yet.
Few No. of Staff of Urban Management in Vientiane Capital	<ul style="list-style-type: none"> -Total number of staff related to urban management in Vientiane Capital is 245 (9 OPWTs (69), DPWT (100) and VUDAA (76)). -Population in Vientiane Capital in 2009 is around 795,000 persons. -Number of staff related to urban management is few compare to population. -Therefore, many buildings against the law and the regulation exist in the Capital, especially in the urban center area. -Moreover, solid waste is collected from only 43 % of households in territory of VUDAA. Collection of solid waste at new urbanized area outside of the territory is not implemented. 	<ul style="list-style-type: none"> -Increase of number of staff in OPWTs, DPWT and VUDAA is inevitable. -Re-organization of these authorities should be considered.
Inconformity of Territory of VUDAA and Urbanized Area	<ul style="list-style-type: none"> -VUDAA which covers 100 villages in four districts in Vientiane Capital was established for management of highly urbanized area in the Capital on February 1997. -Other 400 villages are managed by DPWT. -At present, urbanized area is being expanded to the outside of the territory of VUDAA. -Main duties of VUDAA and DPWT on urban management are almost same. -However, management of solid waste and drainage is implemented only by VUDAA. 	<ul style="list-style-type: none"> -Expansion of territory of VUDAA and increase of staff in VUDAA are needed to suit expansion of urban area. -Or, consolidation of VUDAA and DPWT should be considered for better management of the Vientiane Capital.
No Single Window of Guidance on the Construction and the Development, and Land Use Coordination and Technical Judgment	<ul style="list-style-type: none"> -Permission of change in land category or use is issued by the each authority such as Ministry of Agriculture and Forest, Industry and Handicrafts, and the National Land Management Authority, etc. -Acquisition of land use right is permitted by the land management authority. -A foreign investment license, an enterprise registration certificate and a tax registration certificate are issued by Committee for Promotion and Management of Investment 	<ul style="list-style-type: none"> -A section for application and guidance of construction, development and investment and a committee on land use coordination and technical judgment should be established in an authority in a province such as DPWT and DOI.

Items	Present Condition and Constraints	Planning Issues
	<p>(CPMI). -Permission on a building construction and land development is issued by a local authority. -An environmental compliance certificate is issued by WREA. -Thus, many authorities are involved in for obtaining permission of the construction and the development. -However, no section and no committee for guiding the smooth development and coordination of land use exist in any administration in Laos.</p>	

Source: JST

1.5.4 Infrastructure Development

(1) Road and Transport

Table 1.5.5: Problems and Planning Issues of Road and Transport

Items	Problems	Planning Issues
Road Network	<ul style="list-style-type: none"> - Functional classification of network has not yet been established and each authority: VUDAA and MPWT has different design standard on geometric and pavement - In the existing situation, there are several bottlenecks and missing links in the existing network. Some bottlenecks are caused of encroachment and surface condition. - No road development plan harmonizing with a urban planning in the whole Vientiane Capital. In JUTMP 2008, a road development program was proposed only for the central area. Besides, the progress of road development doesn't seem to follow the proposed program. - Motorization has shown more rapid progress than estimated in JUTMP 2008. This should be taken into consideration in a road development plan. 	<ul style="list-style-type: none"> - Establishment of functional classification - Provide a road development program for the whole Vientiane Capital - Development of network plan to meet traffic demand based on future urban planning - Improvement of bottlenecks and construction of missing links - Improvement of road surface condition - Improvement of interchange
Public Transport	<ul style="list-style-type: none"> - Public transport service is being operated by VSBC. They have insufficient profit to provide enough number of new buses so public transport is no longer convenient for users. - In rural area, main transport mode may be public transport and their needs are very high. However, because they have limited vehicles and there is no paved road, they can't provide enough service. - There is no promotion policy for public transport to attract travelers and increase the number of public transport users. No traffic demand management policy too. 	<ul style="list-style-type: none"> - Improvement of bus service quality and quantity to meet travel demand - Public transport plan in harmony with urban planning, especially railway stations. - Introduction of BRT, public transport corridor, bus exclusive/priority lane - Introduction of traffic demand management polity to promote public transport usage - Establishment of fare policy - Conduct a study for an integrated public transport strategy plan
Other	<ul style="list-style-type: none"> - There are in sufficient parking control signs or it is unclear even if there is. As a result of those, many illegal parking are found on street in commercial and business area. This reduces capacity of the street. - Parking space is fewer compared with development of road and buildings, especially in the central area. This cases illegal parking and illegal parking is an obstacle to smooth flow of traffic and traffic safety. - There are several modes existing in the Study area, which are different size and travel speed. The mixture of mode on street causes traffic accident 	<ul style="list-style-type: none"> - Guideline and plans for traffic management strategy including: <ul style="list-style-type: none"> - Segregation plan of several modes - Marking and signs - Parking in the central area - Traffic signal - Traffic safety

Source: JST

(2) Water Supply

Table 1.5.6: Constraints and Planning Issues of Water Supply

Items	Constraints	Planning Issues
Technical Aspect		
Expansion / Renovation of water supply facilities	<ul style="list-style-type: none"> - Population is expected to increase about double from 2010 to 2030, so water supply facilities are required to expand also about double to support the development of Vientiane Capital. - Capacity of reservoirs is small as about 5.3 hr. retention time including WTP reservoir capacity. - Some customers receive water from directly transmission pipes but not from distribution pipe. - Leakage rate, as non revenue water in 2009 is high as 32%. 	<ul style="list-style-type: none"> - Water supply facilities such as water treatment plants, transmission and distribution facilities, service pipes and others are required newly or additionally, - WTP sites shall be selected based on the location of the water sources, location of new water demand area and available land. - Capacity of reservoirs shall be increased for stable water supply. - NRW shall be reduced. - Updated water supply master plan is required.
Identification of pipe location	<ul style="list-style-type: none"> - Locations of pipes are not clearly understood by NPVC, that leads not effective OM work. 	<ul style="list-style-type: none"> - Water pipe network drawings showing detail location are required for the easy pipe maintenance.
Land security for pipes	<ul style="list-style-type: none"> - Water pipes have been constructed since 1964, mainly pipes are installed along roads. Houses, temples or buildings have been constructed above some pipes. The situation makes the pipe maintenance difficult. 	<ul style="list-style-type: none"> - Management of underground structure shall be well organized.
Rural water supply development	<ul style="list-style-type: none"> - Some groundwater is contaminated by arsenic in Vientiane Capital. 	<ul style="list-style-type: none"> - Groundwater quality shall be assured before it is used for potable water.
Institutional, Management and Financial Aspect		
Institution for rural water supply	<ul style="list-style-type: none"> - Rural water supply system is operated and maintained by not proper organization. 	<ul style="list-style-type: none"> - Adequate organization and institution shall be established for the rural water supply system.
Revision of registration category	<ul style="list-style-type: none"> - Water users are categorized in residents, commercial, industrial, government and others, but they are not correctly categorized. 	<ul style="list-style-type: none"> - The categories shall be revised for controlling water consumption by categories.
Responsibility of NPVC	<ul style="list-style-type: none"> - NPVC is working for water supply, although NPVC has been nominated in charge of wastewater management in Prime Minister Disition No.37/PM, September 1999. 	<ul style="list-style-type: none"> - Responsibility of NPVC shall be clearly study if it has the roll of wastewater management.
Financial Aspect	<ul style="list-style-type: none"> - Present financial condition of NPVC is not stable, as income from water charge does not cover the depreciation and capital costs for large scale projects 	<ul style="list-style-type: none"> - Water tariff revision is required to make the financial condition stable.
Human Resource Aspect	<ul style="list-style-type: none"> - Abilities of NPVC staff on water supply system are not high enough to operate and manage water supply system. 	<ul style="list-style-type: none"> - Training to NPVC staff is necessary to improve their technical, institutional and financial capacity.

Source: JST

(3) Sewerage/Wastewater

Table 1.5.7: Constraints and Planning Issues of Sewerage/Wastewater System

Items	Constraints	Planning Issues
Management Aspect		
Organization and Institutional	<ul style="list-style-type: none"> - There are several organizations involved and responsible in the sewerage/wastewater management but no clear duty defined. 	<ul style="list-style-type: none"> - Provide the specific organization structure for the sewerage/wastewater management in Vientiane Capital. - Consideration in utilizing Nampapa Vientiane and WaSRO to handle the management due to their good efficiency.
Law and Regulation	<ul style="list-style-type: none"> - The new wastewater discharge standard from each type of building has just been announced but there is no monitoring procedure and limited laboratory to analyze for the wastewater composition. - No strict control and monitor on industrial wastewater discharge. 	<ul style="list-style-type: none"> - Set up monitoring regulation for both domestic wastewater and industrial wastewater together with good laboratory. - Promote the new standard for environmental pollution to public in the awareness program. - Household industrial that produces wastewater pollution should be prohibited if no proper wastewater treatment.
Financial	<ul style="list-style-type: none"> - Insufficient budget allocation from the Government in monitoring and maintenance works. - No cost recovery mechanism 	<ul style="list-style-type: none"> - Set up plan for yearly budget allocation from the Government. - Introduce polluters pay principal to urban area. - Include wastewater management fee to the water bill or set wastewater tariff system. - Request for foreign fund or financial assistance
Human Resource	<ul style="list-style-type: none"> - Lack of wastewater experts with practical experience. - Lack of public awareness in wastewater management and pollution control system. - Limited number of staffs and human capacity especially in monitoring and control 	<ul style="list-style-type: none"> - Coordinate with education institute to provide more environmental management programs with technical support - Promote public awareness program in pollution prevention and control. - Develop human resource and capacity building for sewerage / wastewater management
Technical Aspect		
Sewerage/Wastewater Generation	<ul style="list-style-type: none"> - No information on actual quantity and quality of sewerage/ wastewater and sludge generation in Vientiane Capital More large projects are going to develop in Vientiane Capital that will generate high polluted wastewater. 	<ul style="list-style-type: none"> - Analyze for estimate sewerage/wastewater quantity and quality from land use and population projection for future planning in wastewater management. - Proper and modernized wastewater treatment system shall be provided for the new development projects, not only septic tank.
Sanitation Facilities	<ul style="list-style-type: none"> - Proper toilet has not been completely provided in Vientiane Capital, approx. 90% of household have access to toilet sanitation. - Grey water from bathing and kitchen area is directly drained to the drainage system. 	<ul style="list-style-type: none"> - Provide proper toilet to cover 100% for all households in Vientiane Capital area. - Introduce grey water treatment in household and high polluted source.
Treatment Facilities	<ul style="list-style-type: none"> - Septic tank or onsite treatment system is normally used to all types of buildings. 	<ul style="list-style-type: none"> - Plan for proper treatment facilities in urban area such as CBS or central treatment plant. - Pilot project on sewerage / wastewater treatment for short and medium action plan.
Operation and Maintenance	<ul style="list-style-type: none"> - No regular maintenance to the septic tank or onsite treatment system currently used. Most of the wastewater treatment plants for industrial factories are not properly operated and maintain. 	<ul style="list-style-type: none"> - Set up operation and maintenance manual in sewerage/wastewater management system for the concerned agencies; provide sufficient sludge removal truck and treatment. - Provide public awareness program in operation and maintenance for sanitation facilities and wastewater treatment plant.
Technical and Knowledge Support	<ul style="list-style-type: none"> - Lack of technical support in sewerage/wastewater management and control to the concerned authorities. 	<ul style="list-style-type: none"> - Provide technical training and capacity building Prepare guideline and manual.

Source: JST

(4) Drainage

Table 1.5.8: Constraints and Planning Issues of Drainage System

Items	Constraints	Planning Issues
Management Aspect		
Organization and Institutional	- No central organization to be responsible in overall drainage management system. -	- Set up responsible organization in drainage management system to coordinate from the planning stage, design, construction to operation, maintenance and control.
Law and Regulation	- There is no regulation on conservation of wetland and natural pond. - Filling up of marsh, pond or channel does not consider in impact to existing drainage system.	- Law or regulation on wetland conservation shall be issued and implement. - Monitoring and control in marsh or pond fill up shall be mentioned with realistic penalty when not follow.
Financial	- Insufficient budget allocation from the Government in monitoring and maintenance works.	- Set up plan for yearly budget allocation from the Government. - Request for foreign fund or financial assistance
Human Resource	- Limited number of staffs and human capacity especially in operation and maintenance.	- Develop human resource and capacity building for drainage system management - Promote public awareness program in keeping drainage clean without dumping solid waste, pollution prevention and control.
Technical Aspect		
Rainfall data and catchment analysis	- There are a few data collection on rainfall statistics with no analysis for drainage catchment flow within VUDAA. - There is no water quality monitoring for public or natural drainage receiving area.	- Collect and analyze for rainwater quantity in each catchment area for future planning in drainage control and management. - Set up good laboratory in WREA to analyze water quality for monitoring purpose.
Drainage Equipment and Facilities	- Only a few water gates are installed to control the level of water in the drainage channel with no drainage pump. - Limited maintenance equipment for VUDAA. - Filling up of existing marsh and pond occurred from private investor for new project development, reducing the rain water storage volume.	- Introduce overall drainage system management and control with water gate and drainage pump where necessary. - Establish master plan on drainage system.
Operation and Maintenance	- A lot of sediments are stored in the bottom of the drainage channel, reducing in channel flow capacity. - Drainage channel and pipes are not regularly cleaned and maintained.	- Set up specific group or responsible team for removing solid waste from drainage, routine channel dredging and drainage facility maintenance with sufficient budget.
Technical and Knowledge Support	- Lack of technical support in drainage system management and control to the concerned authorities.	- Provide technical training and capacity building from foreign technology transfer. - Prepare guideline and manual especially in planning and maintenance.

Source: JST

(5) Solid Waste

Three major issues are highlighted from the results of current condition analysis in the solid waste treatment and several management issues are associated with them. The coverage ratio of collection service is still low even in the built-up area of Vientiane Capital (less than half of households are contracted for the collection services). Solid wastes that are not collected are either burned, dumped or buried. A number of burn marks can be seen even in the built-up area. Some wastes are recycled by residents themselves before discharging. The solid waste around residential areas should be well managed to maintain a sanitary living environment.

Another major issue is for the final disposal. The existing landfill site, KM32, is not in so appropriate operation that some adverse affects on environment can be apprehended. The facilities and operation systems should be improved to prevent adverse affects to environment in stages.

Major issues are:

- To control discharging sources to prevent scattering and unsanitary discharging;
- To improve the collection service to prevent scattering and unsanitary discharging; and
- To improve the landfill site to prevent adverse affects to environment.

Table 1.5.9: Constraints and Planning Issues of Solid Waste Management

Items	Constraints	Planning Issues
Management Matters		
Legal System	<ul style="list-style-type: none"> - No definitions of types of solid waste - No integrated plans for the solid waste management in VC - No regulations on industrial solid waste and hazardous solid waste disposals 	<ul style="list-style-type: none"> - Officially acknowledge definition of waste and waste services, clarification of responsibility, and motoring system with penalties - Provide laws or regulations and enforcement by types of wastes - Provide an integrated solid waste management plan in VC
Organization	<ul style="list-style-type: none"> - Limited number of staff and human capacity in VUDAA 	<ul style="list-style-type: none"> - Develop human capacity for the solid waste management
Finance	<ul style="list-style-type: none"> - Increasing maintenance and repair costs of the equipments for collection and landfills - No sufficient budget allocation from the government to cover necessary activities (expansion of collection service and operation of a sanitary landfills) 	<ul style="list-style-type: none"> - Improve financial management system - Improve cost recovery system
Subcontracting and privatization	<ul style="list-style-type: none"> - No clear systems for subcontracting and privatization - Growing dependence on private collectors which tend to cover only areas with easier access and fare collection 	<ul style="list-style-type: none"> - Expand VUDAA's public intervention and collection service - Provide formal license, contract and operational guidelines - Provide monitoring system for the subcontractors
Large scale discharging sources	<ul style="list-style-type: none"> - Few own treatment systems of large scale discharging sources - No one bring waste materials and surplus from construction sites to the KM32 landfill site 	<ul style="list-style-type: none"> - Provide discharging guidelines - Promote awareness on the solid waste management and environment
Technical Matters		
Generation and discharge of solid waste	<ul style="list-style-type: none"> - Unclear discharging rules and enforcement - Low awareness level of citizens to the solid waste treatment - Litter - Burning - Illegal dumping 	<ul style="list-style-type: none"> Control discharging sources with: <ul style="list-style-type: none"> - Provide discharging guidelines, distribution and promotion - Facilitate community participation for cleaning public spaces - Promote awareness on the solid waste management and environment - Facilitate women's involvement

Items	Constraints	Planning Issues
Collection and transportation services	<ul style="list-style-type: none"> - Not sufficient coverage ratio of the collection service due to - No plans, little willingness and budgets to increase staff and equipments by VUDAA - Lack of willingness to pay the collection fee - Lack of resident's awareness - Poor conditions to access to garbage collection points - The maintenance cost tends to expensive 	<ul style="list-style-type: none"> - Prevent illegal dumping, litter and burning - Improve collection and transportation system (establish public collection points) - Expand the coverage area (enlarge VSWCS activities, increase private collectors) - Improve service quality - Increase governmental supports
Finance	<ul style="list-style-type: none"> - Lack of earnings (budgets) to repurchase for the old vehicles depreciating - Lack of earnings (budgets) to purchase additional vehicles for expanding the service area 	<ul style="list-style-type: none"> - Increase governmental supports - Find other financial supports from international donors
Intermediate treatment	<p>Shredding</p> <ul style="list-style-type: none"> - Few bulky wastes which are subjects for size reduction because they are mostly recovered as recyclables before their collection and transportation <p>Incinerator</p> <ul style="list-style-type: none"> - Lack of finance to construct and operate an incinerator - Lack of highly skilled techniques that can control pollution (smoke, dioxin) and maintain stable incinerator operations 	<ul style="list-style-type: none"> - Still premature to introduce the intermediate treatment systems - In case of that Large amount of solid waste can be expected from the Industrial Zone, intermediate treatment should be considered
Final disposal site (KM32) Site selection (Location)	<ul style="list-style-type: none"> - Unclear process of the location selection - Long transportation distance 	<ul style="list-style-type: none"> - Conduct an actual condition survey - Conduct the EIA study - Provide the master plan of KM32 - Provide efficient and urgent operation plan
Planning and construction	<ul style="list-style-type: none"> - No master plans of facilities - No EIA Study 	<ul style="list-style-type: none"> - Provide necessary facilities and equipments with maintenance system - Develop human capacity for the final disposal site management and operation - Establish monitoring system
Operation	<p>No proper operation as:</p> <ul style="list-style-type: none"> - Unclear phasing plans and layout of landfill plots or pits - No bottom linings, proper drainage system and a water treatment facility - No soil is covered on the dumped solid waste - The maintenance costs for equipments tend to expensive 	<ul style="list-style-type: none"> - Develop human capacity for the final disposal site management and operation - Establish monitoring system
Hazardous waste disposals	<ul style="list-style-type: none"> - No regulation for the final disposal - No impervious sheets are provided - Not clear for enough distance from the surface and ground water - No facilities for prevention of retention and leakage of leachate - No monitoring systems of the surface and ground water 	<ul style="list-style-type: none"> - Enact and enforce regulations - Conduct an actual condition survey on hazardous wastes (medical and industrial wastes) - Planning sanitary (controlled) landfill site
Finance	<ul style="list-style-type: none"> - Lack of earnings (budgets) to repurchase for the old machineries and equipments depreciating - Lack of earnings (budgets) to purchase additional machineries and equipments for the sanitary landfills 	<ul style="list-style-type: none"> - Increase governmental supports - Find other financial supports from international donors
Safety closing (KM18)	<ul style="list-style-type: none"> - Litter and leachate from the surface of slope in the drain gutter - No monitoring system on - Sedimentation, Gas emission, Leachate from landfill - Water quality of the surface and ground water 	<ul style="list-style-type: none"> - Establish monitoring system - Study land use plan after closing

Source: JST

(6) Parks, Open spaces and Greenery

In the whole Vientiane Capital, there are only 9 public parks and the total area is merely 25 ha which corresponds to 0.3 sqm per person. This number seems to be much smaller for the urban population, therefore increasing the number and area of the public parks as well as other public spaces are recommendable for achieving sustainable urban development in the future. In addition to the issues of public parks, marshes which still remain in urbanized area should be paid more attention for conservation, because these marshes are very important for flood control and mitigating environmental pollutions. Conserving the existing marshes is one of the most essential and pressing issues.

Table 1.5.10: Constraints and Planning Issues of Public Parks, Open spaces and Greenery

Items	Constraints	Planning Issues
Public Parks		
Number and Area	<ul style="list-style-type: none"> - The number and the area of public parks are very much smaller than they should be - The number and the area of other open spaces with public facilities are also much smaller than they should be 	<ul style="list-style-type: none"> - To construct new public parks - To prepare network and distribution planning of public parks - To utilize surplus spaces of public facilities as public parks
Distribution and Location	<ul style="list-style-type: none"> - No public parks in the suburbs - Only a few public parks around major sightseeing spots in urban areas 	<ul style="list-style-type: none"> - To construct new public parks especially in the suburbs - To change the purpose of public parks construction towards people - To prepare network and distribution planning of public parks and open spaces
Objectives and Functions	<ul style="list-style-type: none"> - Not mainly for the citizens living in urban area, but mainly for the tourists - Not enough to function mitigating disasters and conserving nature conditions 	<ul style="list-style-type: none"> - To enhance and improve the functions of existing public parks - To construct new public parks to supplement functions in shortage - To provide more tree shades for relaxing - To enhance the functions of new park “Nongsaphanglen”
Legal System	<ul style="list-style-type: none"> - No regulation of public parks - No definition of public parks 	<ul style="list-style-type: none"> - To provide a definition and a regulation for public parks
Work Force	<ul style="list-style-type: none"> - Not sufficient human capacity 	<ul style="list-style-type: none"> - To prepare a work manual for management - To develop the capacity of staff
Finance	<ul style="list-style-type: none"> - Not enough budget for construction of new public parks 	<ul style="list-style-type: none"> - To improve budget allocation for new public parks
Management	<ul style="list-style-type: none"> - No clear perception of the total number of public parks exactly 	<ul style="list-style-type: none"> - To clarify a definition of public parks and management data collectively
Others		
Number and area of Totally Open Spaces	<ul style="list-style-type: none"> - The number and the area of totally open spaces are much smaller than they should be 	<ul style="list-style-type: none"> - To construct new public parks - To prepare network and distribution planning of open spaces including public parks
Enforcement of Protected Areas	<ul style="list-style-type: none"> - Lack of enforcement against development projects in existing protected areas 	<ul style="list-style-type: none"> - To enhance enforcement of protected areas in terms of regulations, boundary and zoning of area, management organization, etc
Marshes	<ul style="list-style-type: none"> - Decreasing the area and quality of valuable marshes which remain in urban area - Increasing development pressures to That Luang marsh 	<ul style="list-style-type: none"> - To provide a regulation for marshes in urban areas - To designate marshes which remain in good conditions as new protected areas - To clarify the boundary for protection especially in That Luang marsh
Roadside Trees	<ul style="list-style-type: none"> - Lack of roadside trees' growth - Lack of functions for improving landscape and conserving natural conditions 	<ul style="list-style-type: none"> - To select tree species which can grow well and fast - To prepare a work manual for management - To develop the capacity of staff

Source: JST