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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DEVELOPMENT STRATEGY INSTITUTE
MINISTRY OF PLANNING AND INVESTMENT
THE SOCIALIST REPUBLIC OF VIETNAM

THE STUDY ON THE HOA LAC AND XUAN MAI AREAS URBAN DEVELOPMENT PROJECT IN THE SOCIALIST REPUBLIC OF VIETNAM PHASE - 1

MASTER PLAN (VOLUME - 3)

MARCH 1999

PACIFIC CONSULTANTS INTERNATIONAL
JAPAN INDUSTRIAL LOCATION CENTER
NIPPON KOEI CO., LTD.

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N I P P O N K O E I C O., L T D.

The following foreign exchange rates are applied on this study report;
US$ 1.00 = VND 13,900
(October 1998)

PREFACE

In response to a request from the Government of the Socialist Republic of Vietnam, the Government of Japan decided to conduct "the Study on the Hoa Lac and Xuan Mai Areas Urban Development Project in the Socialist Republic of Vietnam (Phase-1)" and entrusted the study to the Japan International Cooperation Agency (hereinafter referred JICA).

JICA selected and dispatched a study team headed by Mr. Itaru Mae of Pacific Consultants International and consist of Japan Industrial Location Center and Nippon Koei Co., Ltd. to the Socialist Republic of Vietnam three times between December 1997 and March 1999.

The team held discussions with the officials concerned of the Government of the Socialist Republic of Vietnam and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Socialist Republic of Vietnam for their close cooperation extended to the team.

March 1999
Kimio FUJITA
President
Japan International Cooperation Agency

Mr. Kimio FUJITA
President
Japan International Cooperation Agency
Tokyo, Japan

March 1999

Letter of Transmittal

Dear Mr. Fujita,

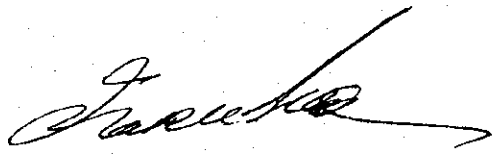
We are pleased to formally submit herewith the final report of "The Study on the Hoa Lac and Xuan Mai Areas Urban Development Project in the Socialist Republic of Vietnam."

This report compiles the results of the Study which was undertaken in the Socialist Republic of Vietnam from December 1997 through March 1999 by the Study Team, organized jointly by Pacific Consultants International, Japan Industrial Location Center, and Nippon Koei Co., Ltd. under the contract with the JICA.

This study is a national project aiming at the establishment of the "New Research and Education Town" in the Hoa Lac and Xuan Mai Area with 500,000 population. The New Town is planned to: 1) become a center of the human resource development, 2) lead the high-tech industry, 3) share urban functions with Hanoi, and 4) absorb increasing population of Hanoi. The economic crisis, which hit many Asian countries, including Vietnam, has forced the economic development of Vietnam to slow down. In order to be flexibly able to respond to such changing situations, this report proposes the phased development plan for every five years. We hope that the report will contribute to the future urban development of the New Town.

Finally, we would like to express our gratitude to all the officials of your agency, the JICA Advisory Committee, the Embassy of Japan in Vietnam, as well as the Ministry of Foreign Affaires. We also would like to send our appreciation to the Development Strategy Institute of Ministry of Planning and Investment, and related Ministries and Agencies for their cooperation with us during the course of the study.

Very truly yours,



Itaru MAE
Team Leader
The Study on the Hoa Lac and Xuan Mai Areas
Urban Development Project
in Vietnam

Foreword

A dire economic situation gripping many Asian countries is now rippling over the other parts of the world including Japan. And while the Study for the Hoa Lac and Xuan Mai Areas Urban Development Project is in progress by the "Japan International Cooperation Agency (JICA)" since its commencement in December 1997, it is even becoming more serious at the turn towards the 21st century.

In effect, the situation can be ascribed to many factors and reasons, but one thing to be learnt from the bitter experience is that the developing world needs to reorient its development path towards a more "endogenous direction". Many Asian countries have adopted to date a development path, which is overly dependent upon foreign capital resources and imported technologies, but without internalizing them properly. The endogenous development path implies to place more emphasis on domestic capital formation, exploitation of domestic market, utilization of domestic resources, human resource development, institutional building, promotion of science and technology, and so on.

The Hoa Lac and Xuan Mai Areas Urban Development is, in fact, responsive to these needs in that it will build a national center in the country for human resource development as well as the promotion of science and technology. The former is to realize the relocation and expansion of the Vietnam National University (VNU), and the latter is to develop the Hoa Lac High-tech Park (HHTP) in the Hoa Lac Area. Taking these principal objectives into consideration, the development is of truly national importance and significance, and hence, it should be regarded and treated as a "national project".

Given the difficult fiscal situation of the Government however, the development will face formidable challenges in light of the massive investment required for its implementation. As a solution to reconcile its necessity as a national project to the tight fiscal situation of the Government, an "Action Plan", which is, in fact, of the initial cost minimizing alternative, was proposed as a consequence of the Study. The Action Plan includes only core facilities of VNU, HHTP, and supporting urban infrastructure at a considerably reduced scale and cost.

As a matter of fact, in the circumstances where the Lang-Hoa Lac Highway linking the Hanoi Central Area and the Hoa Lac Area will be open for use very shortly, the Vietnam side is highly desirous to commence the development as early as possible. Towards this end, the continuous technical and financial assistance of the Japanese Government seems to be mandatory to put the development onto a right implementation track.

It will be more than a happy moment, if the JICA Master Plan can be of substantial help for the initiation of this highly strategic and important project. Also, the effective and efficient cooperation extended over the study period by the Vietnam side to the JICA Study Team is very much appreciated at the occasion of ending the Study.

March 1999, in Tokyo

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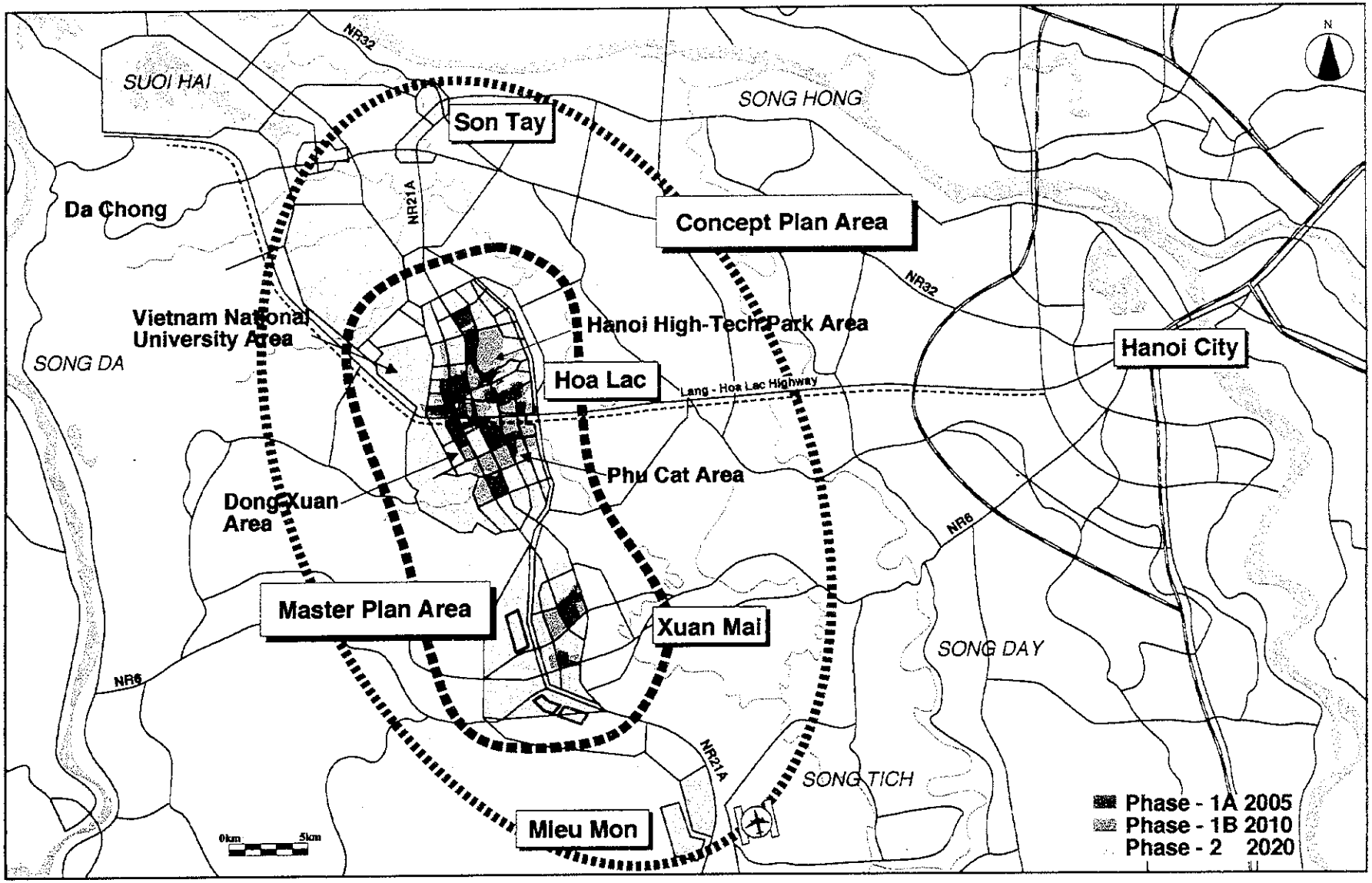

The Study Area

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CHAPTER 6 Infrastructure Development Plan for the Hoa Lac and Xuan Mai Urban Development

List of Abbreviation

A

ACSR ---------- Aluminum Cable Steel Reinforced
AFTA ---------- ASEAN Free Trade Area
AIT ---------- Asian Institute of Technology
ASEAN ---------- Association of Southeast Asia Nations

B

BFT ---------- Bank for Foreign Trade
BOT ---------- Build, Operate and Transfer
BT ---------- Build and Transfer

C

CAA ---------- Civil Aviation Administration
CAD ---------- Computer Added Design
CBD ---------- Central Business District
C-21 ---------- Corridor 21
C-21DA ---------- The Corridor 21 Development Authority
CNC ---------- Computer Numeric Control
COD ---------- Chemical Oxygen Demand
C/P ---------- Concept Plan

D

DA ---------- Development Authority
DSI ---------- Development Strategy Institute

E

EIA ---------- Environmental Impact Assessment
EIRR ---------- Economic Internal Rate of Return

EPZ ---------- Export Processing Zone
E&T ---------- Education and Training
EVN ---------- Electricity of Vietnam

F

FDI ---------- Foreign Direct Investment
Fe ---------- Iron
FIRR ---------- Financial Internal Rate of Return
FOT ---------- Faculty of Technology
F/S ---------- Feasibility Study

G

GDP ---------- Gross Domestic Product
GDPT ---------- General Department of Post and Telecommunications
GOJ ---------- Government of Japan
GOV ---------- Government of the Socialist Republic of Vietnam
GRDP ---------- Gross Regional Domestic Product
GSO ---------- General Statistical Office

H

ha ---------- hectare
HCMC ---------- Ho Chi Minh City
HDF ---------- Housing Development Fund
HHTC ---------- High-Tech Center
HHTP ---------- Hoa Lac High-Tech Park
HHTP-ST ----------HHTP JICA Study Team
HMA ---------- Hanoi Metropolitan Area
HN-PC ---------- Hanoi People's Committee
HRD ---------- Human Resource Development
HSEDP ---------- Ha Tay Socio-Economic Development Plan
HT-PC ---------- Ha Tay People's Committee
HUT ---------- Hanoi University of Technology
HWL ---------- High Water Level

I

IBRD ---------- International Bank for Reconstruction and Development
IDC ---------- Infrastructure Development Company
IP ---------- Industrial Park
ISDN ---------- Integrated Services Digital Network
ISI ----------International Statistical Institute
IT ---------- Information Technology
IZ ---------- Industrial Zone

J

JICA ---------- Japan International Cooperation Agency
J/S ---------- Joint Stock
J/V ---------- Joint Venture

K

kg ---------- kilogram
km ---------- kilometer
kV ---------- kilo-Volt
kVA ---------- kilo-Volt-Ampere
kW ---------- kilo-Watt
kWh ---------- kilo-Watt-hour

L

LAN ---------- Local Area Network
LRT ---------- Light Rail Transit

M

m ---------- meter
MARD ---------- Ministry of Agriculture and Rural Development
MB ---------- Management Board
MCI ---------- Ministry of Culture and Information

m^3/d ---------- Cubic meter per day
MOC ---------- Ministry of Construction
MOET ---------- Ministry of Education and Training
MOFA ---------- Ministry of Foreign Affairs
MOF ---------- Ministry of Finance
MOI ---------- Ministry of Industry
MOLISA ---------- Ministry of Labor, Invalids and Social Affairs
MOSTE ---------- Ministry of Science, Technology and Environment
MOT ---------- Ministry of Transport
M/P ---------- Master Plan
MPI ---------- Ministry of Planning and Investment
MRT ---------- Mass Railway Transit
MU ---------- Manganese
MVA ---------- Mega-Volt-Ampere
MSL ---------- Mean Sea Water Level
MW ---------- Mega-Watt

N

NC ---------- Numeric Control
NCHRT ---------- National Center for High-tech Research and Training
NCST ---------- National Center for Natural Sciences and Technology
NDP ---------- National Development Plan
NHDC ---------- National Housing Development Corporation
NIURP ---------- National Institute of Urban and Rural Planning
NPIP ---------- North Phu Cat High-Tel integrated Industrial Park
NR ---------- National Road
NR21A ---------- National Road 21A
NSC ---------- National Steering Committee
NUDC ---------- New Urban Development Corporation
NUHDC ---------- New Urban Housing Development Corporation

O

ODA ---------- Official Development Assistance
OECD ---------- Organization for Economic Cooperation and Development
OECF ----------Overseas Economic Cooperation Fund, Japan
OJT ---------- On the Job Training
PTA ---------- Provincial Transport Authority

P

PC ---------- People's Committee
PCU ---------- Passenger Car Unit
pH ---------- Potential of Hydrogen
PMB ---------- Project Management Board
P/S ---------- Power Station

R

R&D ---------- Research and Development
RICCC ----------Railway Investment Constructions and Consulting Company
RID ---------- Research Institute of Development
RIST ---------- Research Institute of Science and Technology
RR ----------Ring Road
RRD ---------- Red River Delta
RRD MP ---------- Red River Delta Master Plan
RTMD ---------- Road Transport Managing Department

S

SC ---------- Steering Committee
SEZ ---------- Special Economic Zone
SOE ---------- State-owned Enterprise
SPM ---------- Suspended Particulate Matte
SME ---------- Small- and Medium-Enterprise
S/S ---------- Sub-Station
S&T ---------- Science and Technology

T

TDS ---------- Total Dissolved Solids
TDSI ---------- Transport Development and Strategy Institute
TEDI ---------- Transport Engineering Design Incorporated
TQM ---------- Total Quality Management
TUPWS ---------- Transport and Urban Public Works

U

UDA ---------- Urban Development Area
UNESCO ---------- United Nations Educational, Scientific and Cultural Organization

V

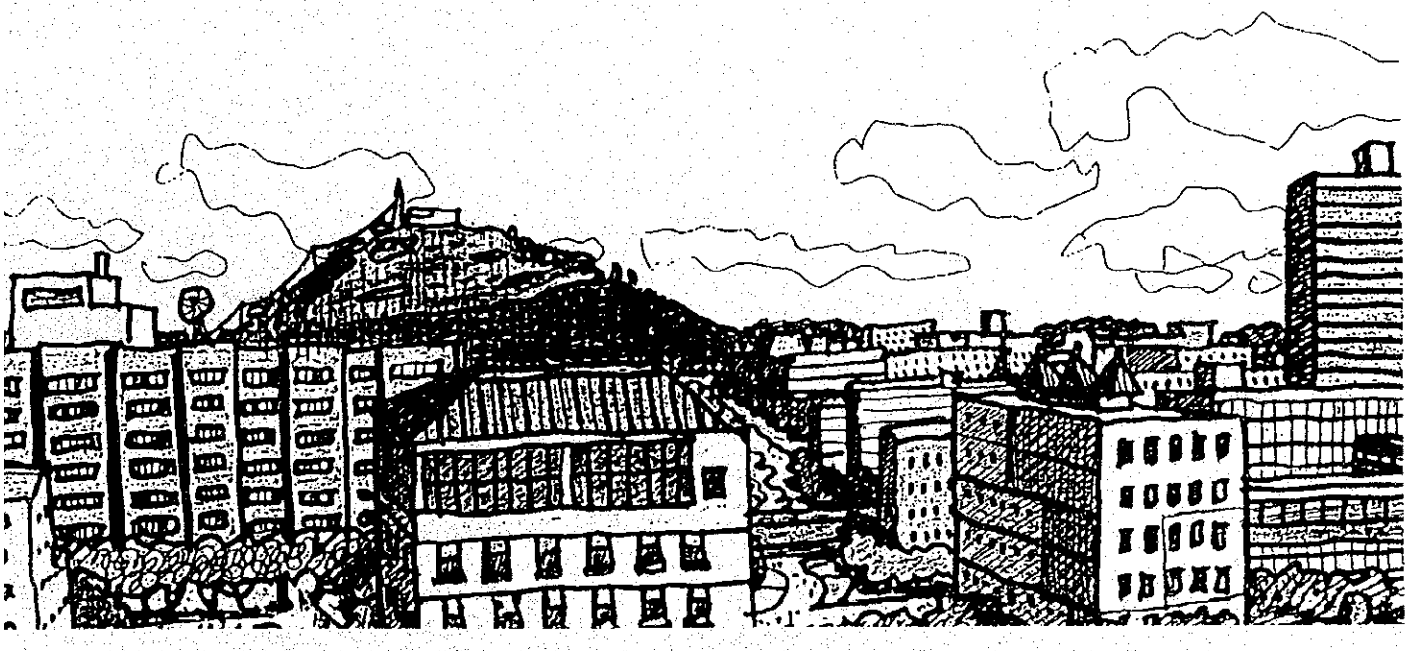
VAT ---------- Value Added Tax
---------- Vinamari Vietnam Maritime Bureau
VN ---------- Vietnam
VND ---------- Vietnamese Dong
VN-M/P&F/S ----------
VNU ---------- Vietnam National University, Hanoi
VRA ---------- Vietnam Road Administration
VRU ---------- Vietnam Railway Union
VTC ---------- Vocational Training Center

W

WHO ---------- World Health Organization

CHAPTER 1

INTRODUCTION
OF
THE MASTER PLAN REPORT



CHAPTER 1 Introduction of the Master Plan Report

1.1 Overall Planning Process for the Study

The objectives of the Study are twofold as described below, having the target year of 2020.

(1) To establish a Concept Plan (hereinafter called **"C/P"**) based on the findings on the existing conditions, development potentials and constraining factors, which ensures the balanced and sustainable development of a counter growth pole[1], having the central functions of absorbing the spill-over population in the future Hanoi Metropolitan Area (HMA), and fostering the human resource development and the development of science and technology in the country; and

(2) To formulate a Master Plan (hereinafter called **"M/P"**) for the Hoa Lac and Xuan Mai areas, which includes the VNU relocation project, HHTP development, and residential area, as well as the Center Area as a core of the entire development.

In establishing the C/P, considerations in the regional context are given to the areas covered by the master plan prepared by MOC, which are Son Tay, Hoa Lac, Xuan Mai, and Mieu Mon, as well as the future Hanoi Metropolitan Area (HMA). The objectives of the C/P is to formulate a development concept for the creation of a targeted "one million new city", which is identified as a proposed counter growth pole for HMA along the National Road 21A (hereinafter called **"NR21A"**). It will be henceforth referred to as the **"Corridor 21"** development. However, the principal objective of the C/P is to establish the development concept, which shall serve as a basis for the development concept for the M/P of the Hoa Lac and Xuan Mai areas (hereinafter called **"the Project"**).

The principal objective of the M/P Study is to formulate a comprehensive development plan by explaining, clarifying and estimating the development background, goals and objectives, needs

[1] Normally, satellite town implies a small city newly developed in the suburban area of a large mother city for the purpose of solving or alleviating its urban problems. In the Study, the proposed counter growth pole is used to imply that a city to be developed to share and absorb an increasing urban population and over-concentrated urban functions in the central Hanoi area, and at the same the time, to strengthen the new national capital functions in Vietnam. Also, it will not be of the "dormitory city" in Japan predominantly having the residential function where majority of residents commute to its mother city for work. Presumably, even after conveniently linked to the central Hanoi area with mass transport systems, it will still be a new city where majority of residents work there, although a considerable number of Hanoi citizens will reside there for its quality living environment as it will become popular as a high quality residential quarter in Hanoi Metropolitan Area.

and targets, framework, land suitability, development cost, operation and maintenance, and so on. Also, the M/P is to promote the creation of the attractive urban environment that should be appreciated by the people living and using the new city.

In the M/P Study however, there is a special condition distinct from ordinary urban development planning, which is the factual situation where the central urban functions such as the VNU relocation project and the Hoa Lac High-Tech Park (HHTP) development, have been already moving towards embarkation with the target operations by the year 2005 and 2003, respectively. This situation implies that those projects are planned to be complete after 5 to 7 years from now, and therefore, **the allowable planning period should be very much limited** if the time required for pre-implementation arrangements are taken into consideration. In other words, it can be said that the M/P Study should not hinder their first phase implementation basically accepting their present progressive status as a *fait accompli.*

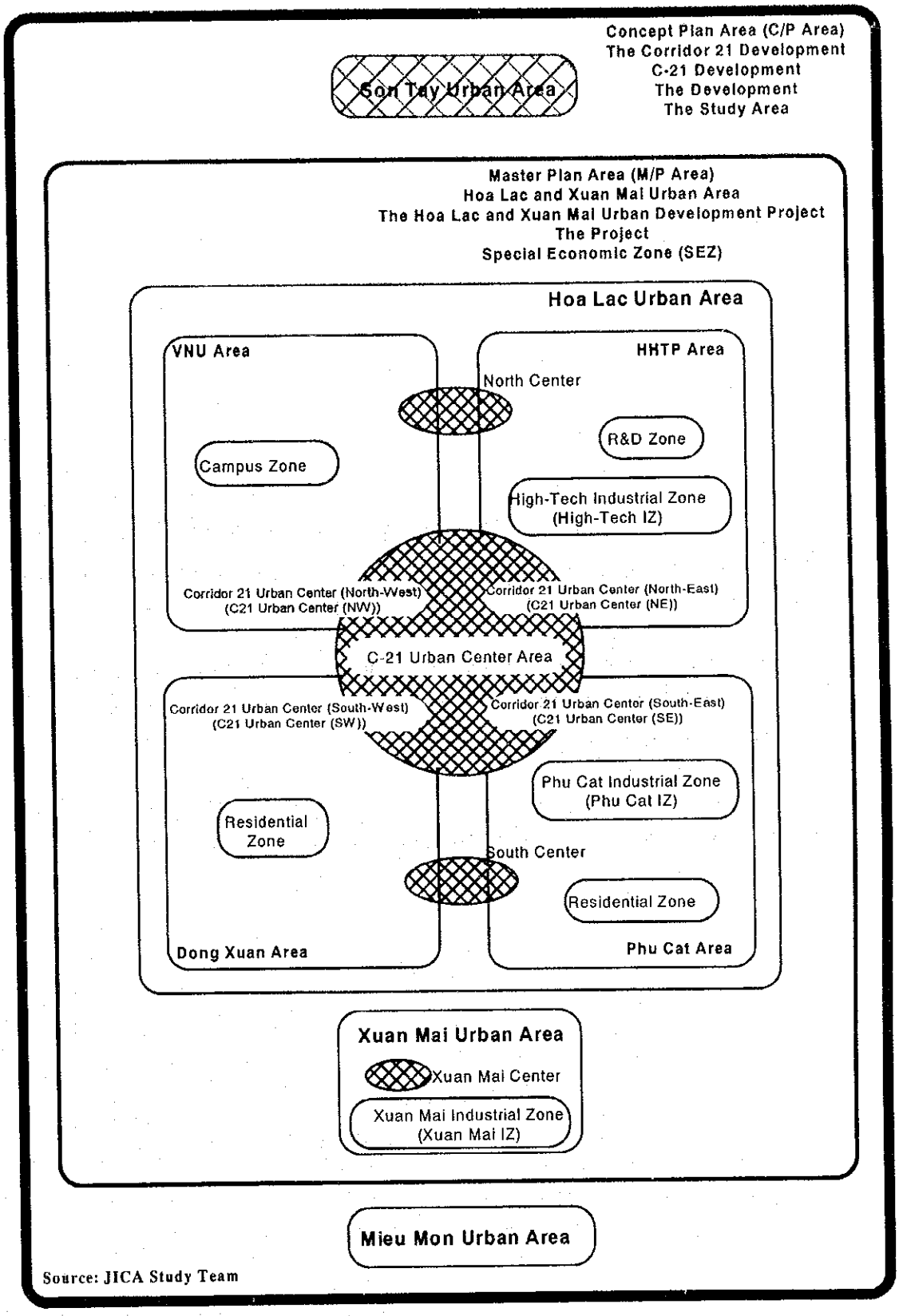
In recognition of the situation, the JICA Study Team formulate the M/P within the limited period, taking full advantage of the master plan prepared by MOC as well as the development plans prepared for the VNU relocation and the HHTP development. It should be noted, however, that the existing development plans should not be blindly incorporated in the M/P but should be carefully reviewed of their rationale, and if necessary, they should be subject to revision or modification.

The M/P for the Hoa Lac and Xuan Mai Urban Development discussed heretofore is the "basic plan" that will serve as the basis for its implementation. As far as national importance and significance remain unchanged, the Project should be implemented as planned, even though it would take a considerable span of time. However, the M/P should be flexible against the surrounding circumstances in terms of its scale, scope, and speed for development. In this context, a strong "head wind" is blowing against the Project, due to the current economic crisis all over the world.

In light of this, considerations were given to an Action Plan, that is in fact a "Cost Minimizing Alternative" of the proposed Phase 1A (2005). The Action Plan is formulated by introducing only highest priority components with minimum supporting infrastructure and facilities, basically in compliance with the basic framework on the M/P.

1.2 Definition of the Area

The definitions of the words of area names and zone names are shown in Figure 1.2.1.



Source: JICA Study Team

Figure 1.2.1 Definition of the Area Names and Zone Names

1.3 Compilation of the JICA Study Report

The JICA Study Report on the Hoa Lac and Xuan Mai Areas Urban Development Project is composed of the following four (4) separate volumes:

Volume 1: Executive Summary
Volume 2: Concept Plan
Volume 3: Master Plan
Volume 4: Appendices

Volume 1: Executive Summary is aimed at providing the essence of Volume 2: Concept Plan and Volume 3: Master Plan, designed to readily understand the results of the JICA Study in its entirety.

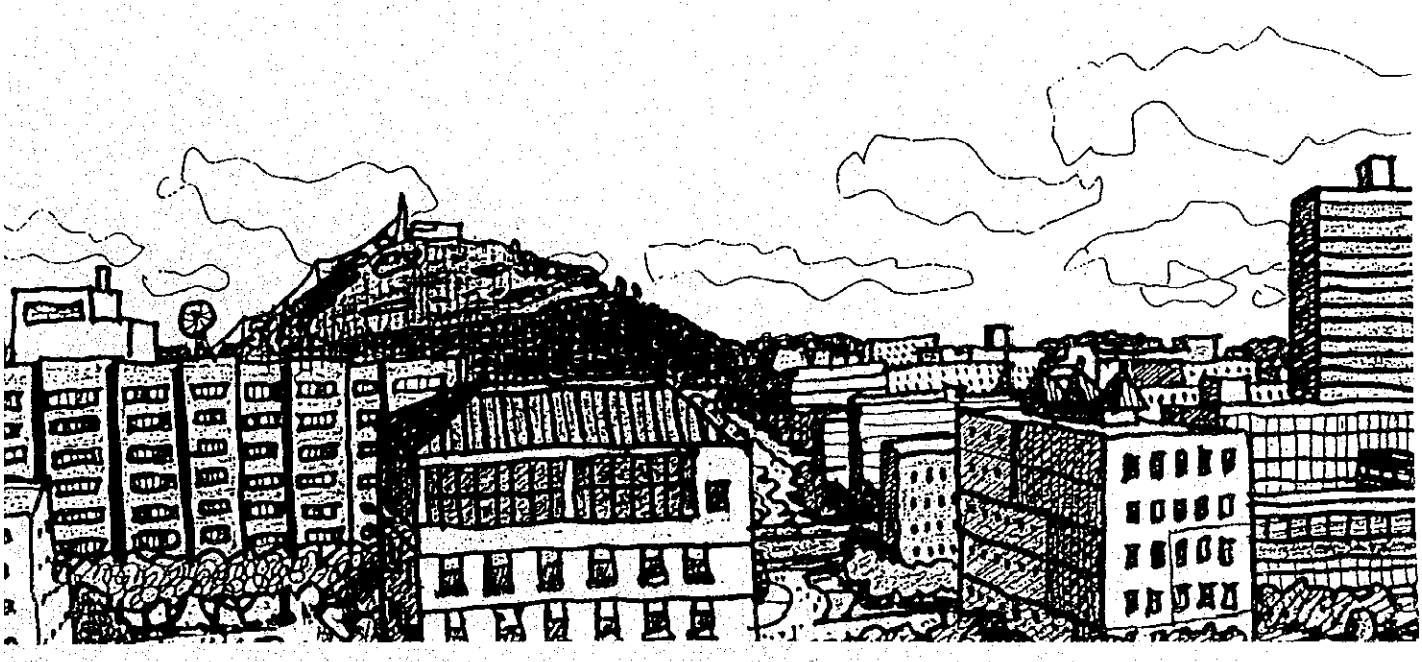
Volume 2: Concept Plan covers the overall view on the development of the Study Area (including the proposed urban areas of Son Tay, Hoa Lac, Xuan Mai, and Mieu Mon) along the NR21A in general. The concept plan particularly covers the development structure of the Hoa Lac and Xuan Mai Urban Development.

Volume 3: Master Plan specifically covers the Hoa Lac and Xuan Mai Urban Development by focusing on the Hoa Lac area, which will assume core functions in the Corridor 21 Development and will be implemented on a priority basis.

Volume 4: Appendices include the information and data pertinent to and in support of the contents covered, but not necessarily to be included, in the C/P and the M/P.

CHAPTER 2

PRESENT CONDITIONS AND LAND SUITABILITY FOR DEVELOPMENT



CHAPTER 2 Present Conditions and Land Suitability for Development

The present conditions and the factors to be addressed in formulating the Master Plan (M/P) in each functional area of the Hoa Lac district is described below. The description is based on the data and information available from the M/P prepared by Ministry of Construction (MOC), the M/P and Feasibility Study (F/S) for Hoa Lac High-Tech Park (HHTP), and the subcontracted surveys carried out by the JICA Study Team. The land use areas were worked out by using the land use map of 1:50,000 scale prepared by the subcontracted survey, but the results are considerably different from those indicated in the MOC M/P. This needs to be carefully examined in formulating the subsequent M/P.

2.1 General Conditions of the Project Area

2.1.1 Topographic Conditions

The topographic feature of the M/P Area is generally classified to flat or gentry sloped area from the west to east. The part of the eastern areas are composed of the low flat plain with altitudes lower than the mean sea level 10 m (MSL 10 m), along rivers and small hilly areas with less than 50 m altitude.

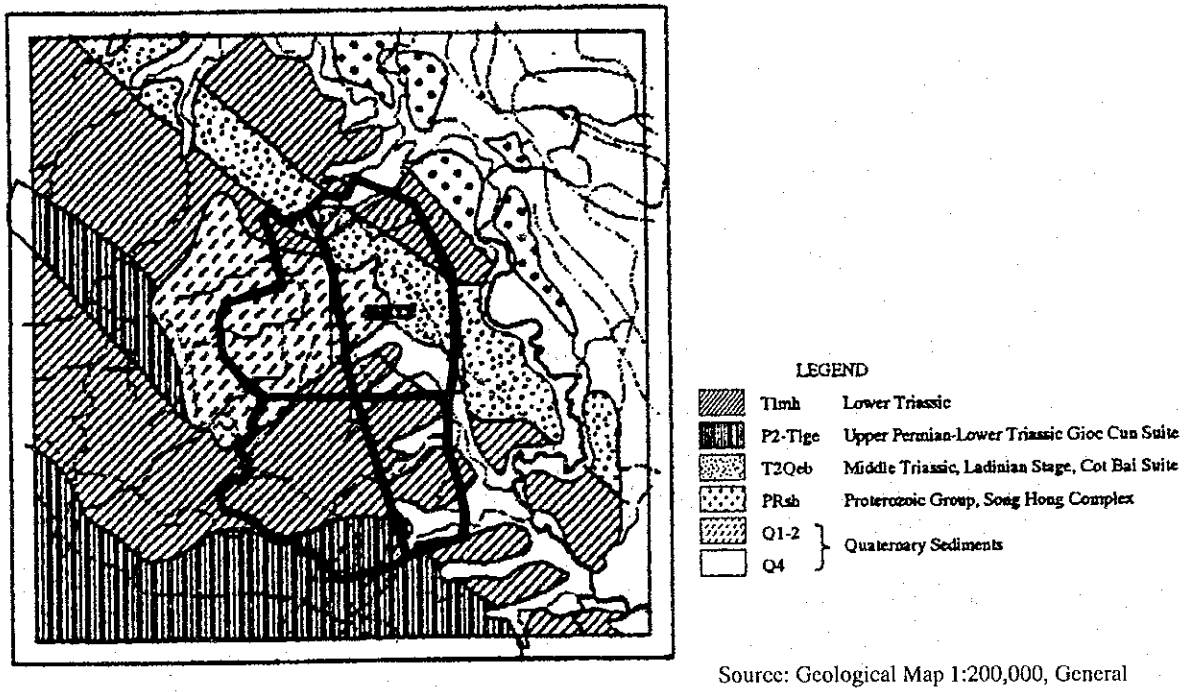
From the urban development planning view points, development potentials for the lowland area (lower than MSL=10 m, which is the counted high water level of the past inundation on Tich River) should be carefully assessed to avoid the inundation at floods in and outside the M/P Area. According to the MOC Master Plan, it is required to avail the land having more than 12.5 m (MSL) in the east of NR21A and more than 14.0m in the west of NR21A. From the aspect of avoiding floods, the development of low land that requires massive earthwork should be avoided. Especially, there are many pieces of low land lying in the east of NR21A along the small rivers and canals, thus constraining the development in this context.

2.1.2 Geological Conditions

The geological conditions of the project area are classified as shown in Figure 2.1.1.

Mountainous and hilly areas are composed of conglomerates and sandstone (triassac) and plain and riverside lowland are composed of alluvial soils, and all the plain, riverside and hilly areas

are deposited with silty clay. According to the MOC master plan, the bearing capacity of foundation soils has more than 1 kg/sq.cm[1] except for the low swampy area.



Source: Geological Map 1:200,000, General Department of Geology

Figure 2.1.1 Classification of Geology

Clayey soils cause difficulties for construction under rains due to liquidation problems, thus limiting the timing for construction. Clayey soils may also cause consolidated settlement by carrying continual loads such as earth cover due to the phenomenon of losing its water contents over a span of time. In the light of this, the area for development should be selected so as to minimize the earthwork, and quality assurance for construction should be conducted.

Mountainous areas, although there a few in the M/P Area, are composed of rocky foundation strata, and in the light of difficulties for earthwork and construction economy, such areas should also be minimized for development. The M/P Area is classified as the Grade 8 seismic zone subject to possible occurrence of earthquake. Also, there runs a geological dislocation line along the Tich River. The data for the size and characteristics are not available at present but to be examined further as and when necessary.

[1] The Japanese standards specify that medium-rise apartment housing made of concrete can be built without piles on the foundation stratum having more than 2kg/sq.cm.

2.1.3 Conditions of Rivers and Canals

The M/P Area is a part of the Tich River Basin. Many small rivers and canals across the M/P Area from the west to east are tributaries of Tich River. In the area, many reservoirs and ponds are developed to preserve a water resource for irrigation (such as Tan Xa Lake). The present water resources in the area should be considered to preserve the quality and quantity for the irrigation. Also, the present waterfronts of the rivers, canals, lakes and reservoirs create the very precious landscape for attractive urban space, and as such, it should be maintained in so far as practical. Almost of the rivers across the area has not been improved a river and shore protection work, which cause flooding on the surrounding lowland areas in the rainy seasons. Therefore, the drainage and flood control measures on a urban development should be given to protect the disaster, and the cost incurred for the purpose should be taken into account.

2.1.4 Conditions of Fauna and Flora

The vegetation in the M/P Area are typically composed of rice paddy, vegetable and tea fields, bamboo and grass lands, reforested land such as eucalyptus, and so on. The flora in the area is almost the secondary and the natural forest cannot be identified, and therefore, it is classified as the area of least degree of natural flora. As to the fauna, it is reported that there are some habitats of rare species over the Tan Xa Lake area and the mountainous areas in Dong Xuan, thus due care should be given to the preservation thereof.

2.1.5 Land Use Conditions

Rice production is the major agricultural industry in the Red River Delta area, and hence, the agricultural land use change should be avoided as much as possible. However, the fertile top soil in the M/P Area is not sick compared to the other Red River Delta Plain, thus the rice paddy fields in the area are limited on the part of the low flat land along rivers without irrigation system. Small towns and new agricultural settlements are located in the area. In order to minimize the negative social impact and land acquisition cost for the relocation of the present settlement, existing towns and major settlements could be proposed to remain and improve in principle. The future land use direction of some special use areas, where are identified on the MOC Master Plan, are incorporated in the land use planning.

In the Xuan Mai Area, the present urbanized and village areas share 18% of the area which are scattering over the vast area, so that when considering new urban development, they should be well integrated in the existing urbanized areas.

2.2 Present Conditions of the Hoa Lac Area

2.2.1 Hoa Lac – 1 : VNU Area: 1,910 ha

The area is located west of NR21A and north of the Lang-Hoa Lac Highway. The area have been designated and planned to develop for the Vietnam National University of Hanoi (VNU) and some international universities by the MOC master plan. On the surrounding, areas adjacent to the north perimeter is the Hoa Lac Airport, and in the further north is the Dong Mo Lake area which is planned to develop for cultural and recreational activities area in MHA.

The area is generally a low hilly area with 25-30 m (MSL) except for the two hilly areas which are the area on the western edge and the area near the intersection of the NR21A and the Lang-Hoa Lac Highway (Nui Muc Hill). Those two hills are presenting the landmark for identity of the Hoa Lac Area. The geological dislocation across the area from the northwest to southeast direction.

The one of major tributary of Tich River flow in the southwest to northeast direction down to the Binh Yen area. Except for the low plain of less than the 10 m (MSL) in the north, most of the area is flat plain of more than 10 m (MSL), which is the one of major urban development potential area in the Hoa Lac. The paddy fields and settlement areas are limited in the area.

The 46.5 % of land are currently used for upland crop fields, and the other for eucalyptus forests in the hilly area of 15-20 m (MSL) mostly located in the north and west of the area. There is a border between Ha Tay Province and Hoa Binh Province in the west, and the area between the border and NR21A are used for Special Use Areas (Defense Force).

The future development directions for each Special Use Area were planned to urbanize on the coordination with related government agencies on the MOC master plan. For the designated VNU relocation area, the major part of the Special Use Areas has been planned gradually relocate to the Xuan Mai Area.

2.2.2 Hoa Lac - 2 : HHTP Area: 2,630 ha

This area is located the east of the NR21A and the north of the Lang-Hoa Lac Highway. According to the MOC master plan, HHTP is located in the center to southern part and the Binh Yen residential area is located in the north. The overall terrain condition is gently sloping to

the east towards the Tich River with the change in 20-25 m (MSL). However, there are narrow valleys in place with 5-10 m (MSL), which presents a rather complicated terrain condition.

The geology of the area is generally composed of conglomerates and sandstone and riverside lowland are composed of alluvial soils. According to the boring survey conducted by the Study Team, there is a silty clayey deposits with 10-20 m thick over the foundation stratum in the hilly areas of 0-6 m (MSL), and similarly silty clayey deposits of 15-30 m thick in the valley areas of -8 to -14 m (MSL).

Also, in the area and the area of Phu Cat, there are 3-4 geological dislocations running in the northwest to southeast direction, and a major formation line is running along the Tich River. These need to be examined further as and when it becomes necessary.

There is a large-scale reservoir in the central area named the Tan Xa Lake with its water surface of 167ha, reserved quantity of 3 million tones, and service area of 3,600 ha, which is divided into northern and southern parts. This Tan Xa Lake area should be preserved from the aspects of secure an irrigation water resources, aquatic fauna and ecological system, as well as beautiful landscape. There are two major rivers in the area tributary of the Tich river, i.e. the Song Linh So river flowing in the north with 50 m width and the other river flowing in the south with 10 m width, both sides of which are low swampy areas unsuitable for development.

As to the existing land use, there is a special characteristic of the area that the paddy and village areas account for higher percentages as compared to the other areas, particularly the paddy area is lying over the low flat plain of less than 10 m (MSL) in the north. Whereas, in the south are the fields of upland crops except for paddies in confined areas in the hilly terrain. Besides the paddy and fields areas, eucalyptus forests cover the area. The paddy accounts for 36 % or 940 ha, and crop fields account for 42 % or 1,110 ha.

The village settlement areas account for 15.6 % or 410 ha. The large-scale villages are of about 15 ha with about 100 households and 500 population, and small-scale villages are of about 0.5 ha with 3 households and 15 population. Those villages are concentrated over three areas, i.e. northwest area along NR21A, central area, and the eastern edge along the perimeter of the area.

There is a residential area for the farmers working in the Long Phu Tea Farm along NR21A, and the area is the center of Hoa Lac, Long Phu having a fairly high density. In the residential area along the eastern edge is resided by the farmers and families of Military Forces, and therefore, the proposed development needs to deliberately exclude the area.

2.2.3 Hoa Lac - 3 : Dong Xuan Area : 2,640 ha

The area is located west of NR21A and south of the Lang-Hoa Lac Highway. According to the MOC master plan, this area is characterized as the major residential area in the whole development in Hoa Lac. There is a border between Ha Tay Province and Hoa Binh Province, and the eastern half belongs to Ha Tay province and the western half belongs to Hoa Binh Province. There are ups and downs in the area mostly with more than 20 m (MSL), including confined low swampy areas in place.

According to the MOC survey (Selection of Construction Location and Orientation for the Planning of Housing Area for the Hanoi National University staff in Dong Xuan - Thach That District - Ha Tay Province, 1997), the soils and geological conditions of the area are divided into 4 types as follows:

(a) New sediments and slope sediments: located in every hill and mountain, composed of mainly stones and some laterite. R>3 kg/sq.cm.

(b) Slope sediments: gravel, clay mixed with sand, located at hill slopes and low hills.

(c) Marsh sediments: located at marches, ponds, streams, and lakes, composed of mainly coal, mud mixed with clay, black-gray clay. R>1kg/sq.cm.

(d) Delta sediments (in the east, near the Tich River), composed of sediments, sand, stones, gravel mixed with clay. R> 1 kg/sq.cm.

The Mt. Ba Vi and Vien Nam locate on the east and outside the M/P Area. The western edges of the area locate on the foot of Mt. Vien Nam. Mt. Vien Nam is covered by the primary and secondary forests of evergreen broadleaf trees from the halfway up the top. The area is designated to the nature conservation area, and the forests on the foot area have the retaining function of the water resources. The MOC master plan excludes the proposal for the natural environment conservation and preservation.

Over the western part of the area, rich natural resources on the adjacent to Mt. Vien Nam, Mt. Dong Cham and Mt. Doi Dun of about 200 m (MSL) covered with shrub forests should be assessed carefully. As well as the habitats of rare fauna such as insects and amphibian should be also assessed from the view point of conservation of the eco-system. The geological condition of the area is composed of rocky strata, which leads to the cost for earthwork and thus unsuitable for development. These two mountainous areas are proposed as the conservation

areas and the area lying between the mountainous area and NR21A could be identified as the suitable area for urban development.

The three tributaries of Tich River across the area, of which the one flows from the north-west to the north through the VNU area, and the other two flow respectively from the center and the south to the eastern area.

The paddy fields and settlements areas are sharing the large area in the south, and in the north (near the intersection of NR21A and the Lang-Hoa Lac Highway). The forests of eucalyptus and acacia could be identified as the suitable area for urban development.

2.2.4 Hoa Lac - 4 : Phu Cat Area : 1,330 ha

The area is located east of the NR21A and south of the Lang-Hoa Lac Highway. The area is planned to develop a large-scale Phu Cat Industrial Park by Ha Tay Province.

There are three tributaries flowing from the east to the west to join the Tich River, along which are the low flat plains with less than 10 m (MSL). The area is the lowest area in Hoa Lac including more than a half of the low land with less than 10 m (MSL). The highest part of the area is of the 40 m (MSL), and the general terrain condition is less ups and downs like the area of HHTP.

The relatively large villages are located in the central and the eastern area such as Phu Cat and Gia Cat. The other existing small and scattered settlements locate along NR21A. The total village and settlement areas account for 13% of the area or 170 ha. Due to the existing villages, the available land for development is generally divided into the north and the south. The northern part of the area is composed of the mixed paddy and crop fields mostly with less than 19 m (MSL). The urban development in the area will require the earthwork with borrowed materials. The finger-shaped valley locate in the eastern part of the area. The area between the valley is used for the productive forests of eucalyptus and acacia, which could be identified as the suitable development areas.

Table 2.2.1 Existing Land Use by 4 Areas in Hoa Lac

	Category	HHTP Area		VNU Area		Dong Xuan Area		Phu Cat Area		Total	
		ha	%	ha	%	ha	%	Ha	%	ha	%
1	Agricultural Land Paddy Field	940	35.7	280	14.7	260	9.9	140	10.5	1,620	19.0
2	Upland Crops field	1,110	42.2	890	46.5	1,010	38.3	650	48.9	3,660	43.0
3	Long Term Crops/ Tea Gardens			80	4.2					80	0.9
6	Productive Forest of Eucalyptus, Acacia			380	20.0	230	8.7	330	24.8	940	11.0
7	Residential Area Special Use	410	15.6	40	2.1	200	7.6	170	12.8	820	9.6
8	Vacant Used Land Scrub Land					500	18.9			500	5.9
9	Grass, Other land			230	12.0	400	15.1	20	1.5	650	7.6
10	Water Surface Lake, Pond, Stream	160	6.1			30	1.1	10	0.8	200	2.4
11	Regional Road	10	0.4	10	0.5	10	0.4	10	0.8	40	0.5
	Total	2,630	100.0	1,910	100.0	2,640	100.0	1,330	100.0	8,510	100.0

Source: The existing land use measured on the JICA land use survey map within the MOC Master Plan Area.

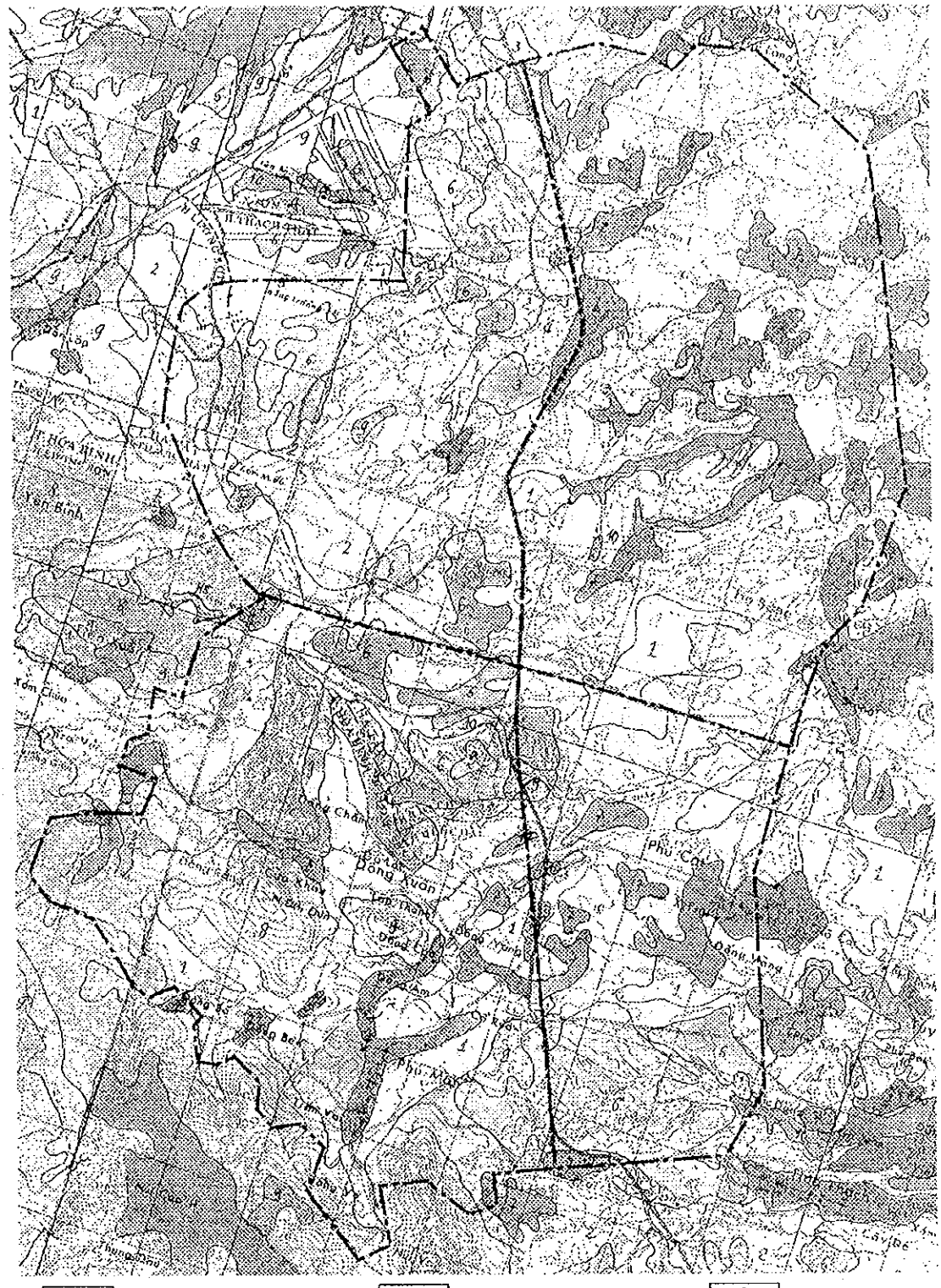


Figure 2.2.1 Existing Land Use Map of Hoa Lac

2.2.5 Present Conditions of the Xuan Mai Area

The Xuan Mai area is located on the node of the major regional roads of NR21A and NR6, where has the functions as regional center for goods distribution, manufacturing industry and the national defense as well.

The area has been developed centering around the Xuan Mai town and Thuy Tien Commune, and the area along the two national highways are mostly urbanized, with 54,000 population and 18 % of the total area or 560 ha. The institutes and facilities of the Special Use (Defense Force) locate on the surrounds of urbanized area. The University of Forestry, Provincial College of Pedagogy, Agricultural College and Fine Art Professional School locate on the middle to northern part of the area. Those facilities compose the one of higher education center for Ha Tay Province.

The Bui River flows in the south of NR6 from west to east and inflow to the Tich River. On the area along the Bui river and the eastern area of NR21A are low flat plains with 5-15 m (MSL), consisting largely paddy fields, crop fields, water reservoirs, and villages, which would be the negative factors for the land suitability and availability for urban development.

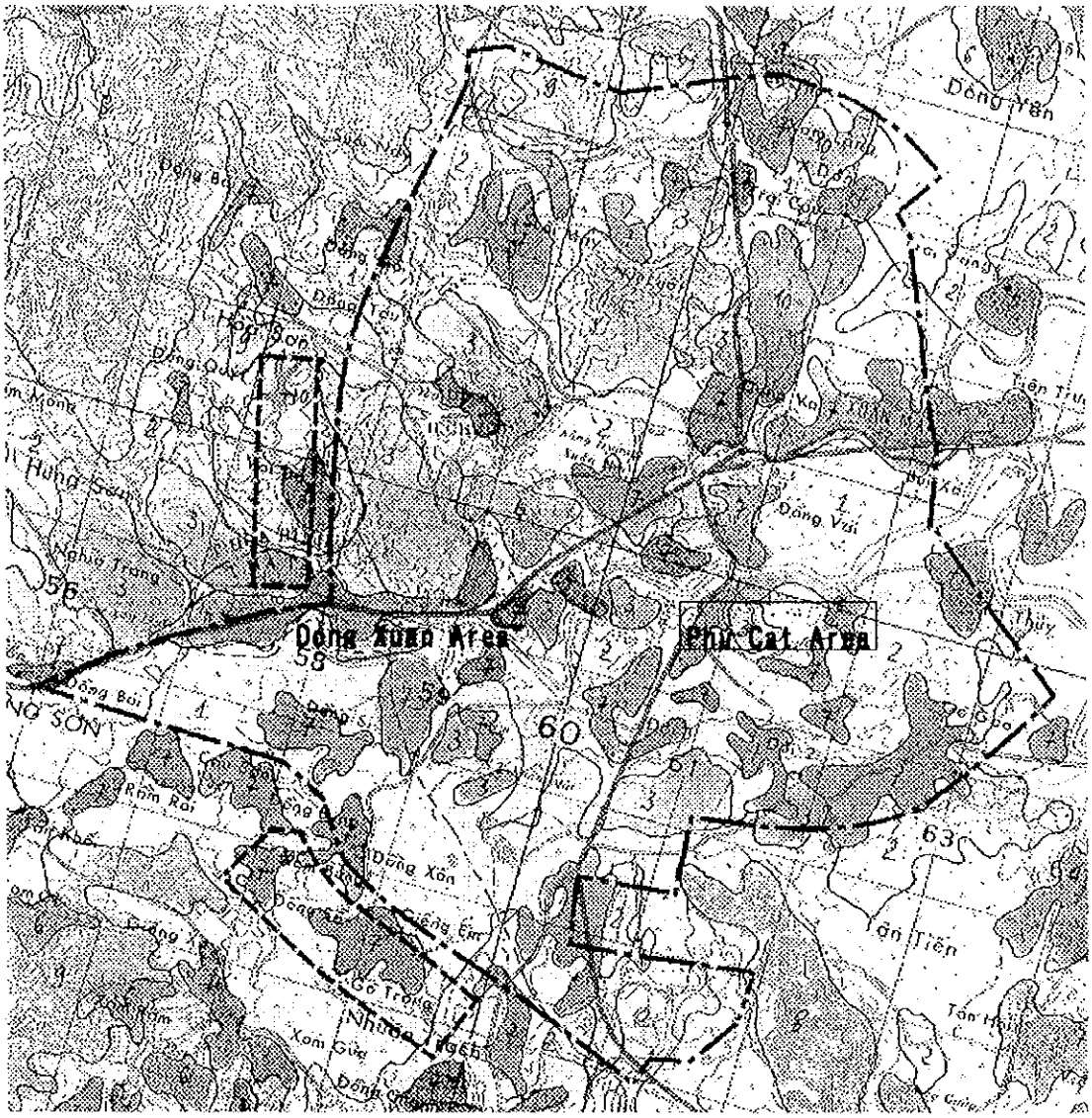
In the contrast, the area north of NR6 and west of NR21A is composed of the tea fields and production forests on the gentle hilly area, which would be the suitable land for development. The development of the Xuan Mai area needs to adopt the method of land readjustments for improvement of road and infrastructure on the existing village settlement areas and urbanized areas and their expansion.

The Existing Land Use Condition in Xuan Mai is as follows,

Table 2.2.2 Existing Land Use in Xuan Mai

Ref.	Category	Area (ha)	Ratio (%)
1	Agricultural Land, Paddy Field	710	22.8
2	Upland Crops Field	1,170	37.7
3	Long Term Crops, Tea Garden	320	10.3
6	Production Forest of Eucalyptus, Acacia	150	4.8
7	Residential and Specialized Use Area	560	18.0
9	Grass, Other Land	50	1.6
10	Water Surface (Reservoir, Pond, Stream, etc.)	110	3.5
11	Regional Road	40	1.3
	Total	3,110	100.0

Source: The existing land use measured on the JICA land use survey map within the MOC Master Plan Area.



1	Agricultural Land, Paddy Field	5	Bamboo Plantation	8	Vacant Used Land, Scrub Land
2	Upland Crop Field	6	Production Forest of Eucalyptus, Acacia	9	Grass, Other Land
3	Long Term Crops Tea Gardens	7	Residential Area Special Use	10	Water Surface Lake, Pond, Stream
4	Forest			— · —	MOC M/P Area

Figure 2.2.2 Existing Land Use Map of Xuan Mai

2.3 Present Conditions of the Hoa Lac Area

2.3.1 Classification of Land Suitability

Based on the findings of the present conditions of the Hoa Lac and Xuan Mai Areas, the land suitability of the area for the urban development is assessed by the Study Team.

The findings of land suitability analysis for the urban development are as per the MOC Master Plan. However, attempts are made by the Study Team to review the land suitability so that the results are incorporated in the study to ensure the development of a safe, convenient, and comfortable new city in harmony with the natural and social conditions of the M/P Area. The following are the classification of the land suitability taking into consideration the natural conditions such as terrain, geology, vegetation, rivers and other water surface, and so on, as well as the social conditions such as the settlements and production activities in the area.

(1) Suitable Land

The land on flat plains or gentle slopes in hilly areas free from floods (above 10m-MSL) in the rainy season, preferably low productive land use such as vacant use and production forests, upland crop fields, and underused for paddy.

(2) Conditionally Suitable Land

The present green areas such as the secondary forests and riverside areas should be excluded from major urban development, but they should be well organized to create a rich urban landscape. The paddy fields in the M/P Area could be generally classified as the conditionally suitable or unsuitable area for development. Since the rice production is the important industry in the country, while the paddy fields in the area are classified to low productive field compared to others in RRD. Those paddy fields could generally be flood mitigation plain and regulating reservoir functions to avoid inundation on the downstream, which may caused by the drastic increase of rainwater run-off from major urban development areas. The paddy field areas are also proposed to utilize as the appropriate urban open space and recreational area without major urban facilities. The limited part of the area can be developed with the condition of reclamation and/or subsoil improvement.

(3) Unsuitable Land

The unsuitable land is composed of the land as follows,

1) Cultural and Historical Heritage

The area with cultural and historical monuments and heritage should be conserved by the assessment of their importance along with conservation measures.

2) High Mountains and Steep Slopes

The steep slope areas with or without important natural resources should be basically conserved (high mountains do not exist in the M/P Area).

3) Water Surface (lakes, ponds, and rivers)

These should be basically conserved or preserved as their functions of flood mitigation and irrigation water resources. Rain water flows from the western mountains to the eastern Tich River through the M/P Area, and therefore, the riverbed and banks should be maintained with appropriate improvement. Also, these should be utilized to upgrade the urban landscape of the M/P Area.

4) Major Urban and Village Settlement Land

The existing urbanized areas and towns as well as concentrated settlement areas are principally proposed to maintain along with infrastructure improvement. However, some part of the areas, which are small and spotted village settlements, are identified to redevelop as urban area depending upon the future development direction and land use orientation.

5) Others

According to the MOC master plan, part of the identified Special Use Areas are proposed for urban development by the master plan. The JICA M/P Study follows the MOC M/P regarding the land availability for C21 Development related to the Special Use Area, which are assessed to remain as they are or relocate to other areas such as Xuan Mai. It might be the key factor for the land availability to collect the pertinent information to incorporate in the subsequent study.

2.3.2 Suitable Land for Development

The land classified as "suitable" accounts for about 46 % or 3,910 ha out of the total area of 8,510 ha in Hoa Lac and 67.2 % or 2,090 ha out of the total area of 3,110 ha in Xuan Mai. As

to the four areas divided by the Lang-Hoa Lac Highway and NR21A, the location of suitable land for urban development in the M/P Area are as follows:

(1) VNU Area

The suitable land accounts for 50.3% or 960ha out of the total area of 1,910ha. A part from the area, there exist the conditionally suitable area of 380 ha, and if the area is added, the development area becomes 1,340ha, which accounts for 70.2 %. This implies that the VNU Area has relatively bigger share for urban development compared to the other areas.

(2) HHTP and Binh Yen Area

The suitable land accounts for 41.8 % or 1,100 ha out of the total area of 2,630 ha. HHTP plans to use its first phase development in the suitable land, but the northern residential area in Binh Yen are planned on the paddy fields and major village settlement classified as the conditionally suitable land.

(3) Dong Xuan Area

The suitable land accounts for 47% or 1,240ha out of the total area of 2,640ha. However, the suitable area in the Dong Xuan is separated by the hills, of around 100-m height (MSL). If the suitable area between the two hills, near the Lang Hoa Lac Highway is to be a nature conservation area, the suitable land accounts for 33.3 % or 880ha.

(4) Phu Cat Area

The suitable land accounts for 51.9 % or 690 ha out of the total area of 1,330 ha. The northern part of the area can be agglomerated for the development. However, the central part of the area is mainly used for paddy fields and settlements, thus limiting the development. In the southern area, the up-land and long term crop fields and settlements spreads over the wide area, thus necessitating to consider the harmonious development thereof.

(5) Xuan Mai

The suitable land accounts for 67.2% or 2,090ha out of the total area of 3,110ha. The spotted agricultural lands with settlements encroach the identified massive suitable land in the northwestern part of the area. Therefore, the new urban development needs to be planned to integrate with the existing villages and urban settlement so that a balanced and harmonized development should be ensured. Also, in the southern part of the intersection

of the NR 6 and the NR21A are many Special Use Areas and their facilities, which would be readjusted from the view points of the more proper location for those functions in the long term. The location of suitable land of the Xuan Mai area is shown as follows:

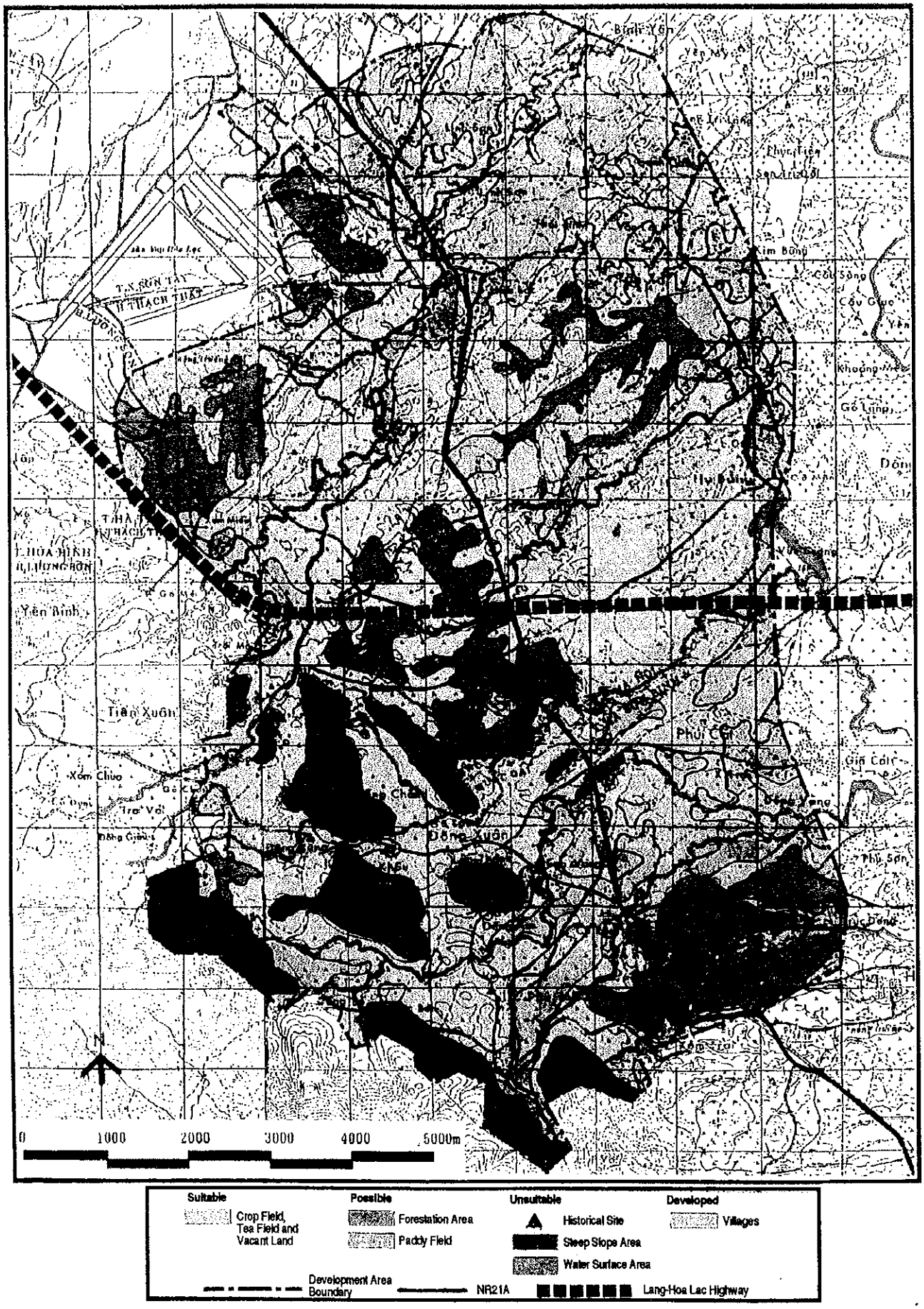


Figure 2.3.1 Land Suitability : Hoa Lac Urban Area

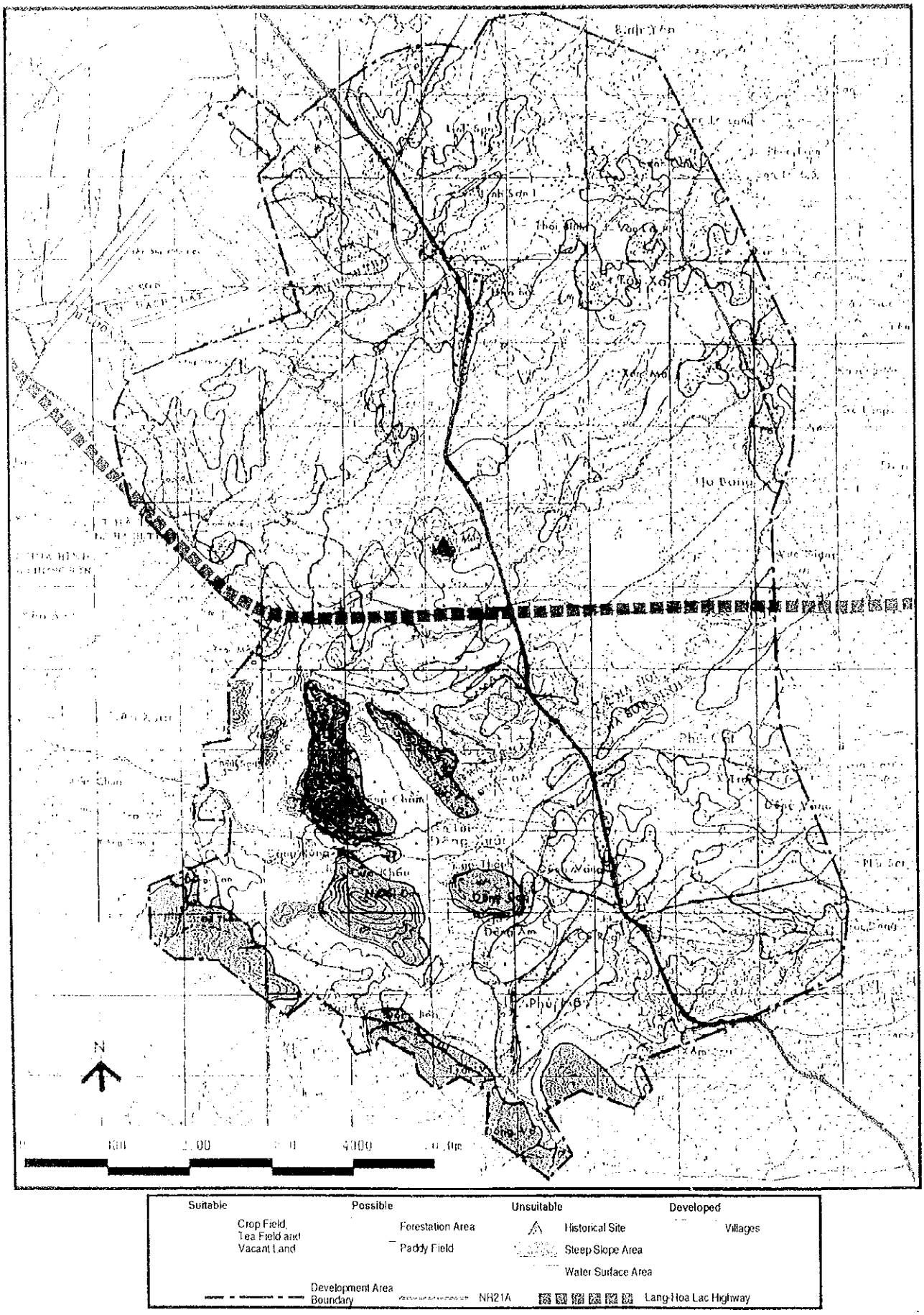


Figure 2.3.1 Land Suitability : Hoa Lac Urban Area

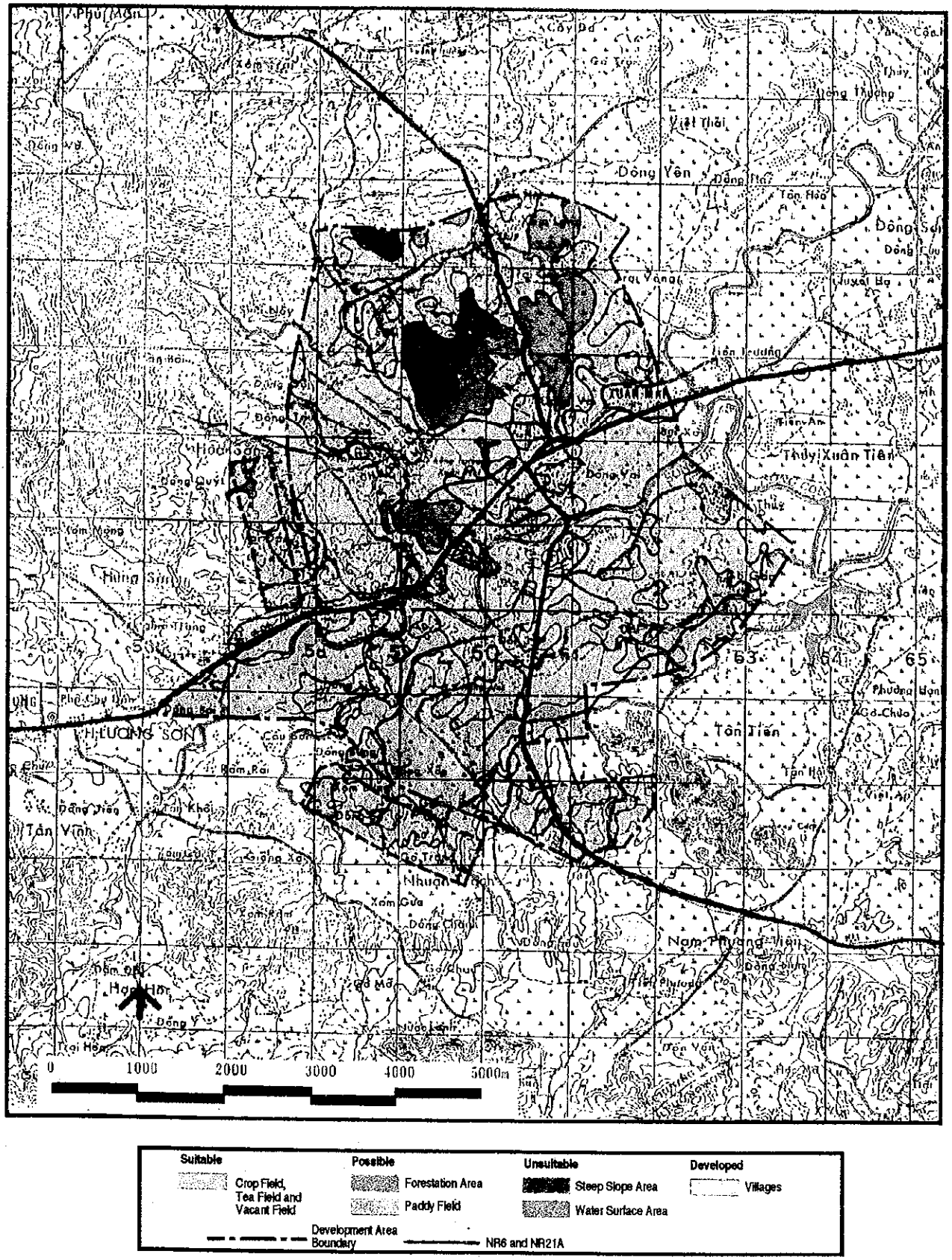


Figure 2.3.2 Land Suitability : Xuan Mai Urban Area

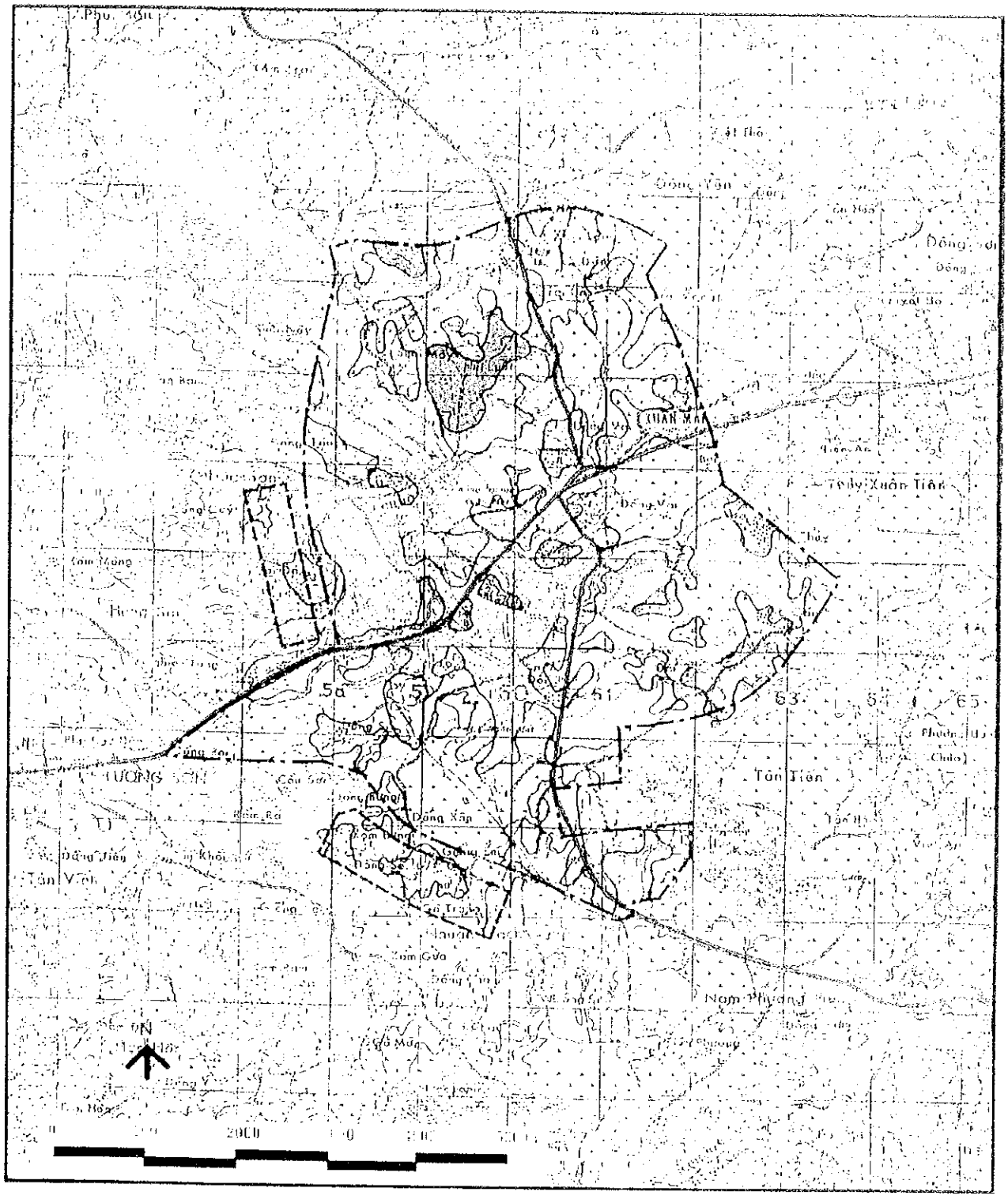


Figure 2.3.2 Land Suitability : Xuan Mai Urban Area