THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
PUBLIC WORKS AND TRANSPORT INSTITUTE (PTI)
MINISTRY OF PUBLIC WORKS AND TRANSPORT

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

THE PROJECT FOR URBAN DEVELOPMENT MASTER PLAN STUDY IN VIENTIANE CAPITAL

FINAL REPORT

MARCH 2011

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NIPPON KOEI CO., LTD.
INTERNATIONAL DEVELOPMENT CENTER OF JAPAN
PACET CORP.
ORIENTAL CONSULTANTS CO., LTD.

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JNY 86.19 = USD 1

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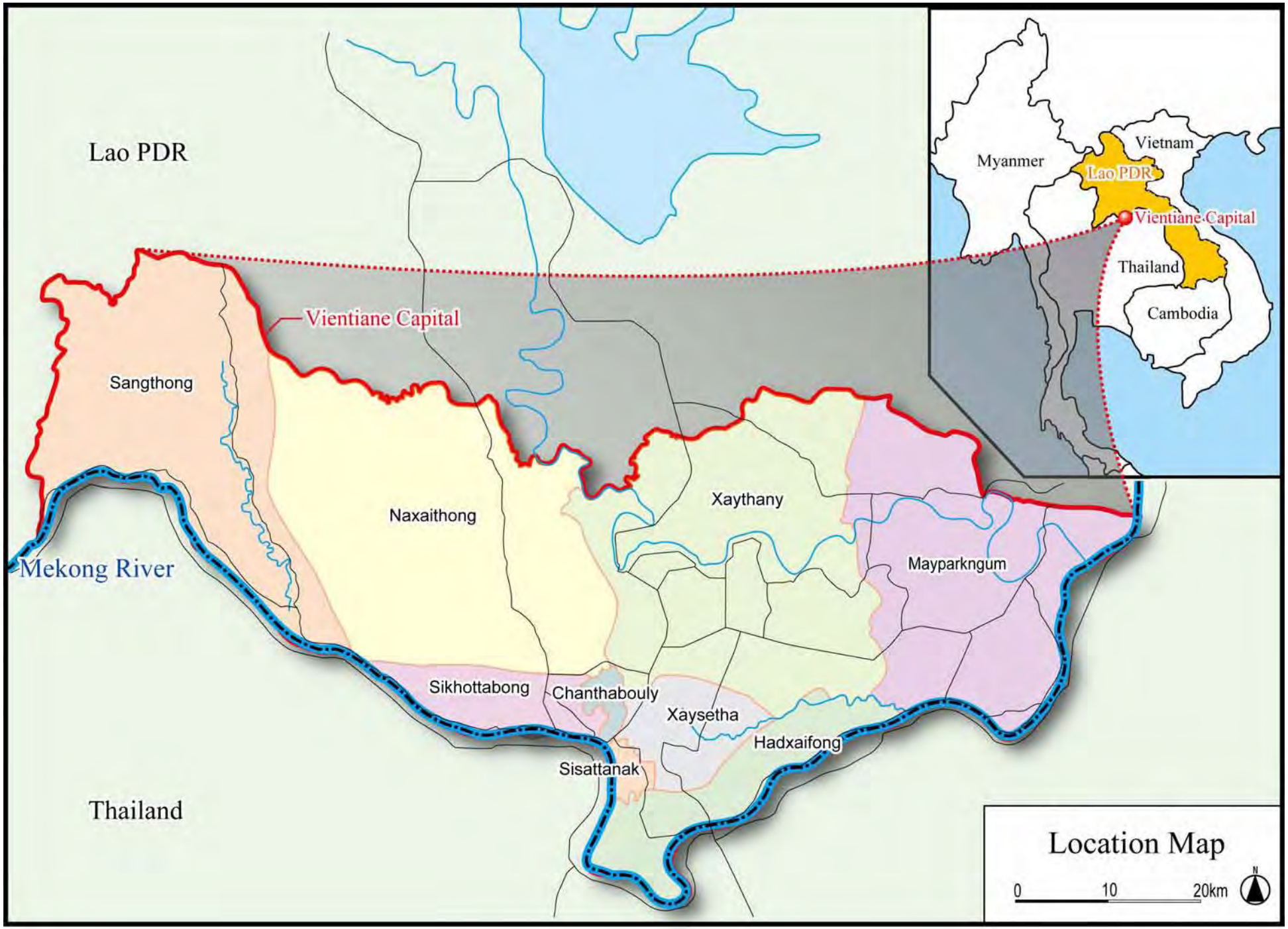
Lao PDR
Vientiane Capital
Sangthong
Naxaithong
Xaythany
Mayparkngum
Mekong River
Sikhottabong
Chanthabouly
Xaysetha
Hadxaifong
Sisattanak
Thailand
Myanmer
Vietnam
Lao PDR
Vientiane Capital
Thailand
Cambodia
Location Map
0
10
20km
N

Source: JST

The Project for
Urban Development Master Plan Study in Vientiane Capital

Final Report

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AFTA	ASEAN Free Trade Zone
AIT	Asian Institute of Technology
APB	Agriculture Promotion Bank
ASEAN	Association of South-East Asian Nations
BRT	Bus Rapid Transit
BST	Bituminous Surface Treatment
CBD	Central Business District
CBS	Community Based Sanitation
COS	Building Total Floor Area/Area Ratio
C/P	Counterpart
DANIDA	Danish International Development Agency
DAF	Department of Agriculture and Forestry
DIC	Department of Information and Culture
DOIC	Department of Industry and Commerce
DOE	Department of Environment
DoS	Department of Statistic
DF/R	Draft Final Report
DHUP	Department of Housing and Urban Planning
DMA	District Metered Area
DPI	Department of Planning and Investment
DPRA	Development Projects Responsible Agency
DPWT	Department of Public Works and Transport
FAR	Floor Area Ratio
FTA	Free Trade Agreements
EA	Environmental Assessment
ECC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Economic Partner Agreement
ERP	Electric Road Pricing
ESIAD	Environment and Social Impact Assessment Department
FDI	Foreign Direct Investment
F/R	Final Report
GIS	Geographic Information System
GMS	Greater Mekong Sub-region
GOL	Government of Lao People's Democratic Republic
GOJ	Government of Japan
GDP	Gross Domestic Products
GPZ	German Technical Cooperation
GRDP	Gross Regional Domestic Products
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (German society for technical cooperation)
IC/R	Inception Report
IEE	Initial Environmental Evaluation
IEIA	Initial Environmental Impact Assessment
IT/R	Interim Report
JICA	Japan International Cooperation Agency
JST	JICA Study Team

LOI	Law on Investment
LAK	Lao PDR Kip
LMA	Land Management Authority
MAF	Ministry of Agriculture and Forestry
MIC	Ministry of Information and Culture
MOIC	Ministry of Industry and Commerce
MPI	Ministry of Planning and Investment
MPWT	Ministry of Public Works and Transport
MRC	The Mekong River Commission
NLMA	National Land Management Authority
NGO	Non-governmental Organization
NRW	Non Revenue Water
NUL	National University of Laos
NPVC	Nam Papa Vientiane Capital, Water Supply Company of the Vientiane Capital
OJT	On the Job Training
OPWT	Office of Public Works and Transport
PACSA	Public Administration and Civil Service Authority
P/R	Progress Report
PTI	Public Works and Transportation Institute
PPP	Public Private Partnership
S/C	Steering Committee
SEA	Strategic Environmental Assessment
SHM	Stakeholder Meeting
S/W	Scope of Work
SWMDS	Solid Waste Management and Disposal Section
SWOT	Strength, Weakness, Opportunity, and Threat
TDM	Traffic Demand Management
UCDS	Urban Cleaning and Decoration Service
UDAA	Urban Development Administration Authority
UDMP	Urban Development Management Program
UD MP	Urban Development Master Plan
USD	US Dollar
VC	Vientiane Capital
VCR	Vehicle Capacity Ratio
V-GIS	GIS Database of Vientiane
VIP	Vientiane Industrial Park
VLP	Vientiane Logistic Park
VSBC	Vientiane State Bus Company
VSWCS	Vientiane Solid Waste Collection Service
WASA	Water Supply Authority
WaSRO	Water Supply Regulatory Office
W/G	Working Group
WREA	Water Resources and Environment Administration
WTO	World Trade Organization
WSD	Water Supply Division
WSRC	Water Supply Regulatory Committee
WTP	Water Treatment Plant
WUA	Water User's Association
VUDAA	Vientiane Urban Development Administration Authority

THE STUDY IN PICTURES

Steering Committee (1st)
(29th January 2010)

Training Workshop (3rd)
(10th August 2010)

Working Group Meeting (9th)
(27th October 2010)

Scientific Seminar in the 450th Anniversary (20th November 2010)

Steering Committee (4th)
(9th February 2011)

Final Seminar
(4th March 2011)

CHAPTER 1

Introduction

CHAPTER 1: INTRODUCTION

1.1 Background of the Study

Vientiane Capital, which is the capital city of Lao PDR, has high economic and demographic growth potential. It is thus quite likely that the urban area would rapidly expand toward the suburbs along the arterial roads with inadequate infrastructure facilities, creating the problem of urban sprawl with bad living conditions and inappropriate social services, and the pastoral charms of the city might be lost. To counter this problem, appropriate measures must be taken promptly based on a comprehensive urban development plan. In the light of this situation, it is recommended that the local government of Vientiane Capital as well as all its citizens carefully examine the problems which they are confronted with and consider the best way to develop Vientiane Capital toward the year 2030, so that it should be a more attractive capital for both Lao people and foreign visitors as well. This year is a good occasion for the master plan, as Vientiane Capital marks the 450th anniversary of the transfer of the capital to the city.

In response to the request of the Government of Lao PDR, the Government of Japan decided to conduct "The Project for Urban Development Master Plan Study in Vientiane Capital". Accordingly, JICA undertakes the Study in close cooperation with the authorities concerned of the Government of Lao PDR.

1.2 Objectives of the Study

(1) Objectives of the Study

The objectives of the Study are as follows.

1) To formulate an urban development master plan in Vientiane Capital, targeting the year 2030.
2) To examine a methodology to improve the effectiveness of the urban development master plan.
3) To implement a technical transfer for urban development and planning.

(2) Output of the Study

The output of the Study is as follows.

1) An urban development master plan in Vientiane Capital.
2) An urban development management program.

1.3 Study Area

The study area covers the whole area of Vientiane Capital, 3,920 km^2 as shown in Figure 1.3.1.

Source: JST

Figure 1.3.1: Study Area

1.4 Implementation Arrangement

The executing agency for the Study was set as the Public Works and Transport Institute (PTI), together with Vientiane Capital. PTI belongs to Ministry of Public Works and Transport (MPWT), and is in charge of establishing and formulating the urban plans and Vientiane Capital is in-charge for its enforcement. Accordingly the Steering Committee (S/C) was established under the co-chairmanship of Minister of MPWT and Governor of Vientiane Capital.

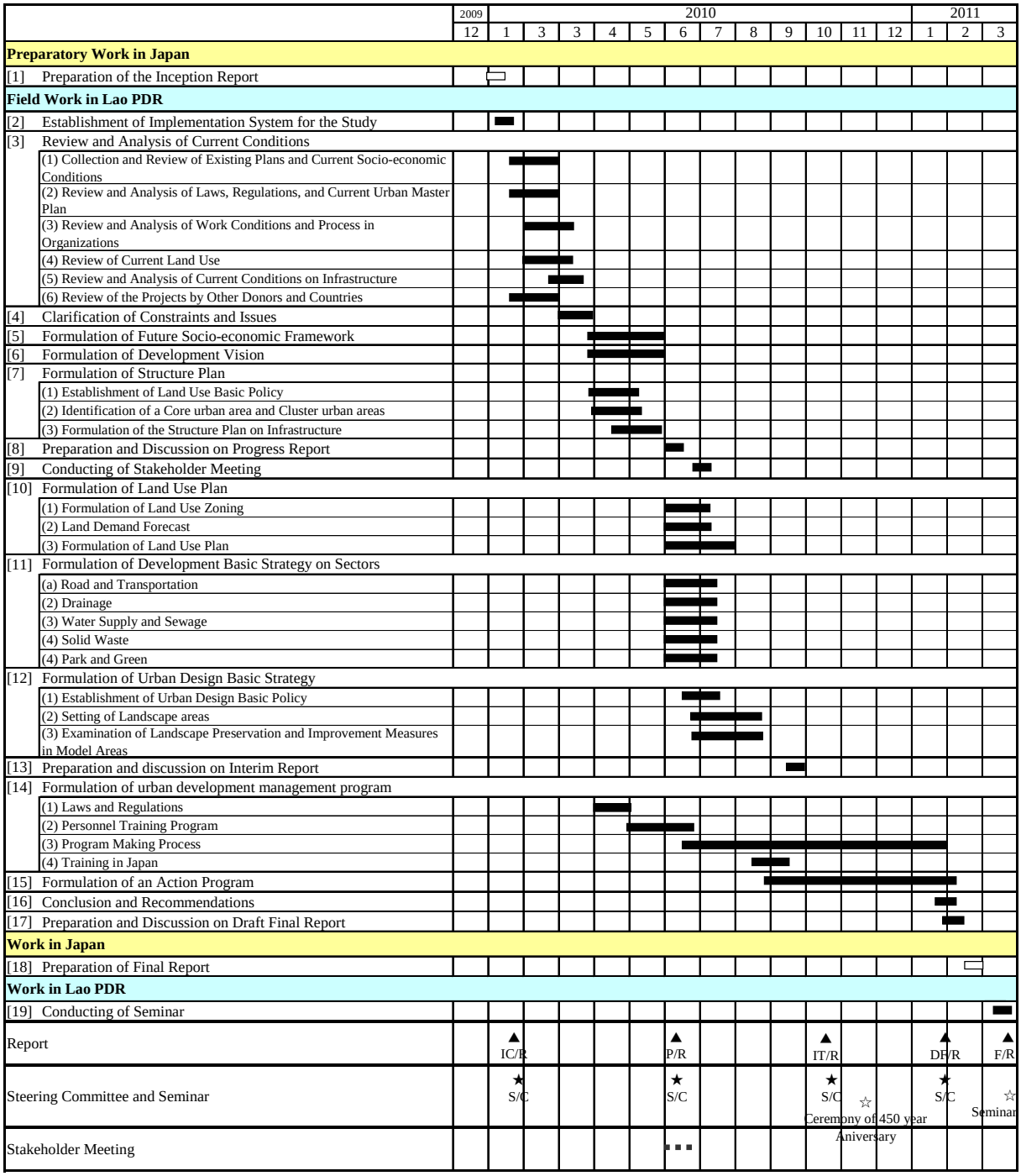
1.5 Work Progress

A team to carry out this study (JICA Study Team), consisting of experts in relevant fields, was dispatched by JICA to Lao PDR in January 2010. The Study was carried out based on the schedule as agreed upon in the first S/C which was held on 29th January 2010, as shown in Figure 1.5.1.

Progress Report summarizes the current condition, issues and basic policies related to Vientiane Capital which will establish a base for further planning. In June 2010, the Progress Report was submitted to the Lao PDR side, and on 2nd July 2010, the second S/C meeting was held in Vientiane to review and discuss the subject of the report.

Interim Report which summarizes the current conditions and issues, visions, basic policies, and basic strategies was prepared. This analysis will establish the base for the formulation of urban development master plan. In November 2010, the Interim Report was submitted and the third S/C meeting was held on 30th November.

In January 2011, JICA Study Team prepared the Draft Final Report and the report was submitted to Lao PDR side in the fourth S/C meeting, which is scheduled on 9th February 2011. At the end of the study, the Final Report was submitted to Lao PDR side through JICA in March 2011.



Source: JST

Figure 1.5.1: Work Schedule

1.6 Formulation Methodology

(1) Steering Committee

A steering committee was established under the co-chairmanship of Governor of Vientiane Capital and Minister of MPWT on 29th January 2010 in order to share present information and perceptions, and oversee the formulation of an urban development master plan to be proposed in this study. The steering committee has held four (4) meetings. The outline of the past meetings is as shown in Table 1.6.1. The meetings were attended by representatives from different organizations such as Vientiane Capital, MPWT (PTI, DHUP), VUDAA, DPWT, NLMA, other Departments concerned of VC, District offices, etc.

Table 1.6.1: Outline of the Steering Committees

No.	Date (DD/MM/YY)	Main Topics	Chair Person	The Number of Lao Attendees
1	29/ 01/ 2010	1) Inception Report	Mr. Sommad PHOLSENA (Minister of MPWT)	36
2	02/ 07/ 2010	1) Progress Report	Mr. Sombath YIALIHER (Mayor of Vientiane Capital)	32
3	30/ 11/ 2010	1) Interim Report 2) Visual Presentation (Urban Landscape)	Mr. Bunchanh SIHTHAVONG (Vice Mayor of Vientiane Capital)	64
4	09/ 02/ 2011	1) Draft Final Report 2) Priority Program	Mr. Keophilavanh APHAYLATH (Director of DPWT)	41

Source: JST

(2) Stakeholder Meetings and Seminars

A stakeholder meeting (SHM) was held on 12 July 2010 chaired by the Vice Mayor of VC, following the 2nd steering committee. The meeting was attended by representatives from different organizations such as Vientiane Capital, MPWT (PTI, DHUP, Science and Technology Assembly), VUDAA, DPWT, NLMA, other Departments concerned of VC, District offices, Unions, Associations, Public Service Companies, Lao National University, NGOs, International Donors, Police and Students, etc. JST explained the Progress Report of the Study, and presented the outline results of the social survey and the feedback to the proposed visions drafted in the Progress Report.

On 20 November, a Scientific Seminar was held, namely Sustainable Urban Development, chaired by the Vice Mayor of VC for cerebration of Vientiane 450 Years Anniversary. The meeting was attended by representatives from both domestic and international relevant organizations. In the seminar, the chairman presented this study's outputs at the time of the Interim Report. In addition it, CG video image which was made in the study with a view to enhancing the public outreach, the awareness of general urban planning and development policies for Vientiane Capital toward the future was also presented in the seminar.

Finally, a Final Seminar on the main results of the study was held chaired by the deputy director of PTI to close the study.

Table 1.6.2: Outline of the Stakeholder Meetings and Seminars

No.	Date (DD/MM/YY)	Title and Main Topics	Chair Person	The Number of Lao Attendees
1	12/ 07/ 2010	**Stakeholder Meeting** 1) Progress Report	Mr. Bounchanh SINTHAVONG (Vice Governor of Vientiane Capital)	92
2	20/ 11/ 2010	**Scientific Seminar** 1) Interim Report 2) Visual Presentation (Urban Landscape)	Mr. Bounchanh SINTHAVONG (Vice Governor of Vientiane Capital)	167
3	04/ 03/ 2011	**Final Seminar** 1) Final Report 2) Visual Presentation 3) Result of Technical Transfer	Mr. Thenkham THONGBONH (Deputy Director of PTI)	105

Source: JST

Source: JST

Figure 1.6.1: Pictures of the Scientific Seminar for 450 Years Anniversary

(3) Working Group Meetings

A working group was organized in February 2010 in order to discuss various topics regarding urban planning in Vientiane Capital. The members have been putting in ideas together from all the related organizations and elaborated on future development visions, including a structure plan, a land use policy, strategies of the infrastructure sectors, for the whole Vientiane Capital with the target year 2030. The members are as shown in Table 1.6.3.

The working group held ten (10) meetings thus far. The participants mainly discussed the topics arranged prior to each meeting. The outline of the past meetings is as shown in Table 1.6.4.

Table 1.6.3: Working Group Members

Organization	Number	Responsibilities
PTI (Public Works and Transport Institute)	4	Core member
DPWT (Department of Public Works and Transport)	2	Core member
DHUP (Department of Housing and Urban Planning)	2	Core member
Vientiane Capital	1	Core member
VUDAA (Vientiane Urban Development Administration and Authority)	2	Core member
OPWT (Office of Public Works and Transport from 9 Districts)	9	Sub member
WREA (Water Resources and Environmental Authority)	1	Sub member
NLMA (National Land Management Authority)	1	Sub member
DIC (Department of Information and Culture)	1	Sub member
DOIC (Department of Industry and Commerce)	1	Sub member
DAF (Department of Agriculture and Forestry)	1	Sub member

Source: JST

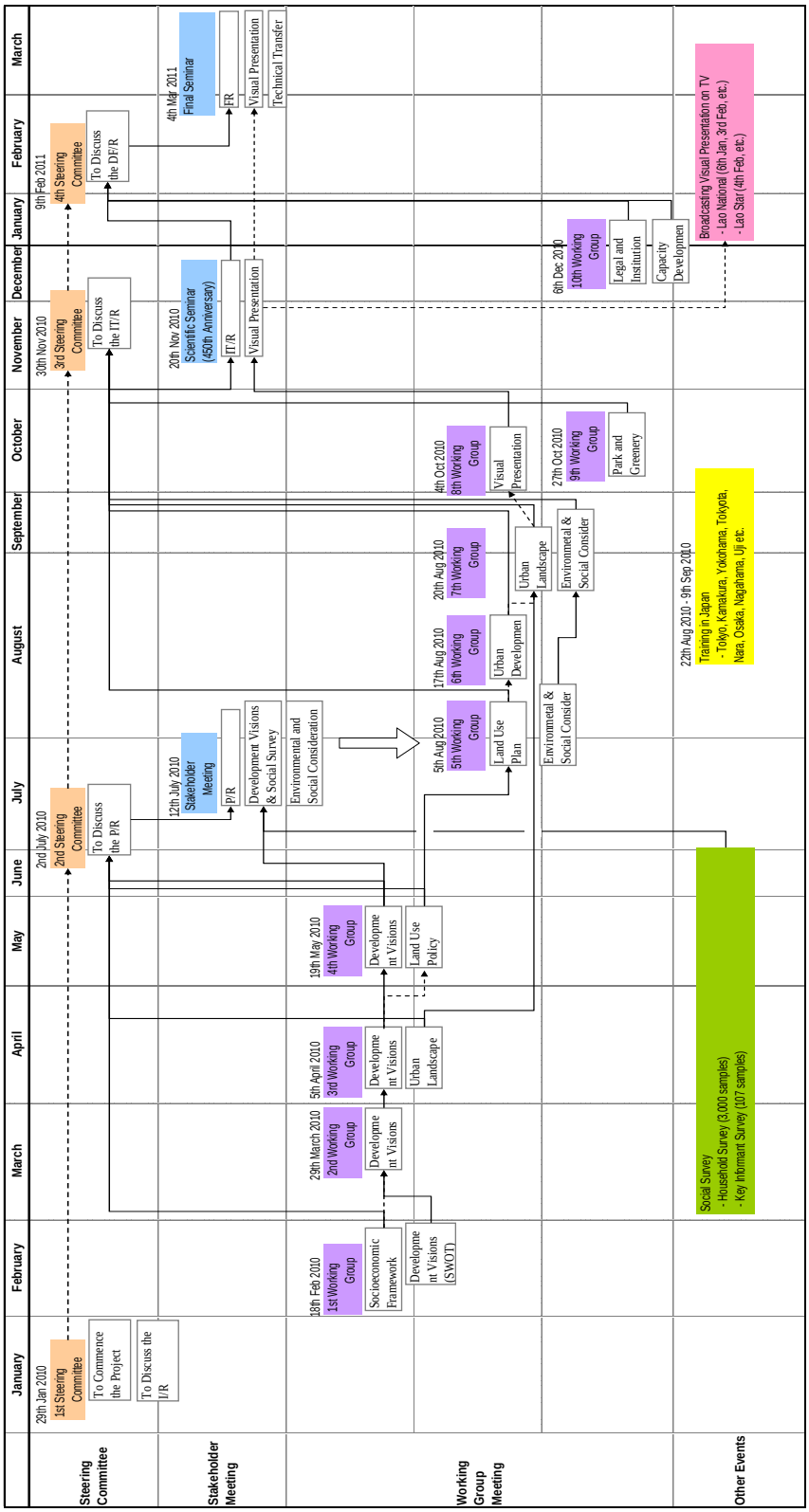
Table 1.6.4: Outline of the Past Working Group Meetings

No.	Date (DD/MM/YY)	Lao Attendees							Main Topics
		PTI	DPWT	DHUP	VC/ VUDAA	OPWT	Other	Total	
1	18/ 02/ 2010	10	2	2	1	9	0	24	- Socioeconomic Framework - Development Visions (1st)
2	29/ 03/ 2010	9	1	2	0	0	0	12	- Development Visions (2nd)
3	05/ 04/ 2010	9	1	1	1	0	2	14	- Development Visions (3rd) - Urban Landscape (1st)
4	19/ 05/ 2010	6	2	1	2	9	1	21	- Development Visions (4th) - Land Use Policy
5	05/ 08/ 2010	10	3	1	6	7	1	28	- Land Use Plan - Environmental and Social Consideration (1st)
6	17/ 08/ 2010	11	1	1	5	5	4	27	- Urban Development
7	20/ 08/ 2010	9	2	0	4	2	6	23	- Urban Landscape (2nd) - Environmental and Social Consideration (2nd)
8	04/ 10/ 2010	4	2	2	1	0	0	9	- Visual Presentation (1st)
9	27/ 10/ 2010	8	2	0	7	9	0	26	- Parks and Greenery - Visual Presentation (2nd)
10	06/ 12/ 2010	10	2	0	5	8	2	27	- Legal and Institutional Framework - Capacity Development Strategy

Source: JST

(4) Flow of the Discussions

These meetings were held in connection with each other. A working flow which represents the methodology for formulating development visions, a structure plan, and a master plan for Vientiane Capital is as shown in Figure 1.6.2.



Source: JST

Figure 1.6.2: Flow of the Discussion

CHAPTER 2

Summary of Current Conditions and Regulatory Framework

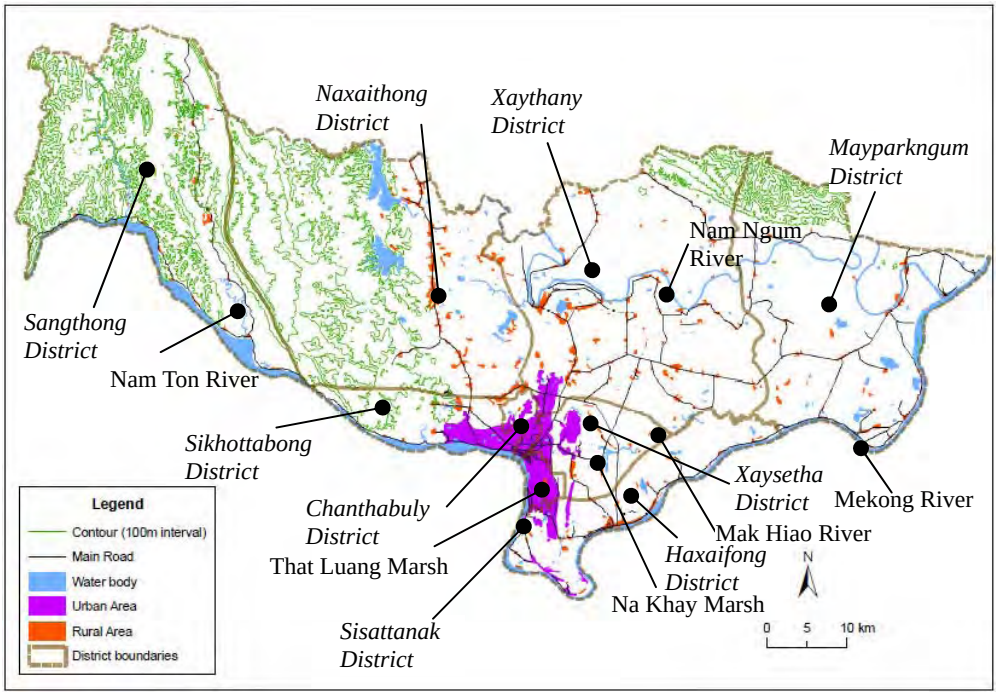
CHAPTER 2: SUMMARY OF CURRENT CONDITIONS AND REGULATORY FRAMEWORK

2.1 Current Environmental and Socioeconomic Conditions

2.1.1 Environment Conditions

(1) Topography

Vientiane Capital is located on the left bank of the Mekong River. The urbanized areas are mainly part of Chanthabouly, Sisattanak, Sikhottabong and Xaysetha Districts which are located on the natural plain formed by the Mekong River at an altitude of 160m – 180m.



Source: National Geographic Office, JST compilation

Figure 2.1.1: Geography and Hydrology

(2) Climate

Vientiane Capital has a tropical monsoon climate which is divided into two seasons: the rainy season from May to October and the dry season from November to April. The hottest season is in April, the

season for Pee Mai Lao (Lao New Year). Annual rainfalls have fluctuated between 1,500 - 2,000 mm over the last decade except in years 1999 and 2008 when it was about 2,200mm.

Table 2.1.1: Meteorology in Vientiane Capital 2007

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum temperature (C)	28.3	30.4	33.0	34.3	32.9	31.8	31.3	30.9	30.9	30.8	29.8	28.1	31.0
Mean minimum temperature (C)	16.3	18.5	21.5	23.8	24.6	24.9	24.8	24.6	24.1	22.9	19.9	16.5	21.9
Mean temperature (C)	22.3	24.5	27.2	29.0	28.7	28.4	28.1	27.8	27.5	26.9	24.8	22.3	26.5
Total rainfall (mm)	7.2	13.1	33.6	85.3	245.3	279.2	275.1	330.5	306.7	77.5	11.2	2.8	1,667.5
Total sunshine duration (hours)	254.4	218.3	223.4	229.7	206.8	147.7	140.8	137.2	167.1	222.2	236.7	256.7	2,440.9

Source: Department of Meteorology and Hydrology, WREA

(3) Hydrology

There are three major rivers in Vientiane Capital. The largest river, the Mekong River, runs at the east side of Vientiane Capital on the border of Thailand. The second largest river, the Nam Ngum River, passes east and west straddling Xaythany District and Mayparkngum District toward the Mekong River in the eastern area. In the western area, the Nam Ton River runs north and south on the border of Sangthong District and Naxaithong District. For the drainage system, discharged water from the urban area first runs into That Luang Marsh which is located at the east edge of the urban area and than the drained water flows eastward through the Mak Hiao River to the Mekong River. That Luang Marsh and the Na Khay Marsh plays an extremely valuable role in storing the drained water before discharging to the Mekong River.

2.1.2 Socioeconomic Conditions

(1) Population

The population of Lao PDR had doubled from 2.9 million in 1976 to 5.6 million in 2005, which shows a growth rate higher than the average in the East Asia and Pacific region. However, the growth rate is gradually getting lower, from 2.5% in the decade between 1976 and 1885 to 2.0% between 1995 and 2005. According to the Statistical Yearbook 2009, population passed the 6.1 million mark in 2009.

Table 2.1.2: Population and Annual Average Growth Rate in Census Years

Year	1976	1985	1995	2005
Total Population (000 persons)	2,886	3,618	4,605	5,622
Annual Average Growth Rate (%)	-	2.5	2.4	2.0

Source: Statistical Yearbook 1975-2005, 2007, Department of Statistic (DoS)

The population of Vientiane Capital was 795,000 in 2009. The population growth of Lao PDR was 2.2% during 1985 and 2005; while the growth rate of Vientiane Capital recorded 3.1% in the same period. As a result, share of population in Vientiane Capital to Lao PDR has increased from 10.5% to 12.4% during the same period.

Considering the population density in 1995, 2005 and 2009, it is possible to classify the districts into 4 groups. The first group consists of Chanthabouly District and Sisattanak District with the population density of more than 2,500 persons/ km^2 in 2009. Sikhottabong District and Xaysetha District constitutes the second group which had the population density of 750 to 800 persons/ km^2 in 2009. The third group is Hadxaifong and Xaythany with the population density of 150 to 350 persons/ km^2,

and the fourth and the final group is Mayparkngum, Naxaithong and Sangthong which had the population density of less than 100 persons/ km^2.

Table 2.1.3: Change of Population Density by Districts

District	Population (Persons)			Area (km^2)	Population Density (Persons/km^2)		
	1995	2005	2009		1995	2005	2009
Chanthabouly	58,855	68,858	78,407	29	2,029.5	2,374.4	2,703.7
Sikhottabong	74,251	99,908	113,763	140	530.4	713.6	812.6
Xaysetha	75,255	97,514	111,037	147	511.9	663.4	755.4
Sisattanak	58,178	68,686	78,211	31	1,876.7	2,215.7	2,522.9
Naxaithong	44,104	58,368	66,462	1,131	39.0	51.6	58.8
Xaythany	97,829	150,793	171,705	916	106.8	164.6	187.5
Hadxaifong	64,962	78,338	89,202	258	251.8	303.6	345.7
Sangthong	16,728	24,215	27,573	622	26.9	38.9	44.3
Mayparkngum	33,945	45,041	51,287	646	52.5	69.7	79.4

Source: Results of Census in 1995 and 2005; Basic Statistics Data on Socio-Economic Development 2008/2009 of Vientiane Capital

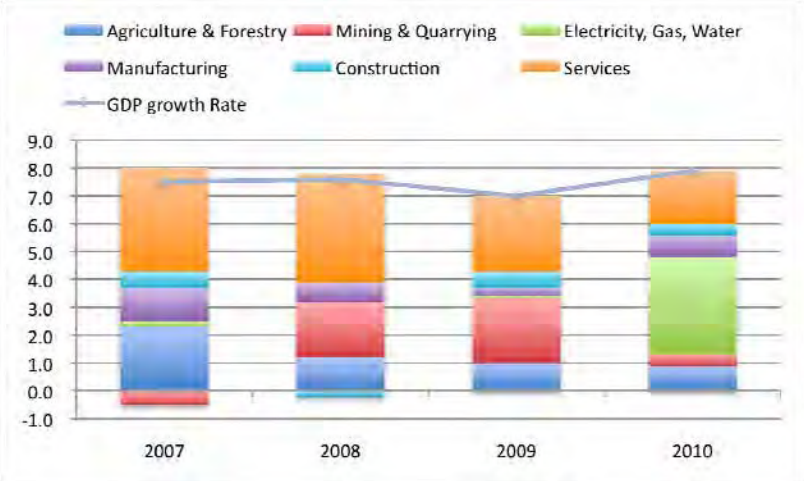
(2) Labor Force

According to Census 2005 Report, 49.1% of the total population of Vientiane Capital was classified as "Economically Active Population" in which people can work and are willing to work. Out of the remaining 50.9%, 17.3% were children under 10 years old, 20.5% were students, 7.4% were engaged in household duties and 5.1% were either retired or suffering with diseases or were old persons.

At the national level, in 2005, the percentage of farming population was 78.5%. However, the percentage was quite low in Vientiane Capital and was 35.3% only.

(3) GDP Growth and Development Plan

Out of 7.6% growth, the sum of service and the mining & quarrying occupied 5.9% in 2008. Contribution of agriculture, manufacturing and construction is around 0.5% to 1.0% during the period. In 2010, large contribution of electricity, gas and water is expected due to the starting of operation of Nam Then 2 Dam.



Note: Figures in 2009 are estimation and figures in 2010 are projection.
Source: Lao PDR Economic Monitor Mid-Year Update May 2010, World Bank Lao Office

Figure 2.1.2: GDP Growth Rate and Contribution of Industries

The annual average growth rate of Gross Regional Domestic Products (GRDP) from 2001 to 2005 was 9.8%. Composition share of industry in 2005 was 23% from the primary, 52% from the secondary and 25% from the tertiary sector. GRDP of Vientiane Capital in 2008 accounted for LAK 10.5 trillion and occupied 23% of national GDP (LAK 46.2 trillion). GRDP per capita in Vientiane Capital was equivalent to USD 1,585, which is 1.7 times higher than the average of Lao PDR (USD 891) in the same year.

According to the on-going socioeconomic development plan, 2006 to 2010, the estimated population of Vientiane Capital was 838,000 persons in 2010 with an estimated increase of 136,000 persons in 5 years. The target GRDP for the year 2010 was LAK 11,130 billion.

(4) Industrial Development

Table 2.1.4 shows that 66% of the large scale factories (Level-1) in Lao PDR were concentrated in Vientiane Capital in 2008. However on considering the other level (Level 2 & 3) of industries, the average share of Vientiane Capital falls to 9% only. The apparel industry makes up a vast majority of Level-1 factories in Vientiane Capital and 530 out of 566 apparel factories are located there.

Table 2.1.4: No. of Factories in Vientiane Capital in 2008

	No. of Factories			
	Level-1	Level-2	Level-3	Total
Vientiane Capital (A)	566	103	1,503	2,172
Lao PDR (B)	857	492	22,817	24,166
Share of Vientiane Capital (A)/(B)	66%	21%	6.6%	9%

Note: Level-1 means large-scale factory (more than 200 labors, etc.), Level-2 means medium-scale (51-200 labors, etc.), and Level-3 means small-scale (10-50 labors, etc.).
Source: Ministry of Industry and Commerce (MOIC)

There are 134 foreign invested factories in Vientiane Capital in 2008, which accounted for 55% of those in Lao PDR as shown in Table 2.1.5.

Table 2.1.5: No. of Foreign Factories in Vientiane Capital in 2008

	No. of Factory Labor
Vientiane Capital (A)	134
Lao PDR (B)	245
Share of Vientiane Capital (A)/(B)	55%

Source: MOIC

In 2008, **t**he number of factory labor were approximately 50,000 in Vientiane Capital which accounts to approximately 41% of total Lao PDR's factory labor force.

In Vientiane Capital, there are following industrial zones or industrial areas located within the commercial, residential, and agricultural areas.

- Central part where many factories are located such as apparel factories
- Old industrial zone on the sides of Thadeua Road with the total area of 673 ha
- New industrial zone with the total area of 2,000 ha located south of Km 21 National Road No.13 South (Koksaat Industrial Zone)

(5) Agricultural Development

Agriculture is active in the central and eastern plain areas, particularly in rice farming. Swamps are one of features of the Vientiane Plain, but they do not always have water all the year. Such areas are submerged during the wet season and the depth depends on the increase in water level. However, these areas do dry up during dry season. Such swamp areas are not utilized for agriculture. Rice farming is done in the areas between such lowland swamps and Buttles, where the drainage condition is relatively good and is not submerged during wet season. As for other agriculture crops, considering the advantage of adjacent location to a big market like Vientiane Capital, various kinds of vegetable and industrial cash crops such as tobacco plantation are in practice from a very long time.

The production of the dry season irrigated rice has increased more than twice from 40,000 ton in 1996 to 930,000 ton in 2000, however since then irrigated rice production has been between kept 90,000 to 100,000 ton per year. Presently, there are 102 irrigation facilities under the management of Vientiane Capital.

Table 2.1.6: Irrigated Rice Area and Production in Recent 10 Years in Vientiane Capital

Irrigated Rice in Dry Season	Year										
	1996	-	2000	2001	2002	2003	2004	2005	2006	2007	2008
Area ('000 ha)	9.1	-	21.0	22.0	23.1	23.3	21.2	21.6	21.1	20.1	21.1
Production ('000 ton)	39.7	-	93.0	101.6	106.5	110.0	103.2	98.6	97.1	96.0	99.8

Source: Basic Statistics, DoS, MPI

(6) Commercial and Tourism Development

There are 83 markets in Vientiane Capital at present. There are large numbers of market as many as 22 in Xaysetha district.

The number of foreign visitors to Vientiane Capital was approximately 200,000 in year 2006 and 2007, respectively, while in comparison to the foreign visitors to Luang Prabang, which is a World Heritage Site, was approximately 240,000 visitors visited. The number of hotels was 175 and one of guesthouses was 187 in Vientiane Capital

Table 2.1.7: No. of Hotels and Guesthouses in Vientiane Capital in 2007, 2008 and 2009

(Unit: buildings)

	Hotel			Guesthouse		
	2007	2008	2009	2007	2008	2009
Vientiane Capital	79	114	175	169	185	187
Luang Prabang	21	31	41	203	161	201
Other provinces	111	120	141	748	774	956
Total Lao PDR	211	265	357	1,120	1,120	1344

Source: Lao National Tourism Administration

2.2 Current Conditions of Urban Planning and Land Use

2.2.1 Legal and Regulatory Framework

There are 16 ministries including Prime Minister's Office and MPWT in the central government. Each ministry has their own agencies at local level (Provinces and Districts).

MPWT has DPWT at provinces including Vientiane Capital and OPWT at districts. MPWT and its line agencies is the main player for urban planning and urban management.

There are 9 districts in Vientiane Capital, namely Chanthabouly, Sikhottabong, Xaysetha, Sisattanak, Naxaithong, Xaythany, Hadxaifong, Sangthong, and Mayparkngum District. Urban planning and management of Vientiane Capital are implemented by DPWT and OPWT in 9 districts. In addition, VUDAA exists in the Capital which is responsible for the management of urbanized area of the Capital. Districts officially covered by VUDAA are four (4) – Chanthabouly, Sikhottabong, Xaysetha and Sisattanak District.

Responsibilities of Relevant organizations are as follows:

(a) MPWT (Ministry of Public Works and Transport) is responsible for macro-management of land, water, and air transport, housing, urban and rural housing in Lao PDR. MPWT consists of ten (10) departments including Department of Housing and Urban Planning and Department of Roads, one authority (Railway Authority), and one Institute (PTI).

(b) DHUP (Department of Housing and Urban Planning) is responsible for research of decree and law and technical standard, management of budget, management and monitoring of planning and construction, and training to staff.

(c) PTI (Public Works and Transport Institute) is the main institute responsible for preparation of urban plans in Lao PDR. Between 1991 and 2007, about 115 urban master plans have been prepared in Lao PDR and more than 70% (81 urban master plans) of them are provided by PTI.

(d) DPWT (Department of Public Works and Transport) in Vientiane Capital manages the other areas that are not managed by VUDAA. There are two management organizations in the Capital – DPWT and VUDAA. VUDAA covers highly urbanized area of villages in districts of Capital based on Decree on the Implementation and Activities of VUDAA. DPWT manages other area (villages in districts).

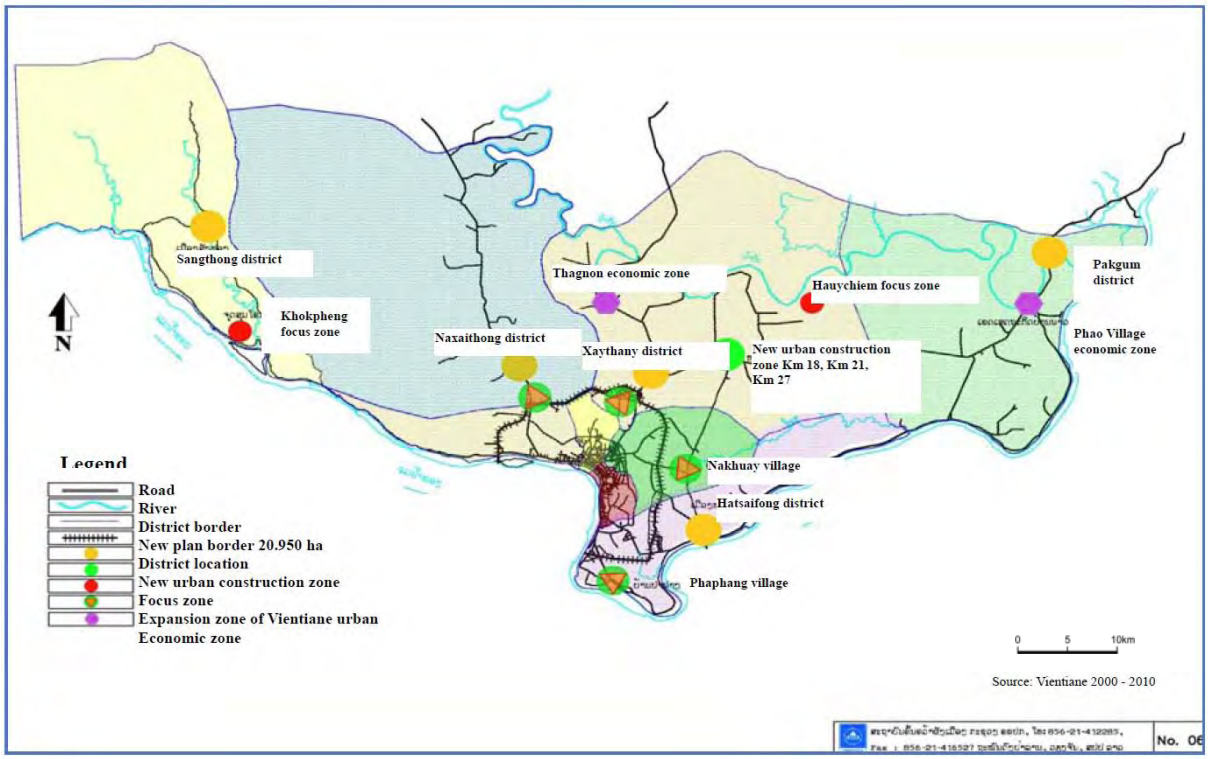
(e) OPWT (Office of Public Works and Transport) in Districts is the organization responsible for the management of public works and transport in the district which are under the control of DPWT in the Capital.

(f) VUDAA (Vientiane Urban Development Administration Authority) has been established for the management of highly urbanized area in the districts of Vientiane Capital. This is based on the Decree on the Implementation and Activities of UDAA of Vientiane Capital promulgated in February 1997. There are 500 villages in 9 districts in the Capital. Of which, 400 villages in 9 districts are managed by DPWT. Other 100 villages in four districts are covered by VUDAA.

2.2.2 Urban Planning

(1) Present Urban Planning

In the Vientiane 2010 plan (2000-2010), the functional distributions were proposed within Vientiane Capital. The Vientiane 2010 plan specifies the location and function of urban centers in Vientiane Capital and shown in Figure 2.2.1. This figure illustrates a clear need for dis-concentrating the urban functions from the Vientiane city center towards the District centers, and need for industrial development in the suburbs of Vientiane city.



Source: Urban Development Master Plan Vientiane Capital 2000 – 2010

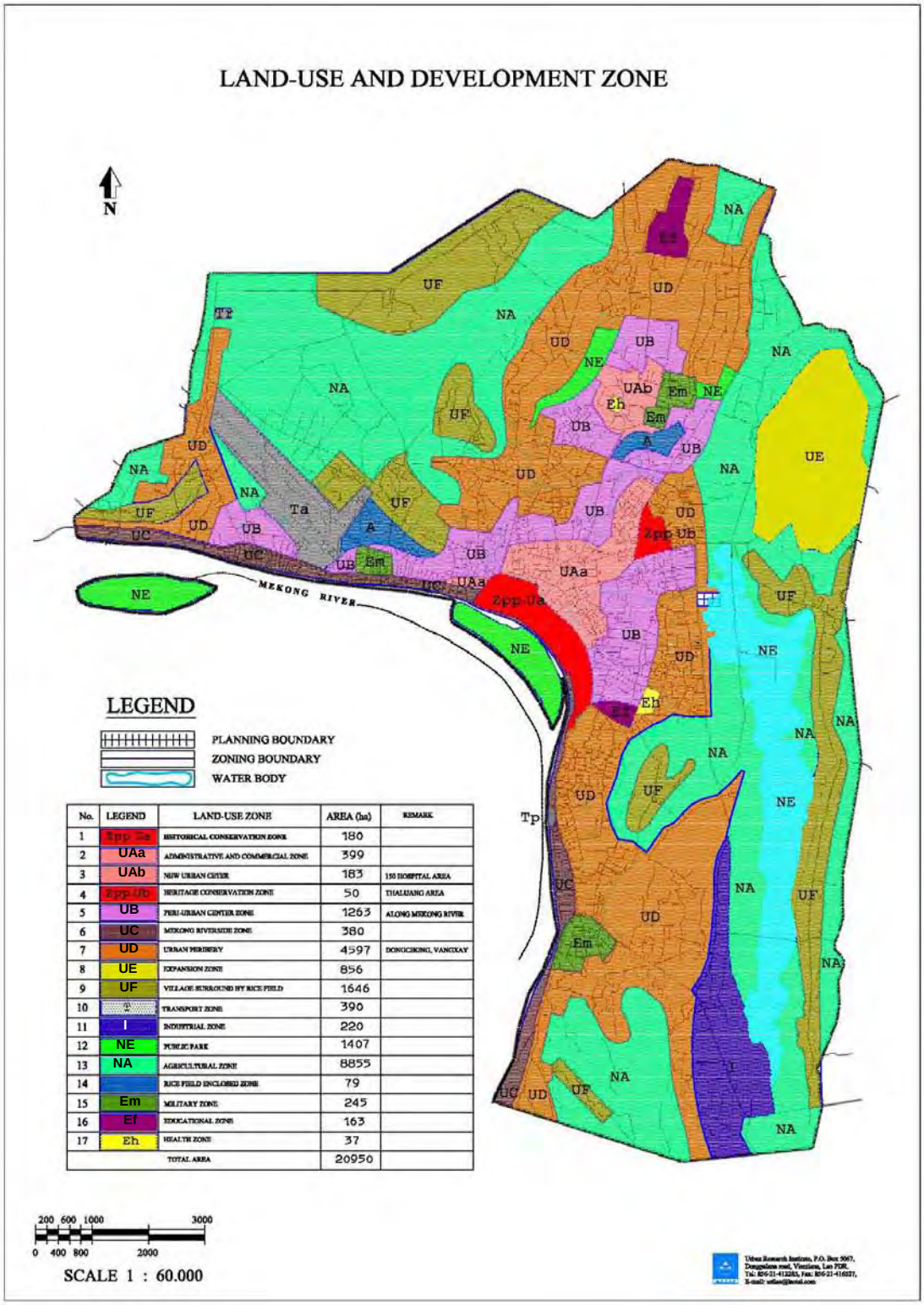
Figure 2.2.1: Location and Function of Urban Centers in Vientiane Capital

In the Vientiane 2010 plan, three boundaries are proposed for the existing urban area (100 villages); new urban area (150 village); and future urban areas (189 villages). The total urban areas of these three categories are 20,950 ha.

Figure 2.2.2 shows a proposed zoning scheme for Vientiane 2010. In all 17 zoning categories are established and applied to the proposed urban planning area for 2010. The basic scheme for the zoning seems to be straight forward and rational.

(2) Buildings Permission

OPWT handles application and permission of buildings having floor area less than 200m^2. In case if the building having a floor area of more than 200m^2 than OPWT receives an application form of a building and sends it to DPWT with OPWT's comment. DPWT gives permission for a building having floor area more than 200m^2.



No.	LEGEND	LAND-USE ZONE	AREA (ha)	REMARK
1	Zpp Ua	HISTORICAL CONSERVATION ZONE	180	
2	UAa	ADMINISTRATIVE AND COMMERCIAL ZONE	399	
3	UAb	NEW URBAN CITER	183	150 HOSPITAL AREA
4	Zpp Ub	HERITAGE CONSERVATION ZONE	50	THALUANG AREA
5	UB	PERI-URBAN CENTER ZONE	1263	ALONG MEKONG RIVER
6	UC	MEKONG RIVERSIDE ZONE	380	
7	UD	URBAN PERIPHERY	4597	DONGCHONG, VANCHAY
8	UE	EXPANSION ZONE	856	
9	UF	VILLAGE SURROUND BY RICE FIELD	1646	
10	A	TRANSPORT ZONE	390	
11	I	INDUSTRIAL ZONE	220	
12	NE	PUBLIC PARK	1407	
13	NA	AGRICULTURAL ZONE	8855	
14		RICE FIELD ENCLOSED ZONE	79	
15	Em	MILITARY ZONE	245	
16	Ef	EDUCATIONAL ZONE	163	
17	Eh	HEALTH ZONE	37	
		TOTAL AREA	20950	

Source: Urban Development Master Plan Vientiane Capital 2000 – 2010

Figure 2.2.2: Present Urban Planning Area and Land Use Zoning

(3) Present Regulations

Among others, the actual regulation of the land use is primarily conducted with a system that focuses more on a few of the selected land use parameters, namely, the Coverage Ratio (E), Height of Building (H) and Plot Ratio (COS). Table 2.2.1 summarizes the present regulation system for the three parameters for different land use zones.

Table 2.2.1: Summary of Present Coverage Ration, Height of Building and Plot Ratio for Vientiane Capital

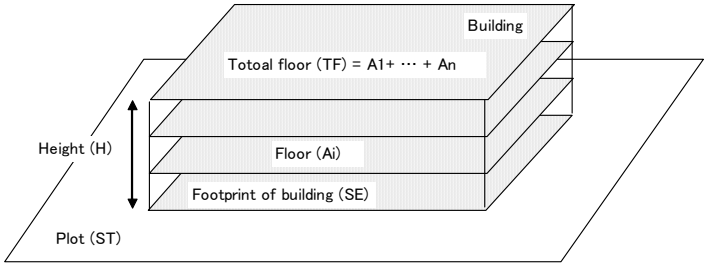
No.	Zones	Description of Zone	Coverage ratio (E) %	Height of Building (H) m	Plot Ratio (COS)
A		Urban Central Zone			
1	ZPP-Ua	- Historical town conservation zone	75%	12	2.5
2	ZPP-Ub	- Ancient site conservation zone	50%	7	0.7
3	UAa	- Administration and trade central zone	75%	26	2.5
4	UAb	- New central zone	75%	26	2.5
B		Urban Inner Zone			
5	UBa	- Urban inner zone within aircraft flying zone	60%	Referring to relevant org.	1.5
	UBb	- Urban inner zone	60%	20	1.5
6	UCa	- Mekong River bank zone with aircraft flying zone	50%	10	1.0
	UCb	- Mekong River bank zone	50%	10	1.0
C		Urban Surrounding Zone			
	UDa	- Urban Surrounding Zone with aircraft flying zone	40%	7	0.7
7	UDb	- Urban Surrounding Zone relevant to agricultural activities	50%	15	1.0
	UDc	- Urban Surrounding Zone and suburb	50%	15	1.0
9	UF	- Village surrounded by rice field	40%	10	1.0
D		Urban Expansion Zone			
8	UE	- Urban expansion zone	50%	23	1.0
E		Subdivide zones or specific land use zone			
10	I	- Industrial zone	30%	15	2.0
11	T	- Transport zone	-	-	-
	Ef	- Education zone	-	-	-
12	Em	- Military zone	-	-	-
	Eh	- Public health zone	-	-	-
	NA	- Agricultural zone	-	-	-
13	A	- Rice field has been surrounded by build up area	-	-	-
14	NE	- Public preservation zone	-	-	-

Source: Urban Development Master Plan Vientiane Capital 2000 – 2010

Among the three land use regulating parameters, there are some known relationship that come from the physical interpretation of the building, floor and land plot. By definition,

$$CR = SE / ST$$

SE = Footprint of the building, ST = plot area, CR=?



When the maximum height is set at H, the maximum number of stories could be determined by assuming the average floor height, say 3.5 meters.

$$N = H / Hf$$

N = maximum number of stories; H = maximum height of building; Hf; average height of floor (assumed to be 3.5 m)

When a building is built in a uniform style, such as illustrated, the total floor area of the building could be calculated as the footprint of the building (SE) times the number of stories.

$$PR = FT / ST$$

PR = plot ratio; FT = total floor area of a building; SE = plot area

Thus the maximum Plot Ratio could be approximated by

$$PRmax = N * SE / ST = N * CR$$

Therefore, by comparing the values of PR and PRmax, a gap in the three parameters could be found. For the present scheme, the following discrepancies were found.

Table 2.2.2: Comparison of Present and Maxim Plot Ratio

Zone	Present PR	PRmax	Possible Maximum PR	Possible change of parameters
ZPP-Ua	2.5	2.0	2.0	Decrease PR
UAa	2.5	5.0	5.0	Increase PR
UAb	2.5	5.0	5.0	Increase PR
UBb	1.5	3.0	3.0	Increase PR
UDb	1.0	2.0	2.0	Increase PR
UDc	1.0	2.0	2.0	Increase PR
UE	1.0	3.0	3.0	Increase PR
I	2.0	1.2	1.2	Decrease PR

Source: JST

2.2.3 Urban Landscape

Urban landscape is still characterized by its traditional green feature, surrounding wetlands and fertile agricultural land. Distinctive urban landscape elements are composed of rich green trees around low-rise public and private building and light-brown color high roofs of temples in urbanized area. However, newly constructed major roads are inducing and enhancing ribbon or corridor type commercial and urban development and started dominating the prevailing agricultural scenery. At the moment, high-rise buildings sometimes with miller walls have started to come up in the urbanized area and agricultural land. Wet lands are changing and developing to urban area in the suburbs.

The four measures for urban landscape conservation and improvement are based on he National Historical and Cultural Heritage Preservation Law and its related action, Land Use Zoning System on the Urban Development Master Plan Vientiane Capital, and Building Permit System and are as follows,

- Existing land use zoning of the Master Plan 2000 – 2010 clearly define and designate the important areas, historical heritages in urban area, etc.
- Building Permit system is enforced to control building height (H), building coverage area ratio (E), building total floor area/area ratio (COS) and building set-back.
- National Historical and Cultural Heritage Preservation Law defines the historical and cultural heritages at two levels i.e. at nation and local level.
- Urban heritages in the designated Historical Conservation Zone have been investigated, which defined 286 buildings that include Lao traditional, French colonial and other arch type buildings.

(1) Land Use Zoning

Improvement and conservation zones of urban and rural scenery had been defined and designated on the land use plan of Vientiane Urban Development Master Plan 2000 – 2010. The land use plan was formulated based on the compiled data and information of historical heritages, high productive farmland and water source, and others. And it clearly defines and set Historical Conservation zone, Heritage Conservation zone, Public Park (greenification) zone, and Agricultural zone.

(2) Heritages Preservation

Five temples, one national monument, and one surrounding area of national monument have been investigated, registered and preserved as national level of historical and cultural heritages in Vientiane Capital by MIC.

- Five Temples: Inpeang, Onteu, Sisaket, Ho Pakeo, Si Muang
- 1 National Monument: That Luang
- 1 Surrounding area of the national Monument: That Luang

Source: Ministry of Information and Culture 2010

Figure 2.2.3: Location Map of Registered National Historical and Cultural Heritage

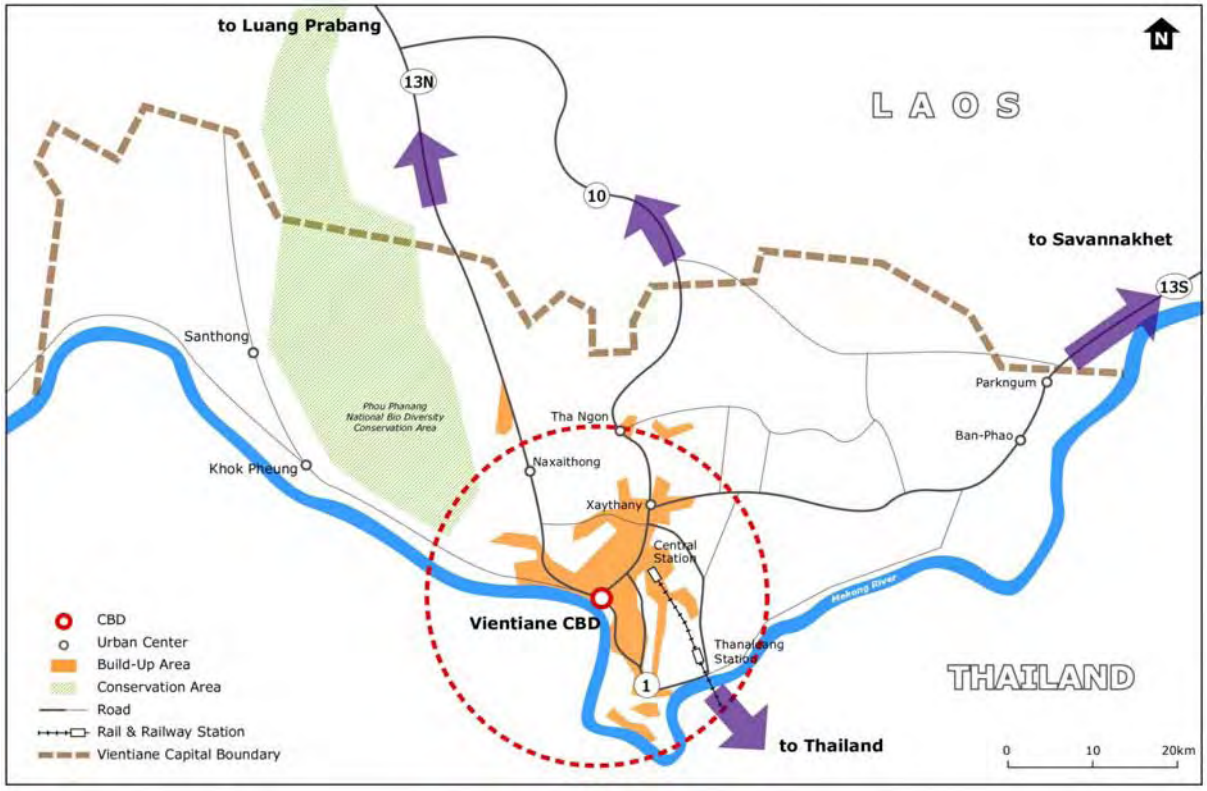
2.2.4 Present Land Use

(1) Overview

1) Urban Structure

Vientiane is historically developed along the Mekong River with a large and fertile plain as its hinterland. The origin of township of Vientiane is on a river bank of the Mekong in front of Don Chan Island, which still performs as the downtown and city center of Vientiane with the concentration of business and commercial activities. Urban central functions including administration, banking, business and commerce are located in the areas along Settha Thirath Road and Lane Xang Avenue. Urbanization occurred in the old town (the downtown) and expanded to the areas along the main roads. Currently, approximately the area in the radius of 5 Km from Patu Xay has been urbanized. The area along the major roads has expanded especially along the Kampengmouang and Kaison Phmvihan Roads. The suburban areas expanded and urbanized covering an area up to 10 km of radius in three directions i.e. northeast and west and south along National Road such as No.13N, and NR.13S.

Overall spatial structure of Vientiane Capital is shown in Figure 2.2.4.



Source: JST

Figure 2.2.4: Current Spatial Structure of Vientiane Capital

Peri-urban areas are still kept in traditional rural landscape expect for the areas along major national roads where ribbon type development occurred. Small local settlements are scattered all over the rural areas, in the forest and along the rivers. Some isolated urban agglomerations are also emerged as a local commercial center along the major roads and

rivers such as Tha Ngon and Ban Pao. However, such development is still in very limited in terms of size, population and economic activities.

2) Transport Network

Urban road network in Vientiane Capital is developed to form a ring and radius systems. The radius system is formed with National Road No.13N, NR.13S, NR.10 and Vientiane Road No.1, while the ring system is formed with inner ring road (Kampengmouang Road and Kaison Phomvihan Road) and outer ring road (450 Years Road and Naxaithong-Dongdock Road). The inner ring road is in approximately 5 km radius area, while the outer ring road is in approximately 15 km radius area.

(2) Land Use

Land use pattern in 1995 and 2005 is developed based on the analysis of Land-sat imagery with land use category of 1) built-up area, paddy area, 2) upland crop area, 3) forest area, 4) vacant land area and 5) water body area, which are shown in Figure 2.2.5 and Figure 2.2.6.

Looking at land use composition of Vientiane Capital in 1995, a dominant land use type is forest area, which occupied about 70% of total area, followed by 17% of paddy area. Built-up area or urbanized area is only approximately 3 % of the total land as shown in Table 2.2.3.

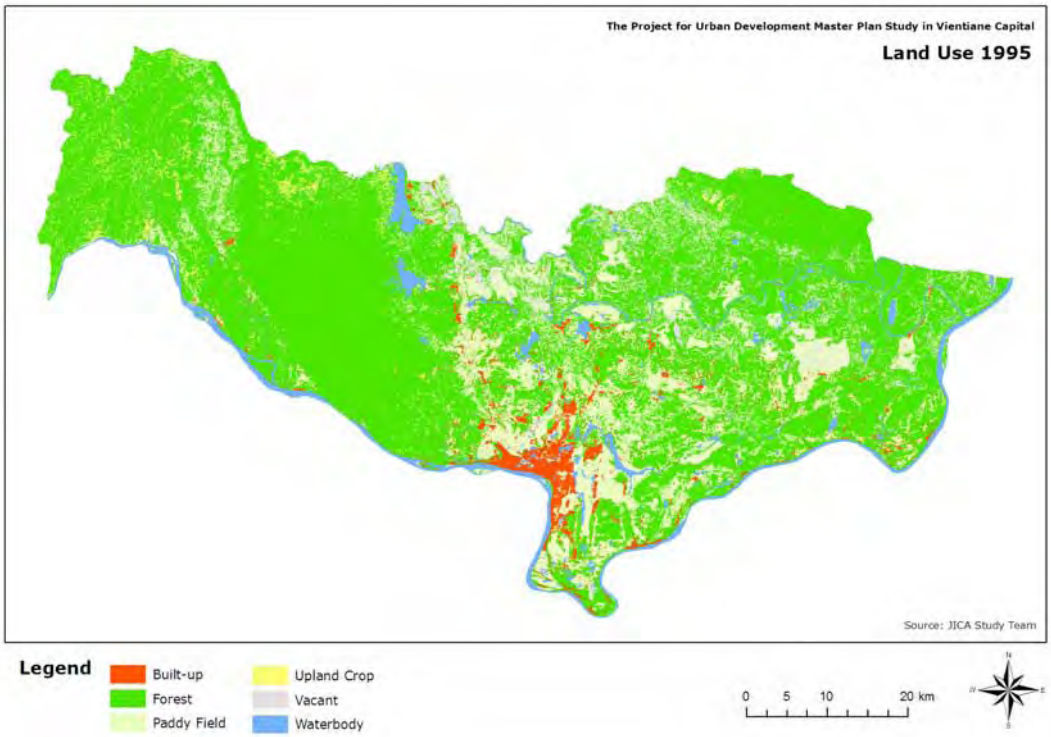
Rapid economic development and population growth may have largely affected the land use pattern in Vientiane Capital. The built-up area doubled from approximately 3% of total area in 1995 to 6% in 2005. In other word, the built-up area increased by 87 km^2 between 1995 and 2005. Instead, forest area and vacant area decreased by 65 km^2 and 108 km^2, respectively.

The net population density was estimated as 33.9 persons/ha in 2005, calculated with the built-up area from Land-sat analysis and census population in 2005.

Table 2.2.3: Land Use Changes

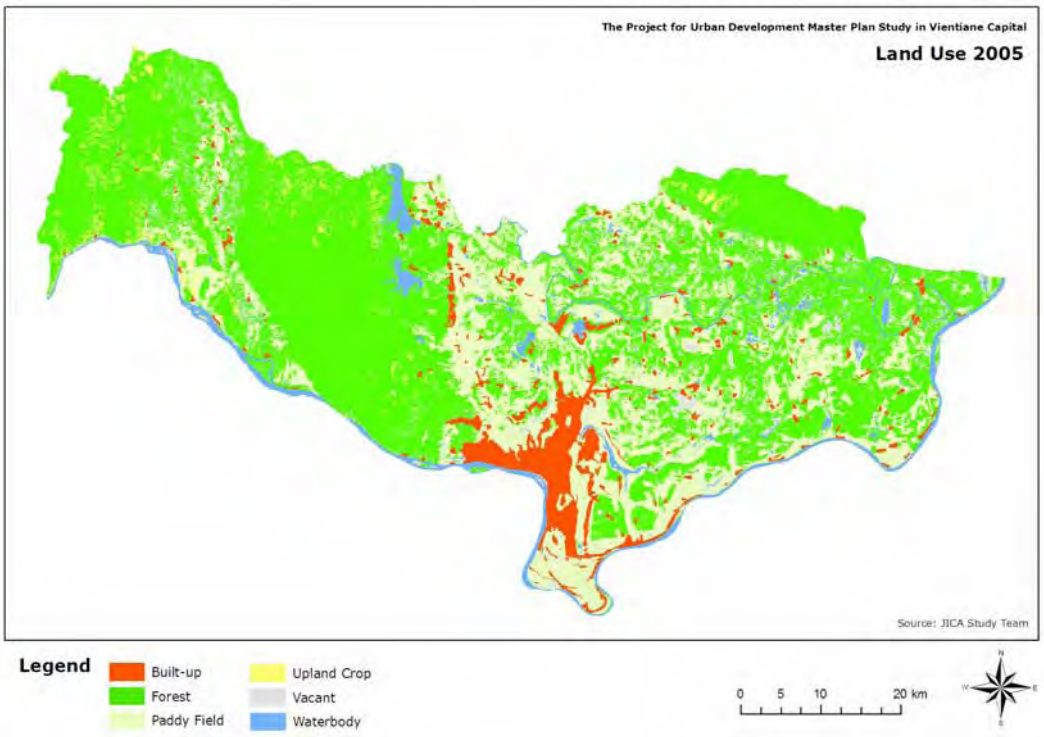
	1995			2005		Difference
	Area (Km2)	(%)		Area (km2)	(%)	(2005-1995)
Built-up Area	132.84	3.4%		220.66	5.6%	87.82
Paddy Area	655.11	16.7%		659.93	16.8%	4.81
Upland Crop Area	52.86	1.3%		65.17	1.7%	12.31
Forest Area	2,710.88	69.2%		2,645.56	67.5%	-65.32
Vacant Land Area	221.08	5.6%		113.01	2.9%	-108.06
Water Body Area	147.23	3.8%		215.67	5.5%	68.44
Total	3,920.00			3,920.00		0.00

Source: GIS Analysis of JST



Source: JST

Figure 2.2.5: Land use 1995

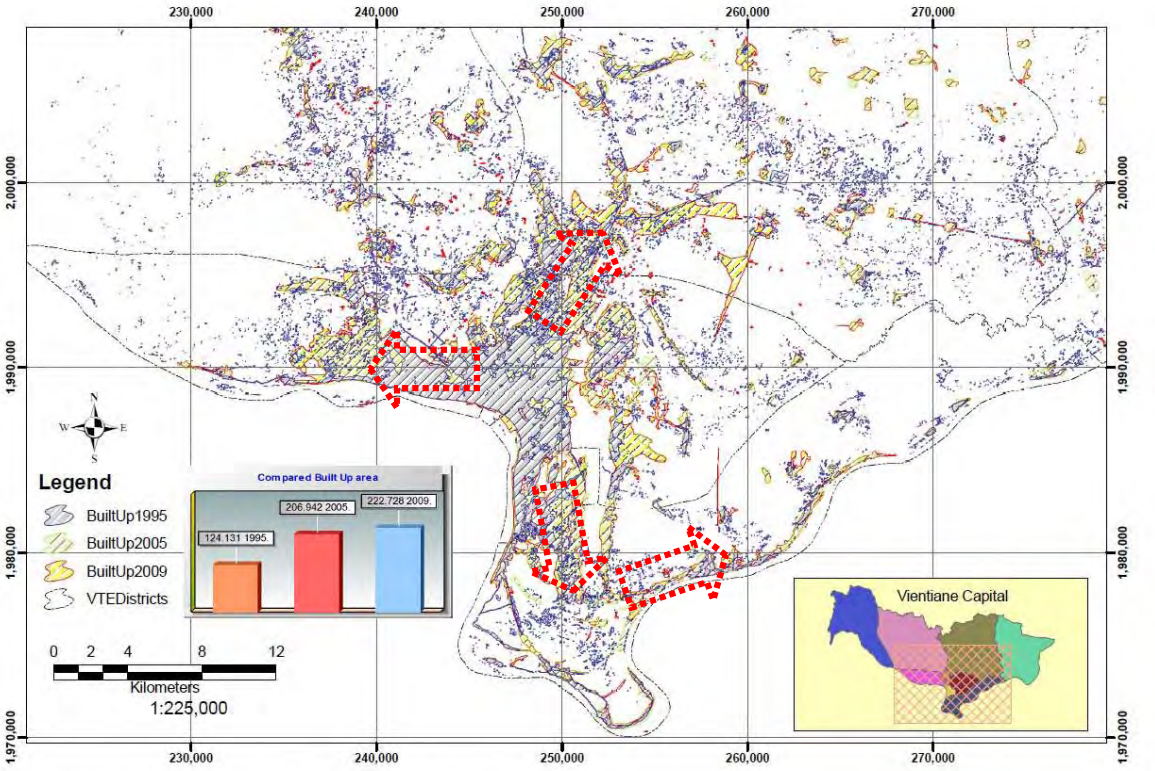


Source: JST

Figure 2.2.6: Land use 2005

(3) Urbanization

Urbanization in Vientiane Capital occurred mainly along the major national roads such as National Road NR.13N, NR.13S, NR.10 and Vientiane Road No.1. As shown in the Figure 2.2.7 the current urban area spreads over the western, northeastern and southern directions. The area of marsh, swamp and paddy filed are not urbanized such as That Luang marsh.



Source: JST

Figure 2.2.7: Urban Expansion of Central Area

This spatial expansion of urban area (or built-up area) can be interpreted from the population data. Urban central district consisting of Chantabouly and Sisattanak Districts has very limited population growth due to limited expansion space anymore, while suburban districts show high population growth, in particular, Sikhottabong, Xaythany Districts.

This observation becomes clearer if looking into the population growth by distance from the center. The area within 5 km radius has very limited population increase with an annual population growth rate of 0.9% during 1995 and 2005. The area within 10 km radius has the highest population growth, which is approximately 4.5%/year. The area outside 10 km radius has population growth rate of 3.4 %/year.

Table 2.2.4: Population and Urban Villages by District

	Area (km2)	Population		Household		No. of Person in HH		Percentage of Urban Population (%)		Pupulation Growth Rate 1995-2005
		1995	2005	1995	2005	1995	2005	1995	2005	
Urban Center District										
Chanthabuly	29	58,855	68,858	10,203	12,433	5.77	5.54	98.1%	100.0%	1.58%
Sysattanak	31	58,178	68,686	9,850	11,357	5.91	6.05	95.8%	100.0%	1.67%
Total	60	117,033	137,544	20,053	23,790	5.84	5.78	97.0%	100.0%	1.63%
Suburban District										
Sikhottabong	140	74,251	99,908	12,612	17,999	5.89	5.55	87.1%	84.7%	3.01%
Xaysettha	147	75,255	97,514	12,932	18,293	5.82	5.33	73.5%	100.0%	2.62%
Xaythany	916	97,829	150,793	16,512	26,259	5.92	5.74	39.3%	83.0%	4.42%
Hatxayfong	258	64,962	78,338	11,933	15,591	5.44	5.02	50.7%	77.8%	1.89%
Total	1,461	312,297	426,553	53,989	78,142	5.78	5.46	61.3%	86.3%	3.17%
Rural District										
Naxaythong	1,131	44,104	58,368	7,600	10,815	5.80	5.40	39.3%	83.0%	2.84%
Sangthong	622	16,728	24,215	2,928	4,862	5.71	4.98	10.6%	7.4%	3.77%
Paknguem	646	33,945	45,041	5,933	8,311	5.72	5.42	14.4%	13.2%	2.87%
Total	2,399	94,777	127,624	16,461	23,988	5.76	5.32	27.4%	50.1%	3.02%
Vientiane Capital	7,780	524,107	691,721	90,503	125,920	5.79	5.49	63.1%	82.4%	2.81%

Source: Results of Census in 1995 and 2005

(4) Land Use and Population Distribution Pattern

Vientiane Capital has the population of approximately 700 thousands persons in 2005. Approximately 350 thousand persons or 50 % of the total population concentrates in the urban area of Vientiane Capital. Out of it, the urban center has only 203 thousands persons, while the suburban area has 145 thousands persons. As mentioned in the previous section, the urban center has very limited population growth rate due to no more apace for development, while the suburban area has high population growth rate with plenty of space available for further urbanization. The population density of the urban center is 36.7 person/ha on an average, whilst some areas may be more densely inhabited with more than 80 persons/ha.

There are other local settlements scattered all over the Vientiane Capital. The village with certain facility and accessibility is defined as “urban village”. Such local settlements in particular the urban village, where the population increased with the annual growth rate of 3.1 %. (Table 2.2.5 indicates that 13.4% and -4.5 % of annual population growth rate in other urban villages and rural villages, respectively. However, many “rural village” upgrade to “urban village during the same period, resulted in showing much higher population growth rate.) Average population density is 0.6 person/ha.

Table 2.2.5: Population Distribution Pattern (2005)

	Area (ha)	Population			Population Density (persons/km2)		Household			Persons/HH	
		1995	2005	Growth Rate (%)	1995	2005	1995	2005	Growth Rate (%)	1995	2005
Urban Center	5,549	185,453	203,660	0.9%	3,342.1	3,670.2	31,174	34,994	1.2%	5.9	5.8
Suburban Area	18,964	88,197	145,375	5.1%	465.1	766.6	15,008	26,557	5.9%	5.9	5.5
Total	24,513	273,650	349,035	2.5%	1,116.3	1,423.9	46,182	61,551	2.9%	5.9	5.7
Other Urban Villages	367,487	62,543	220,694	13.4%			11,604	42,954	14.0%	5.4	5.1
Rural Villages		193,309	121,992	-4.5%	69.6	93.3	33,705	23,124	-3.7%	5.7	5.3
Total	392,000	529,502	691,721	2.7%	135.1	176.5	91,491	127,629	3.4%	5.8	5.4

Source: Results of Census in 1995 and 2005

(5) Typical Land Use Pattern

1) Urban Center

The urban center area has been densely built-up with medium height shop and houses in downtown area and low height detached houses in the surrounding areas of the downtown. In general, there is hardly any vacant space is available for any new development.

Source: Quickbird satellite image

Figure 2.2.8: Urban Center of Vientiane Capital (the area around Settha Thirath Road)

Source: Quickbird satellite image

Figure 2.2.9: Urban Center of Vientiane Capital (the area within Kampengmoung Road)

2) Suburban Area

Currently, suburban areas are the frontage of urbanization, where a number of housing developments are occurring. The entire area may be summed up as mixed development where some areas are developed (or built-up area, urbanized area) while others are still undeveloped. Population density is not yet so high in the suburban area. The area outside the developing area follows the traditional style of rural settlement as shown in the Figure below.

Source: Quickbird satellite image

Figure 2.2.10: Urban Center of Vientiane Capital (the area around Dongdock)

Source: Quickbird satellite image

Figure 2.2.11: Urban Center of Vientiane Capital (the area around Ban Muang Noi)

2.3 Current Conditions of Infrastructure

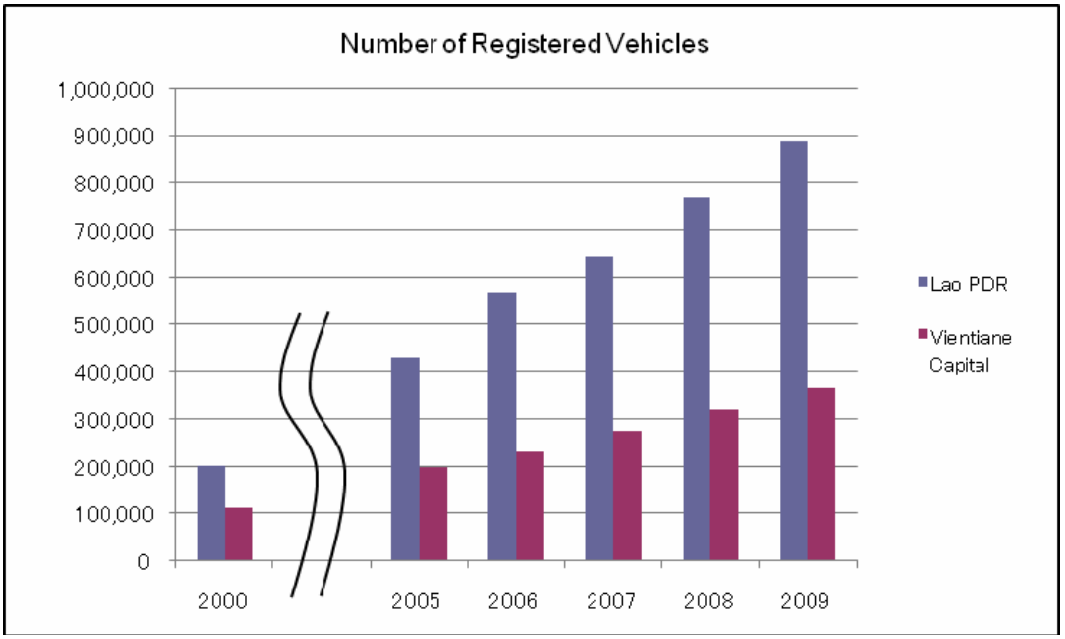
2.3.1 Road and Transport

(1) Increase of Traffic Volume

The growth of traffic volume counted at the National Road No.10, No.13 North and 13 South generally ranges from 2.2 and 2.3 times (2007-2010), which is equivalent to about 30% of an annual increase. This value indicates that the traffic growth has been much higher than the growth of population in Vientiane Capital.

(2) Motorization

The total number of passenger vehicles such as sedans, pickups and vans is 140 thousand in the whole country and more than half of the passenger vehicles, or 79 thousand vehicles, are registered in Vientiane Capital. The registered passenger vehicles in Vientiane Capital increased about four times from the year 2000 to 2009. This growth is about 17 % annually.

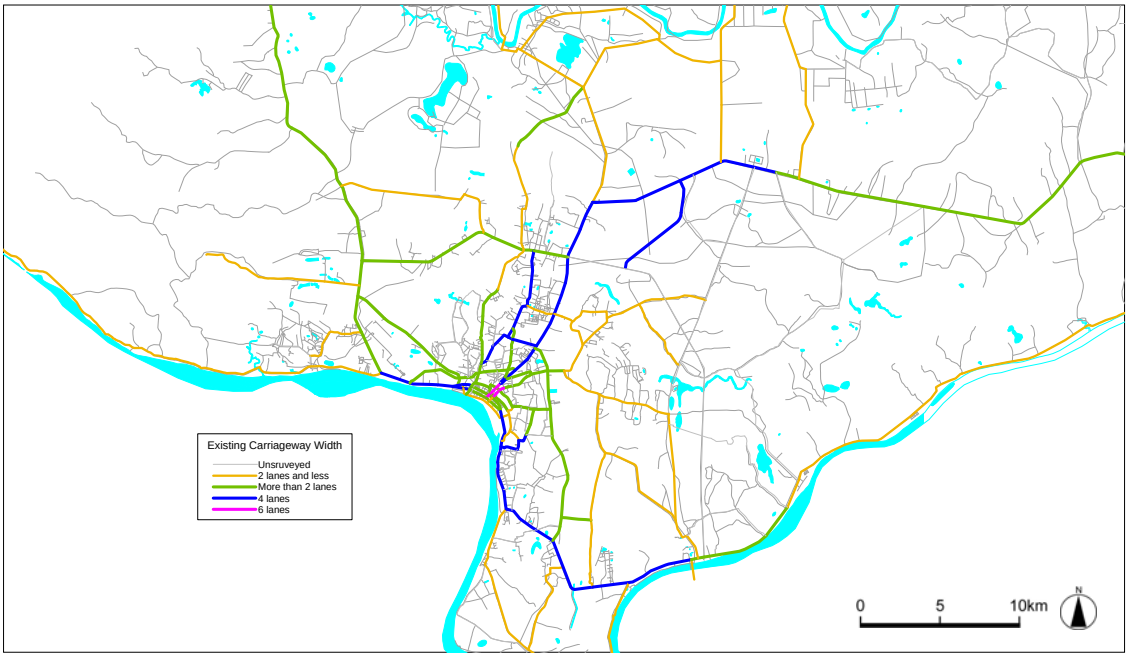


Source: JST

Figure 2.3.1: Number of Registered Vehicles in Lao PDR

(3) Existing Road Network

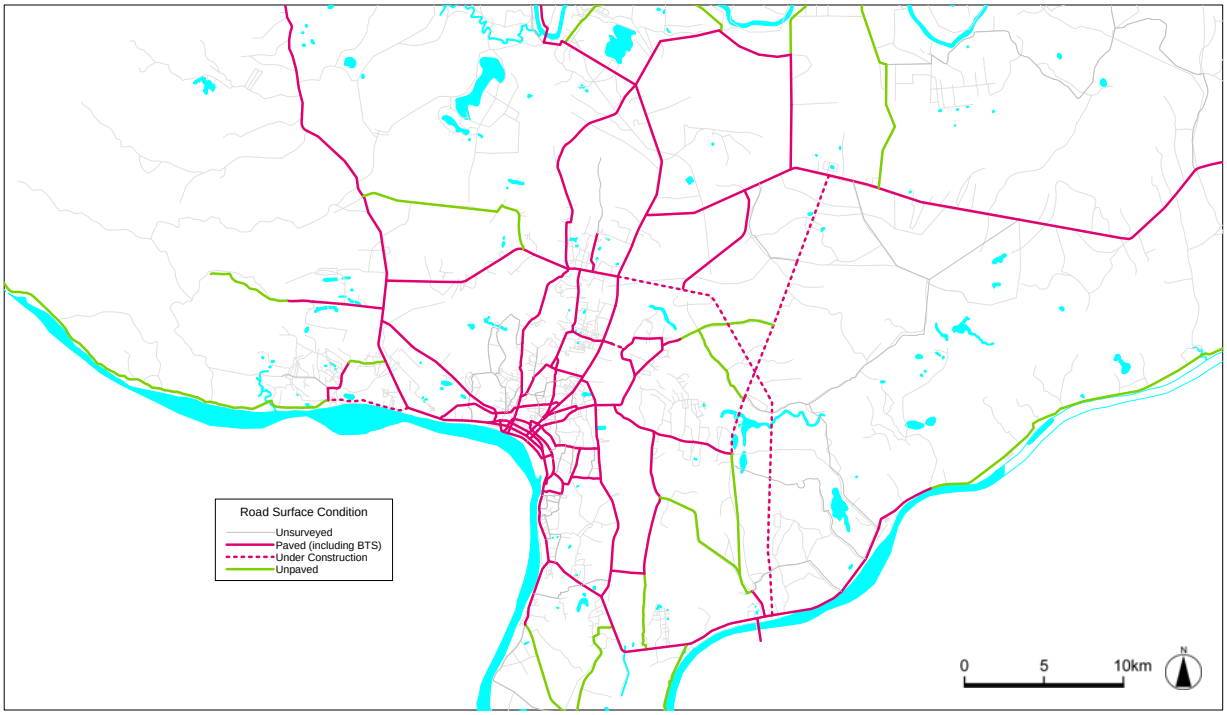
Some road sections of national road are composed with four lanes or more. Other parts of national road are composed with two lanes in the both directions even though there are enough width available or 4 lanes in the right of way (ROW). In the urban area, most roads are two lanes for the both directions with a narrow lane for slow speed vehicles. The district roads in rural area are mainly two lanes road without having sidewalk. A sidewalk is basically provided in the urban area but the width of the sidewalk varies according to road side conditions.



Source: JST

Figure 2.3.2: Existing Carriageway Width

In Vientiane Capital, bituminous surface treatment (BST) is the most common used surface type. National roads are no exception. In suburban area, gravel surface are common.



Source: JST

Figure 2.3.3: Road Surface Condition

2.3.2 Water Supply

(1) Overview

Two type of water supply system are applied in Vientiane Capital, i) water network system in urbanized area which is served by Nam Papa Vientiane Capital, Water Supply Company of the Vientiane Capital (NPVC) and ii) independent wells / bore holes or small scale water networks in rural area is served by resident itself or villages. Currently, the service ratios of i) and ii) are same i.e. approx. 50% in Vientiane Capital.

(2) Water Supply Development Policy

National policy based on DHUP, MPWT for water service ratio is as follows:

- Urbanized area: Service ratio will be 80% by 2020.

Vientiane Capital policy for water service ratio follows DPWT, as mentioned in an article described in the 7th Five year plan for Vientiane Capital.

- Urbanized area: 100% by 2015
- Rural area: 90% by 2015 and 100% by 2020 for whole Vientiane Capital

(3) Future Water Demand

According to Water Supply Master Plan, the future water demand has been projected separately for domestic and non-domestic uses. The table below shows summary of future water demand projection.

Table 2.3.1: Water Demand Projection in Vientiane Capital

	Unit	2000	2005	2010	2015	2020
Population	person	599,000	687,084	788,165	902,716	1,034,521
Served Population	person	215,522	275,567	370,269	466,981	564,648
Service Ratio	%	36.0%	40.1%	47.0%	51.7%	54.6%
Population in Service Area	person	297,575	380,342	499,737	586,710	662,441
Service Ratio in Service Area	%	72.4%	72.5%	74.1%	79.6%	85.2%
Number of Domestic Connections	nos.	34,210	43,741	58,773	74,124	89,627
Number of Non-domestic Connections	nos.	5,095	6,340	7,889	9,817	12,215
Total Number of Connections	nos.	39,305	50,081	66,662	83,940	101,842
Served Population (Incremental)	person		60,046	94,702	96,712	97,667
Number of Domestic Connections (Incremental)	nos.		9,531	15,032	15,351	15,503
Per Capita Consumption	lpcd	174	172	170	170	170
Total Domestic Water Demand	m3/day	37,501	47,398	62,946	79,387	95,990
Non-Domestic Water Demand	m3/day	30,361	37,780	47,011	58,499	72,793
Total Water Demand	m3/day	67,862	85,177	109,957	137,885	168,783
UFW Ratio	%	33%	28%	25%	25%	25%
Day Average Water Demand	m3/day	101,286	118,302	146,609	183,847	225,044
Day Maximum Water Demand	m3/day	111,415	130,132	161,270	202,232	247,548

Source: The Study on Vientiane Water Supply Development Project in Lao People's Democratic Republic, Master Plan, JICA, 2004

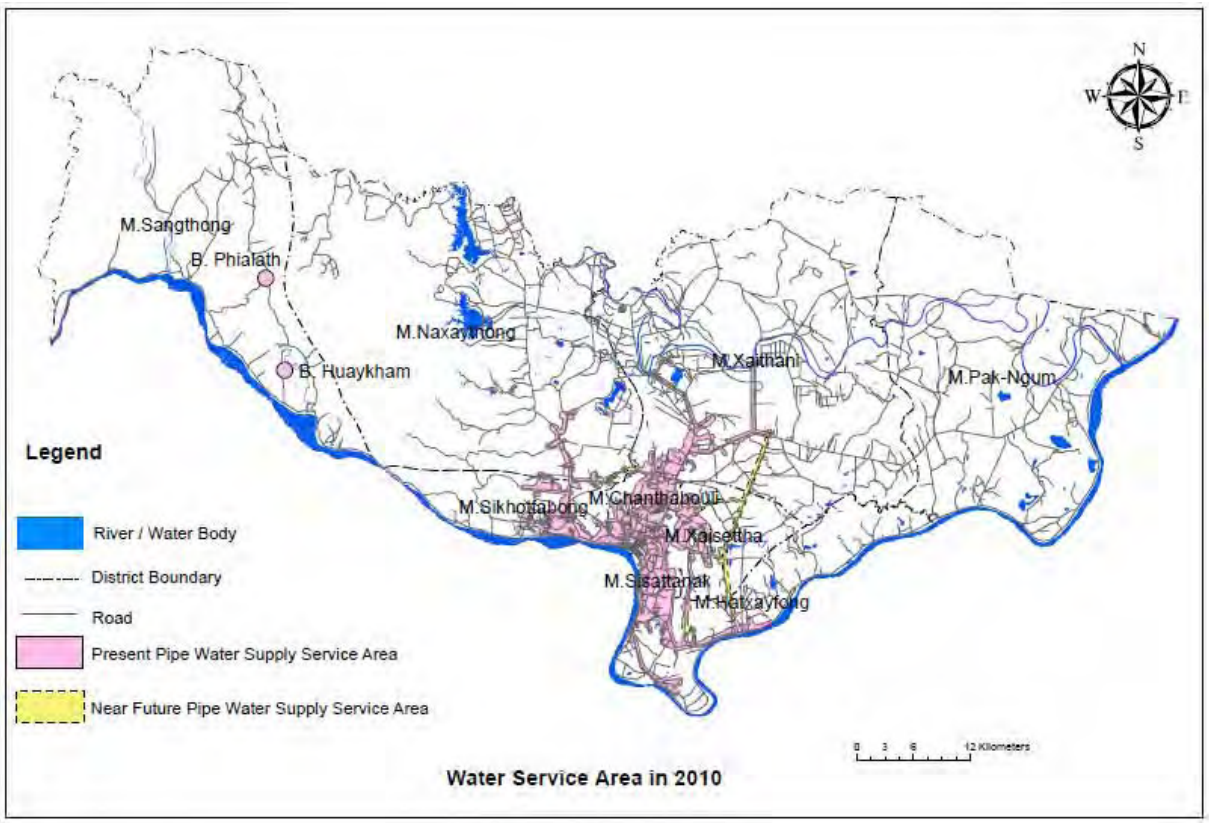
(4) Present Water Sources and Facilities

Basically main water sources for drinking water in Vientiane Capital are surface water of the Mekong River, Nam Ngum River and underground water except water on the market. WREA there are no water rights in Lao PDR for the water sources. According to Nam Saat, few groundwater sources in the southern part of Lao PDR contain arsenic, which is over the permissible standards for drinking water. According to NPVC, arsenic content and salty water were also found at some groundwater in Vientiane Capital

The present service area and location of main water supply facilities are presented in Figure below.

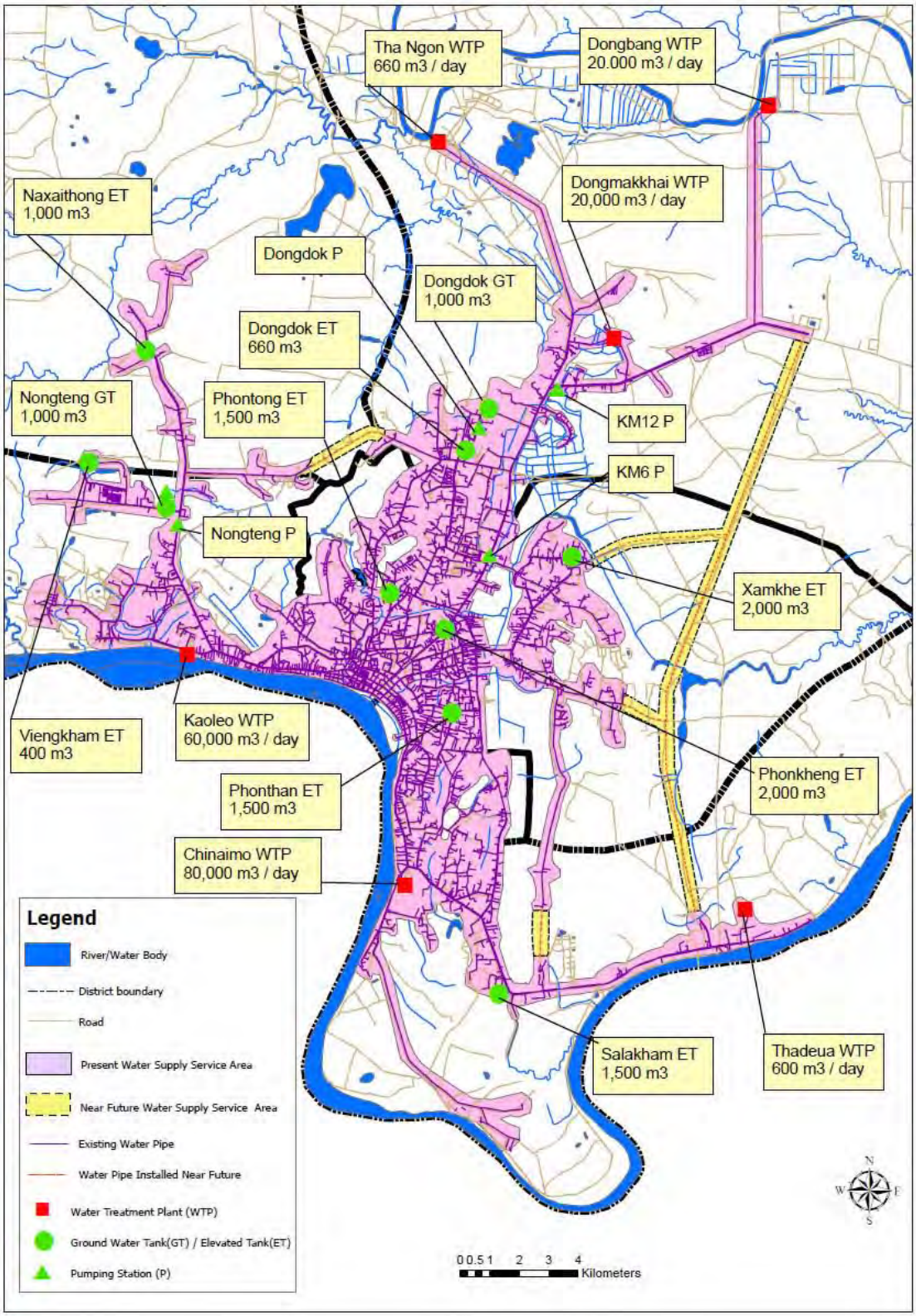
For water treatment purpose, currently, there are four water treatment plants (WTPs) and one borehole station operated by NPVC.

In Vientiane Capital, not only center of Vientiane Capital but there are water supply service area in two rural areas of Phialath village and Houaykham village as shown in figure below,



Source: NPVC, JST

Figure 2.3.4: Location of Existing Water Supply Service Area in Vientiane Capital



Source: NPVC, JST

Figure 2.3.5: Existing Water Supply System in Vientiane Capital

2.3.3 Sewerage/Wastewater

(1) Overview

Sewerage in the Vientiane Capital is at present being considered as a serious problem especially in urban area, where major development and growth are expected. Such future development without effective sewerage system in place in the city will result in more pollution to the natural water resources. Since there are no separate wastewater pipe network, untreated wastewater from all areas are disposed to the nearby drainage system, as result quite dark color water with a lot of garbage on the surface of water especially in the dry season can be observed in most of the open channels or canals in the urban area. This is very clear indication of deteriorating water environment in the city. While most of the wastewater generated in Vientiane Capital is from domestic household or commercial buildings which are major sources, there is some volume of wastewater also generated from the industry, though relatively small in comparison with the domestic wastewater. This is partly due to the fact that most of the large scale factory has its own wastewater treatment system or located in the industrial zone where special wastewater treatment plant has been installed.

(2) Wastewater Generation

Approximately 85,000 m^3 of wastewater from the urban area is drained to the public waterways every day, only about half of which is treated by the current on-site treatment system such as septic tanks and contributes in reducing the pollution. Due to natural purification and dilution from existing water channels, ponds and rivers and the limited wastewater load from the current population, the water quality in the natural waterway is still not so severe, only some points during dry season in the water channel can be noticed with dark color. .

(3) Facility in Sewerage System

According to the National Statistics in 2005, approximately 90% of households in Vientiane Capital have an access to proper toilet facilities. This shows that sanitary coverage is relatively good, but methods adopted in general for treatment is not satisfactory and maintenance is poor.

Currently, there is no separate wastewater collection system in Vientiane City or in other provinces of Lao PDR. Only some sewerage pilot projects had been constructed on a small scale basis by the EU/DANIDA in year 1994/2004. The service area is a center of urban Vientiane city around the Nong Chan marsh and the Northwestern part of the That Luang Marsh, where pilot stabilization pond (140m x 410m) suitable to treat wastewater in hot climatic condition by utilizing the natural biological treatment with less maintenance was developed. But due to a failure of the pumping stations in 2008, the plant has stopped its operation and the facilities have been devastated. Natural marsh or ponds are mostly used as a natural wetland treatment system. Especially, the That Luang Marsh, which is a very large marsh next to the urban area has been mentioned as good wetland and flood retention pond by several studies.

2.3.4 Drainage

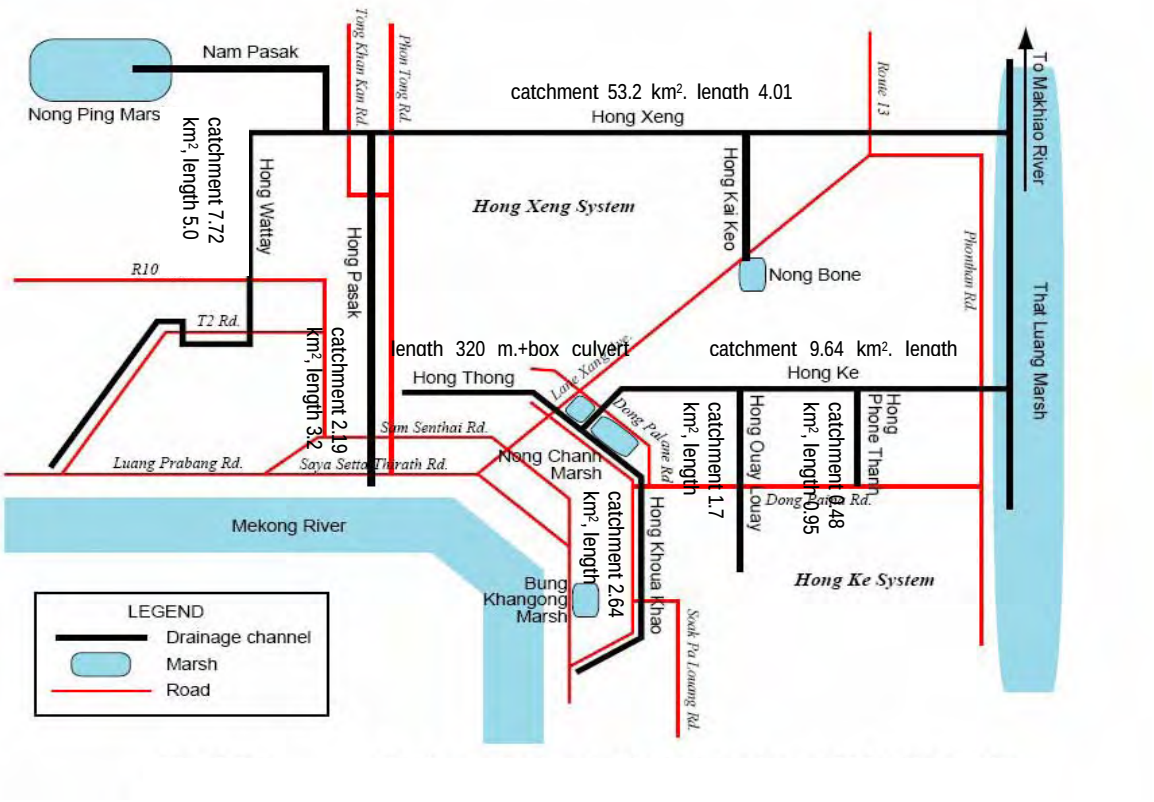
(1) Overview

The drainage system in Vientiane Capital has been studied and improved every year with various foreign supports, which includes the installation of new drainage pipes and channels along the improved roads which will reduce the flood problem in the city especially in urban area. At present the drainage situation is comparatively quite better than the ten years ago, and the flooding seldom occurs and when it does, it lasts for a very short period.

(2) Drainage Facilities and System

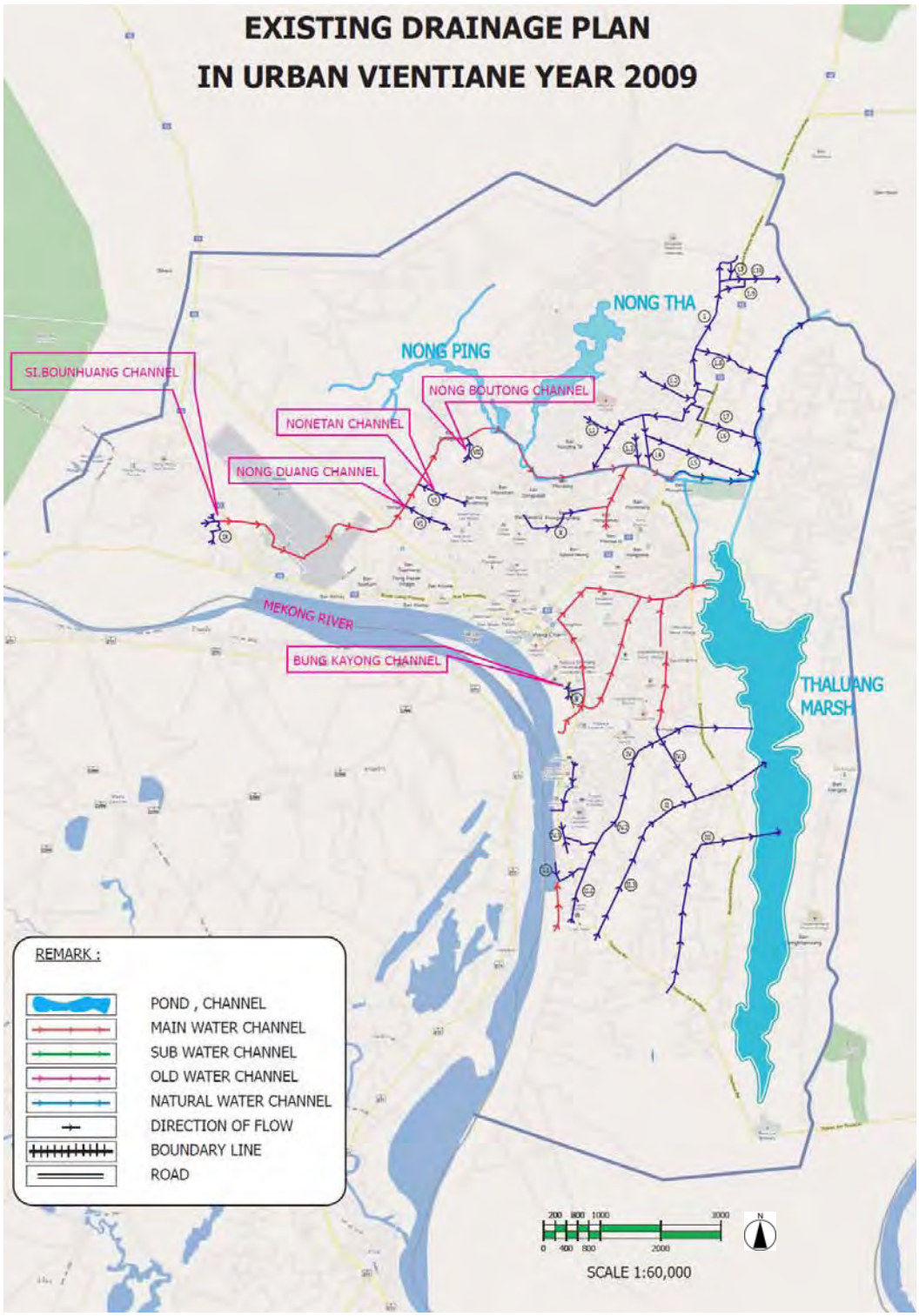
The basic facilities in the drainage system for Vientiane Capital include the drainage network i.e. pipe, channel, canal, river and marsh to convey and discharge all the rain water from the city area to the Mekong River. Also included are flood prevention facilities and river bank protection works within the Vientiane Capital. However, these needs to be properly planned and improved to prevent any seasonal flooding from the Mekong River especially during July and August when the water level is at peak.

Urban area of Vientiane Capital is covered by 2 main catchments areas as shown in the schematic layout in Figure 2.3.7: (a) Hong Xeng system consists of Hong Xeng and its tributaries, Hong Kai Keo, (b) Hong Ke system consists of Hong Ke and its tributaries. These areas are a sub-catchment area of the Mak-Hiao River.



Source: Modify from Interim Report-The Study on Improvement of Water Environment in Vientiane

Figure 2.3.6: Schematic Layout for Drainage System in Urban Area of Vientiane City



Source: VUDAA

Figure 2.3.7: Existing Drainage System in Urban Vientiane Capital

2.3.5 Solid Waste

(1) Management Matters

According to the definitions, there are no clear legislations or written policies related to discharge, collect and dispose solid waste. VUDAA has an implementation division consisting of three sections to manage the solid waste treatment. These sections are Urban Cleaning & Decoration Service (UCDS), Vientiane Solid Waste Collection Service (VSWCS) and Solid Waste Management and Disposal Section (SWMDS). UCDS manages and maintains parks and street trees/plants and conducts cleaning, solid waste collection and sprinkling of water. VSWCS is in charge of collecting and transporting the solid waste to the final disposal site. SWMDS manages the final disposal site located at the point KM32 in Naphasouk Village.

(2) Subcontracting and privatization

Five (5) private companies are operating for the solid waste collection service through a contract with village offices and individuals. VUDAA gives them permission to go for the collection service business and allocate the coverage area.

(3) Generation of Solid Waste

The coverage rate of the households with a contract for the waste collection is still under 40%, while the remaining more than 60% of household wastes get disposed without the collection service. The individual households are probably burning or burying the solid wastes.

(4) Collection service

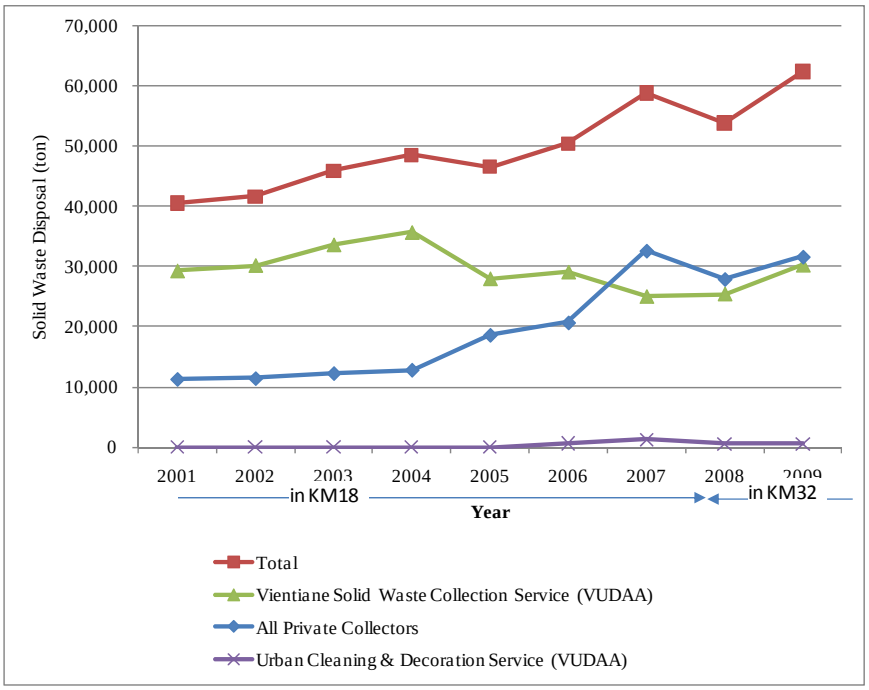
The VSWCS and 5 private collectors are responsible for covering the solid waste collection in the Vientiane Capital. However, of the total 63,312 households in the areas, only 23,505 households are covered under the contract with either of the garbage collection service providers. This results to the coverage ratio of 37% only.

(5) Intermediate Treatment and Final Disposal

There is no intermediate treatment system to reduce the volume and weight and for stabilization (from decay and toxicity) of the waste in the Vientiane Capital. The present final disposal site is the KM32 landfill site which was constructed utilizing local design. The site has a total 748 ha of land although the boundary is unclear, and approximately 100 ha of land is currently used for disposal.

(6) Volume of Solid Waste Disposal

With an increase of private collectors, the annual volume of solid waste disposal is increasing every year. Total 68,089 tons of solid wastes were disposed in 2009, which means that about 187 tons of garbage was carried daily to the site in approximately 50 truck-trips.



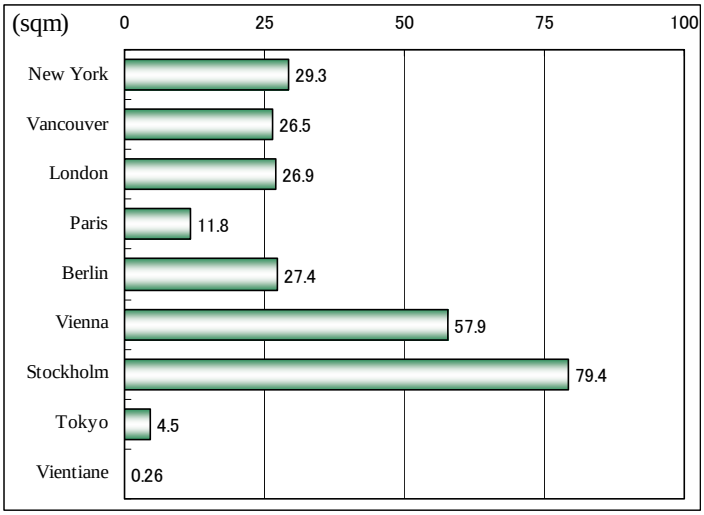
Source: VUDAA Environment Section, compilation by JST

Figure 2.3.8: Annual Volume of Solid Waste Disposal of KM32 Landfill Site

2.3.6 Parks, Open spaces and Greenery

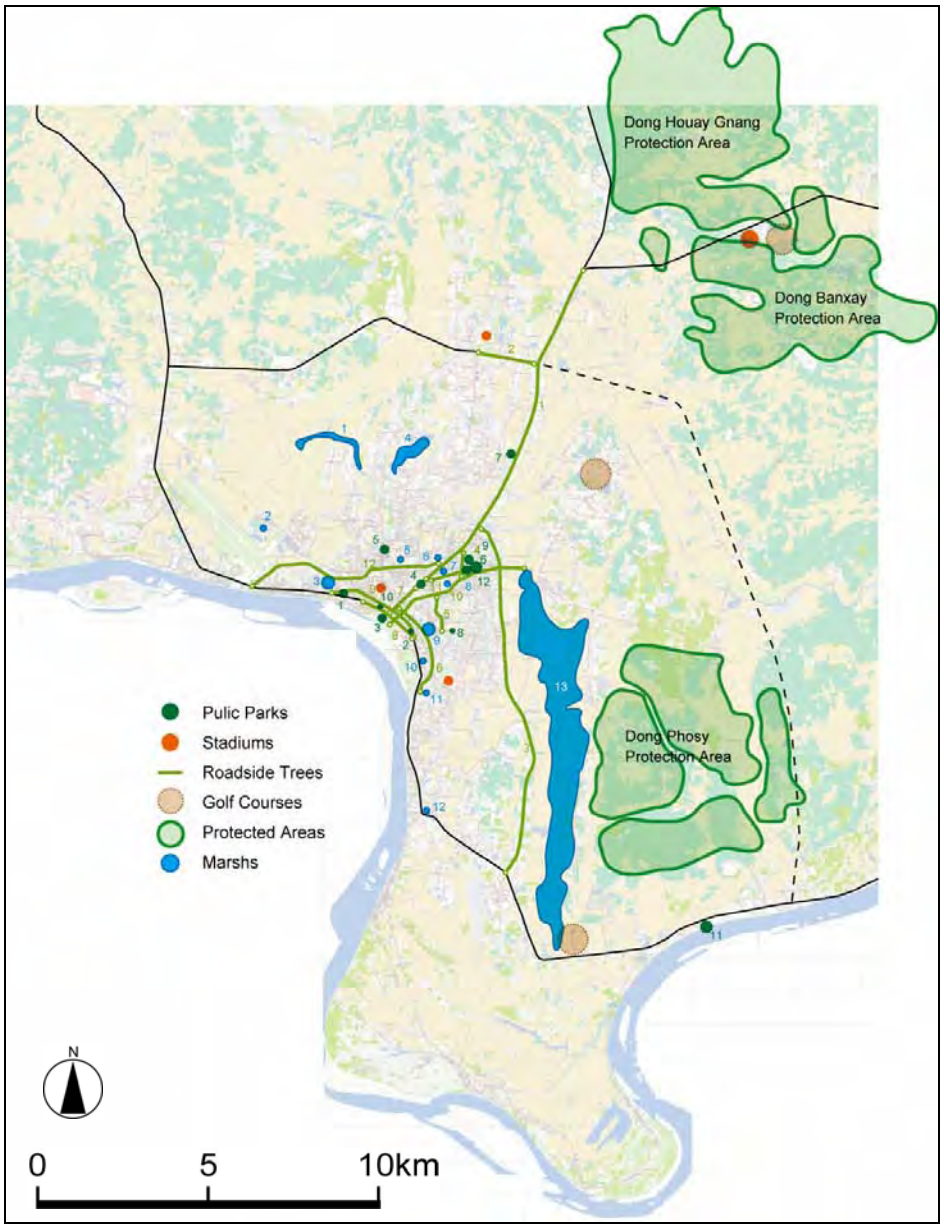
(1) Public Parks

There are only 9 public parks with a total area of 20.6ha. Considering the population of 795,000 in the capital city, the parks area seems to be quite less. If the area of public parks is divided by the population, it gives a parameter of park area per person and for Vientiane Capital, it is quite less with 0.26m^2 of park space per person.



Source: Public Parks Census of Tokyo Metropolitan (2006)

Figure 2.3.9: Park Area per Person in Comparison with Cities around the World



Source: JST

Figure 2.3.10: Locations of Public Parks, Open Spaces and Greenery in Urban Areas of Vientiane Capital

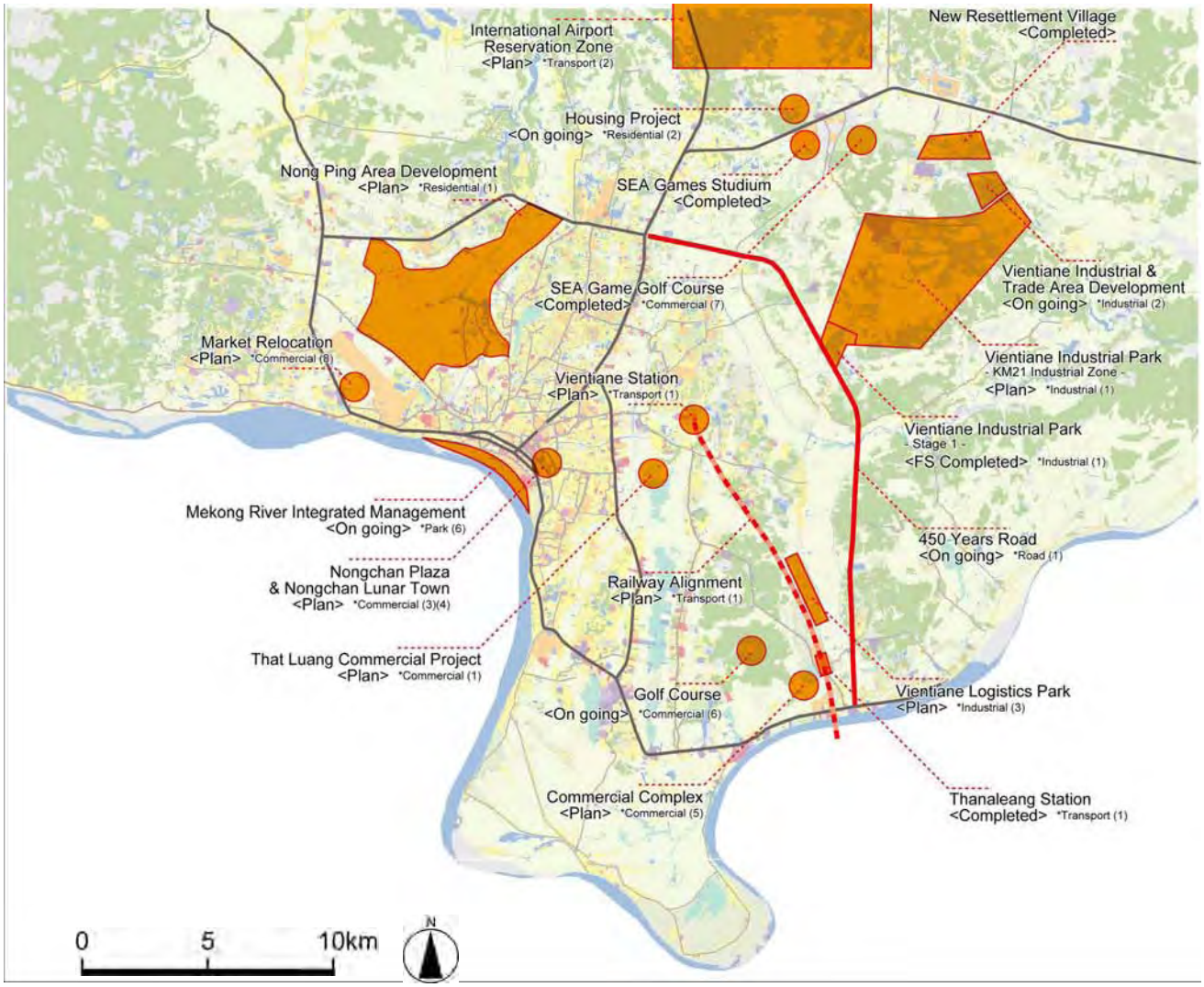
As there is no regulation directly governing the public parks, there is no accurate definition of "public parks" and thus no comprehensive data of public parks are available. For example, VUDAA which is one of major management authorities of public parks has only the data of "Daily Record for Management" which include roadside trees, public park trees, flowers at round about and the mixed data of these.

(2) NE Land Use Zone

NE zone is for nature conservation. There are some special areas such as memorial museum, islands, ponds and natural marshes. In this zone all type of building construction is prohibited except the one which are related to recreation or relaxation activities.

2.4 Relevant Development Project

Relevant Development Projects in Vientiane Capital are as follows;



Source: JST

Figure 2.4.1: Main Relevant Development Projects in Vientiane Capital

Table 2.4.1: 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)	Commertial 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 Yeas Road Connecting Road	-	2009-
Road (3)	SEA Games and Nakhuay 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 Savanakhet 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

2.5 Overview of Constraints and Planning Issues

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

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

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." 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.

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.

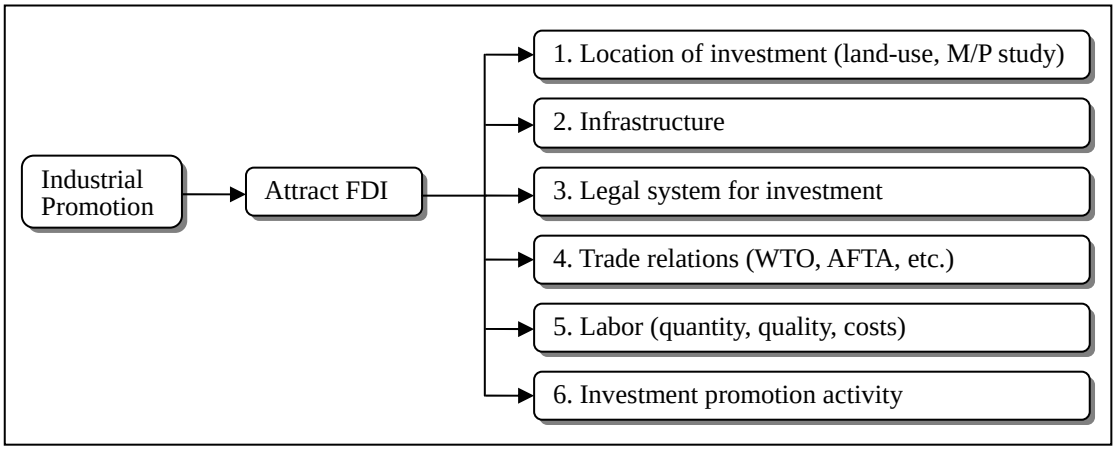
(4) Poor management and use of land resources

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. 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.

Land use 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, FDI is essential for industrial promotion. It is, however, necessary to improve the investment climates for attracting FDI into Vientiane Capital. Figure 2.5.1 shows six issues for improving the investment climates.



Source: JST

Figure 2.5.1: Issues Regarding the Improvement in the Investment Climates

2.5.2 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:

- Provision of more land for the expected increase of population
- Provision of land to promote the manufacturing and service (business) sectors
- Maintenance of agricultural land with higher land productivity (yield)
- Avoidance of over-concentration and keeping the Lao traditional landscape in the suburbs as well as in the central area
- Avoidance of disorderly development in suburban area

(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.

Inner urban is defined as the area enclosed by the Inner ring road and the Mekong River and the inner ring road (Khampenmouang road). 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

Outer Urban refers to the suburbs of Vientiane Capital outside of the Inner Urban. 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

Outskirts refer to the areas outside of the outer urban area of Vientiane Capital. 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