

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

VIETNAM RAILWAYS (VR)

**STUDY FOR THE FORMULATION OF HIGH SPEED RAILWAY
PROJECTS ON HANOI – VINH AND HO CHI MINH – NHA TRANG
SECTION**

FINAL REPORT

TECHNICAL REPORT 4

ENVIRONMENTAL SENSITIVITY MAP

June 2013

**ALMEC CORPORATION
JAPAN INTERNATIONAL CONSULTANTS FOR TRANSPORTATION CO., LTD.
ORIENTAL CONSULTANTS CO., LTD.
NIPPON KOEI CO., LTD.
JAPAN TRANSPORTATION CONSULTANTS, INC.**

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PREFACE

In response to the request from the Government of the Socialist Republic of Vietnam, the Government of Japan decided to conduct the Study for the Formulation of High Speed Railway Projects on Hanoi – Vinh and Ho Chi Minh – Nha Trang Section and entrusted the program to the Japan International cooperation Agency (JICA).

JICA dispatched a team to Vietnam between April 2011 and June 2013, which was headed by Mr. IWATA Shizuo of ALMEC Corporation and consisted of ALMEC Corporation, Japan International Consultants for Transportation Co., Ltd., Oriental Consultants Co., Ltd., Nippon Koei Co., Ltd. and Japan Transportation Consultants, Inc.

In the cooperation with the Vietnamese Counterpart Team including the Ministry of Transport and Vietnam Railways, the JICA Study Team conducted the study which includes traffic demand analysis, natural and socio-economic conditions, alignment planning, consideration of various options including the upgrading of existing railway, technical standards for high speed railway, implementation schedule and institutions, and human resource development. It also held a series of discussions with the relevant officials of the Government of Vietnam. Upon returning to Japan, the Team duly finalized the study and delivered this report in June 2013.

Reflecting on the history of railway development in Japan, it is noted that Japan has indeed a great deal of experience in the planning, construction, operation, etc., and it is deemed that such experiences will greatly contribute to the railway development in Vietnam. JICA is willing to provide further cooperation to Vietnam to achieve sustainable development of railway sector and to enhance friendly relationship between the two countries.

It is hoped that this report will contribute to the sustainable development of transport system in Vietnam and to the enhancement of friendly relations between the two countries.

Finally, I wish to express my sincere appreciation to the officials of the Government of Vietnam for their close cooperation.

June 2013

Kazuki Miura
Director, Economic Infrastructure Department
Japan International Cooperation Agency

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ABBREVIATIONS

5ECSR	Five-Year Environmental Current Status Report
Alt	Alternative
BI	Bird International
CSFC	Committee for Storm and Flood Control
DARD	Department of Agricultural and Rural Development
DGMV	General Department of Geology and Minerals of Vietnam
DOCST	Department of Culture, Sport and Tourism
DONRE	Department of Natural Resources and Environment
EBA	Endemic Bird Area
GIS	Geographic Information System
HCMC	Ho Chi Minh City
HSR	High Speed Railway
IBA	Important Bird Area
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
LU	Landuse
LU (C)	Current landuse map
LU (P)	Landuse plan map
mQII path	Middle Pleistocene (Phan Thiet Formation)
NGO	Non-Governmental Organization
Pop.	Population
QIII3	Upper Pleistocene
QII-III	Middle-Upper Pleistocene
SCFSC	Steering Committee for Flood and Storm Control

SDFSC	Sub-Department for Flood and Storm Control
SDI	Sub-Department of Irrigation
SHM	Stakeholder Meeting
vQ	Undivided Quaternary
WWF	World Wide Fund for Nature / World Wildlife Fund

1 OUTLINE OF ENVIRONMENTAL SENSITIVITY MAPS

1.1 Objectives of Environmental Sensitivity Maps

1.1 It was planned to prepare an environmental sensitivity maps in order to meet following objectives:

- (i) To identify the potentially sensitive areas that may require environmental and social considerations.
- (ii) To prepare the above data sets in order to contribute to the alignment planning.
- (iii) To clearly show that the selected alignments are drawn based on the due considerations of environmental and social aspects.

1.2 Contents of Environmental Sensitivity Maps

1.2 Considering 1) the important and useful information in planning alignment and station of HSR, 2) the information which can be analyzed on the GIS and 3) existing and available geographical data, following layers were selected for the environmental sensitivity maps. The environmental sensitivity maps were defined as the data set of maps consisting of the following layers in Table 1.2.1.

Table 1.2.1 Layers included in the Environmental Sensitivity Map

No.	Layer	Description	Major Sources of Information
01	Protected Area	Special-use forest area from land use map (in the environmental sensitivity maps, special-use forest is recorded as "protected forest")	<ul style="list-style-type: none"> • Land-use map prepared by DONRE • Forest area map prepared by DARD
02	Protection and Production Forest	Production forest and protection forest from land use map	<ul style="list-style-type: none"> • Land-use map prepared by DONRE • Forest area map prepared by DARD
03	Flood Prone	Flood prone areas and/or flood affected areas in the record	<ul style="list-style-type: none"> • Flood prone area map prepared by DARD • Flood affected information by Provincial Storm and Flood Control Committee • Interview with DARD • 5 Year Environmental Current Status Report (5ECSR)
04	Landslide	Landslide prone areas and/or landslide affected areas in the record	<ul style="list-style-type: none"> • Landslide prone area map prepared by DARD • Landslide affected information by Provincial Storm and Flood Control Committee • Interview with DARD • 5ECSR
05	Geology	Geologically sensitive areas	<ul style="list-style-type: none"> • Geology map
06	Cultural Heritage	Cultural heritages	<ul style="list-style-type: none"> • Land-use map prepared by DONRE • Tourism map
07	Ethnic Minority	Population density of ethnic minority by communes	<ul style="list-style-type: none"> • Census data 2009
08	Population Density	Population density by communes	<ul style="list-style-type: none"> • Census data 2009
09	Industrial Zone	Industrial zone areas identified in land-use map	<ul style="list-style-type: none"> • Land-use map prepared by DONRE
10	Cemetery Land	Cemetery areas identified in land-use map	<ul style="list-style-type: none"> • Land-use map prepared by DONRE
11	Pagodas/Churches	Areas identified as faith land and religious land	<ul style="list-style-type: none"> • Land-use map prepared by DONRE
12	Army Area	Areas identified as national defense land and security land	<ul style="list-style-type: none"> • Land-use map prepared by DONRE

No.	Layer	Description	Major Sources of Information
13	Development Area	Areas Identified as Buildings	<ul style="list-style-type: none"> • Topographic map prepared by JICA Study Team based on Satellite Imagery
14	Typhoon Prone	Typhoon prone areas and/or typhoon affected areas in the record	<ul style="list-style-type: none"> • Typhoon affected information by Provincial Storm and Flood Control Committee • Typhoon affected information by Provincial Sub Department of Flood and Storm Control • Interview with DARD • 5ECSR
15	Important Bird Area and Endemic Bird Area	Important Bird Area and Endemic Bird Area which are recognized widely by international NGOs, such as Birdlife International, WWF and IUCN	<ul style="list-style-type: none"> • Important Bird Area and Endemic Bird Area Maps in the website of Birdlife International
16	Overlaid Environmental Sensitivity Map	Overlaying 01,02,06,09,10,11 and 12 as the integrated map	<ul style="list-style-type: none"> • Land-use map prepared by DONRE

Source: JICA Study Team

2 OUTPUT OF ENVIRONMENTAL SENSITIVITY MAPS

2.1 Collected Information and Output

2.1 The information was collected from the cities/provinces along the target sections, namely the north section (Hanoi-Vinh) and the south section (HCMC-Nha Trang).

2.2 In Vietnam, the most important source of landuse information for the environmental sensitivity map is the land use map (both current land use and planning land use) prepared by the cities/provinces. The JICA Study Team acquired following land use information and produced the data set of the environmental sensitivity map through careful overlaying process. The data set produced as both shape files (.shp, Arc GIS format) and picture files (.jpg). Blue shaded part in Tables 2.1.1 and 2.1.2 means that data set and map were produced based on the information clarified in the “data source”.

2.3 With regard to the geography, geology map (hard copy) was available all along the alignment, and only the specific area were identified as sensitive to be digitized into the environmental sensitivity maps. The area includes vQ sand dunes area, and surrounding Pleistocene areas which are considered to be soft (QII-III: Middle-Upper Pleistocene, QIII3: Upper Pleistocene, mQII pth: Middle Pleistocene or Phan Thiet Formation, and vQ: Undivided Quaternary).

2.4 Forest map are produced in two patterns namely (1) protection and production forest map, (2) forest distribution map (special use/protection/production forest).

2.5 Ethnic minority map are produced in two patterns as well, namely (1) ethnic minority density map and (2) ethnic minority population map.

Table 2.1.1 Layers of Environmental Sensitivity Maps (North Section)

			01 Hanoi	02 Ha Nam	03 Nam Dinh	04 Ninh Binh	05 Thanh Hoa	06 Nghe An
01	Protected Areas	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	LU(C), to 2010	LU(P), to 2010	LU(P), to 2020	LU(P), to 2010	LU(P), to 2020	LU(C), to 2010
02	Protection and Production Forest	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	LU(C), to 2010	LU(P), to 2010	LU(P), to 2020	LU(P), to 2010	LU(P), to 2020	LU(C), to 2010
03	Flood Prone	GIS Data Set	Available	No information available	No information available	Available	Available	Available
		Data Source	Map on Natural Hazard Prone Area of Hanoi City (year/unknown)	-	-	Detailed Planning Report on Flood and Dike Control for Inland Rivers/ 2009	5ECSR/2006-2010	Report on some hazards in Nghe An Province/2010
04	Landslide	GIS Data Set	No information available	No information available	No information available	No information available	Available	Available
		Data Source	-	-	-	-	5ECSR/2006-2010	Report on some hazards in Nghe An Province/2010
05	Geology	GIS Data Set	No Sensitive Area	No Sensitive Area	No Sensitive Area	No Sensitive Area	No Sensitive Area	No Sensitive Area
		Data Source	DGMV 1999	DGMV 1999	DGMV 1999	DGMV 1999	DGMV 1999	DGMV 1999

			01 Hanoi	02 Ha Nam	03 Nam Dinh	04 Ninh Binh	05 Thanh Hoa	06 Nghe An
06	Cultural Heritage	GIS Data Set	No information available	No information available	No information available	No information available	Available	No information available
		Data Source	-	-	-	-	DOCST	-
07	Ethnic Minority	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	Census, 2009	Census, 2009	Census, 2009	Census, 2009	Census, 2009	Census, 2009
08	Population density	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	Census, 2009	Census, 2009	Census, 2009	Census, 2009	Census, 2009	Census, 2009
09	Industrial zone	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	LU(C), to 2010	LU(P), to 2010	LU(P), to 2020	LU(P), to 2010	LU(P), to 2020	LU(C), to 2010
10	Cemetery Land	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	LU(C), to 2010	LU(P), to 2010	LU(P), to 2020	LU(P), to 2010	LU(P), to 2020	LU(C), to 2010
11	Pagodas/Churches	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	LU(C), to 2010	LU(P), to 2010	DOCST	LU(P), to 2010	LU(P), to 2020	LU(C), to 2010
12	Army area	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	LU(C), to 2010	LU(P), to 2010	LU(P), to 2020	LU(P), to 2010	LU(P), to 2020	LU(C), to 2010
13	Development Area	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	Topography Map	Topography Map	Topography Map	Topography Map	Topography Map	Topography Map
14	Typhoon	GIS Data Set	No information available	No information available	No information available	No information available	No information available	No information available
		Data Source	-	-	-	-	-	-
15	Important Bird Area and Endemic Bird Area	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	Birdlife International	Birdlife International	Birdlife International	Birdlife International	Birdlife International	Birdlife International
16	Overlaid Environmental Sensitivity Map	GIS Data Set	Available	Available	Available	Available	Available	Available
		Data Source	LU(C), to 2010	LU(P), to 2010	LU(P), to 2020	LU(P), to 2010	LU(P), to 2020	LU(C), to 2010
	DONRE Landuse map (Current)	Yes, 2010	Yes, 2010	Yes, to 2010	Yes, 2010	Yes, 2010	Yes, 2010	
	DONRE Landuse map (Plan)	Not available	Landuse, 2010	Yes, to 2020	Landuse, 2010	Yes, to 2020 (draft)	Not available	

SCFSC: Steering Committee for Flood and Storm Control

SDFSC: Sub Department of Flood and Storm Control

LU(C): Current landuse map

LU(P): Landuse plan map

Source: JICA Study Team

Table 2.1.2 Layers of Environmental Sensitivity Maps (South Section)

			07 Khanh Hoa	08 Ninh Thuan	09 Binh Thuan	10 Dong Nai	11 HCMC
01	Protected Areas	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	LU(P), to 2020	LU(P), to 2010	LU(P), to 2010	LU(P), to 2010	LU(P), to 2020
02	Protection and Production Forest	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	LU(P), to 2020	LU(P), to 2010	LU(P), to 2010	LU(P), to 2010	LU(P), to 2020
03	Flood Prone	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	Marked location maps by Sub-department of Irrigation/2011	Annual Report of SCSFC/2005-2009	Annual report of SCSFC/1995-2010	Annual report of SCSFC/2010	Official letter of SDFSC/2011

			07 Khanh Hoa	08 Ninh Thuan	09 Binh Thuan	10 Dong Nai	11 HCMC
04	Landslide	GIS Data Set	No information available	Available	Available	Available	Available
		Data Source	-	Annual Report of SCSFC/2005-2009	Annual report of SCSFC/2005-2010	Annual report of SCSFC/2010	Official letter of SubDeptFSC/2011
05	Geology	GIS Data Set	Available	Available	Available	No Sensitive Area	No Sensitive Area
		Data Source	DGMV 1999	DGMV 1999	DGMV 1999	DGMV 1999	DGMV 1999
06	Cultural Heritage	GIS Data Set	Available	No information available	Available	No information available	No information available
		Data Source	LU(P), to 2020	-	LU(P), to 2010	-	-
07	Ethnic Minority	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	Census, 2009	Census, 2009	Census, 2009	Census, 2009	Census, 2009
08	Population density	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	Census, 2009	Census, 2009	Census, 2009	Census, 2009	Census, 2009
09	Industrial zone	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	LU(P), to 2020	LU(P), to 2010	LU(P), to 2010	LU(P), to 2010	LU(P), to 2020
10	Cemetery Land	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	LU(P), to 2020	LU(P), to 2010	LU(P), to 2010	LU(P), to 2010	LU(P), to 2020
11	Pagodas/Churches	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	LU(P), to 2020	LU(P), to 2010	LU(P), to 2010	LU(P), to 2010	LU(P), to 2020
12	Army area	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	LU(P), to 2020	LU(P), to 2010	LU(P), to 2010	LU(P), to 2010	LU(P), to 2020
13	Development Area	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	Topography Map	Topography Map	Topography Map	Topography Map	Topography Map
14	Typhoon Prone	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	5ECSR/2006-2010	Annual reports of SCSFC/1998-2010	5ECSR/2005-2009	Annual report of SCSFC/2010	Official letter of SDFSC/2011
15	Important Bird Area and Endemic Bird Area	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	Birdlife International	Birdlife International	Birdlife International	Birdlife International	Birdlife International
16	Overlaid Environmental Sensitivity Map	GIS Data Set	Available	Available	Available	Available	Available
		Data Source	LU(P), to 2020	LU(P), to 2010	LU(P), to 2010	LU(P), to 2010	LU(P), to 2020
	DONRE Landuse map (Current)	Yes, to 2005	Yes, to 2005	Yes, to 2005	Not available	Not available	
	DONRE Landuse map (Plan)	Yes, to 2020 (draft)	Yes, to 2010	Yes, to 2010	Yes, 2010	Yes, 2020	

SCFSC: Steering Committee for Flood and Storm Control
SDFSC: Sub Department of Flood and Storm Control
LU(C): Current landuse map
LU(P): Landuse plan map

Source: JICA Study Team

2.2 Utilization of Environmental Sensitivity Maps

2.6 Prepared data set were utilized to consider the alternative alignment and the location of the stations. As described in the objective of the environmental sensitivity map above, they were also utilized to visualize the environmental and social considerations of this study for stakeholders, especially in the 2nd SHM.

2.7 The result of overlaying alignment options on the environmental sensitivity maps was utilized for the alternative comparison in the IEE study and also for the provisional scoping.

2.8 Table 2.2.1 and Table 2.2.2 are the explanation on alignments shown in the environmental sensitivity maps. Because the alignment was revised in the north section after the 2nd SHM in cities/provinces and the revised version was shown in the plenary session of the 2nd SHM, both alignments were shown on the maps. For the south section, alignments shown in the 2nd SHM in cities/province and the plenary session were the same.

Table 2.2.1 Output of Environmental Sensitivity Maps (North Section)

Section	Alignment	Line	Note
North	Alt1 (revised)	Red	Revised alternative alignment 1 (which was shown and discussed in the plenary session of the 2 nd SHM in Hanoi and HCMC, and was evaluated optimal in this study)
	Alt1 (initial)	Red (broken line)	Alternative alignment 1 which was shown and discussed in 2 nd SHM in the cities/provinces
	Alt2	Blue	-
	Alt3	Light Green	-

Table 2.2.2 Output of Environmental Sensitivity Maps (South Section)

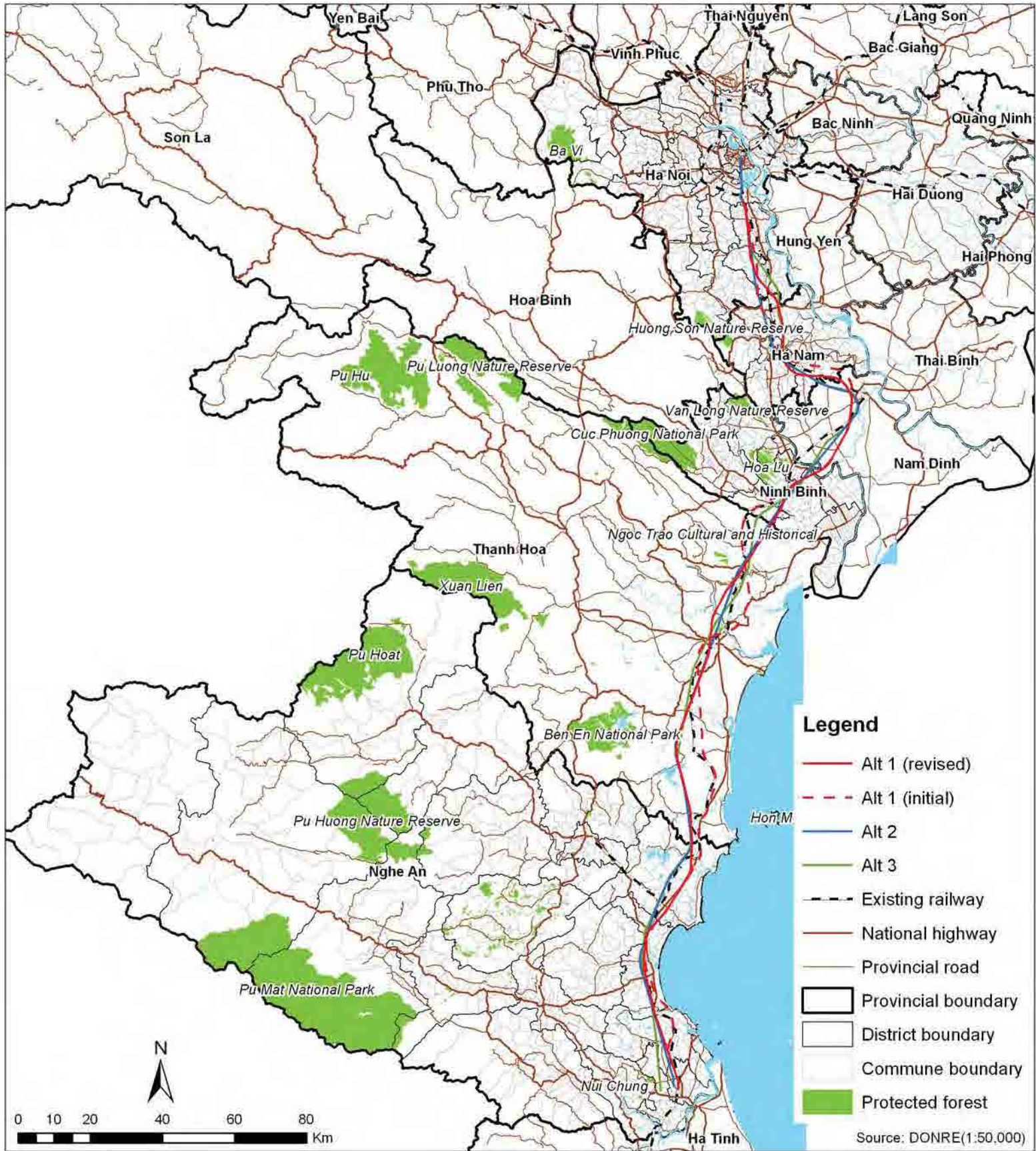
Section	Alignment	Line	Note
South	Alt1	Red	This alignment was evaluated optimal in the study.
	Alt2	Blue	-
	Alt3	Light Green	-

North Section

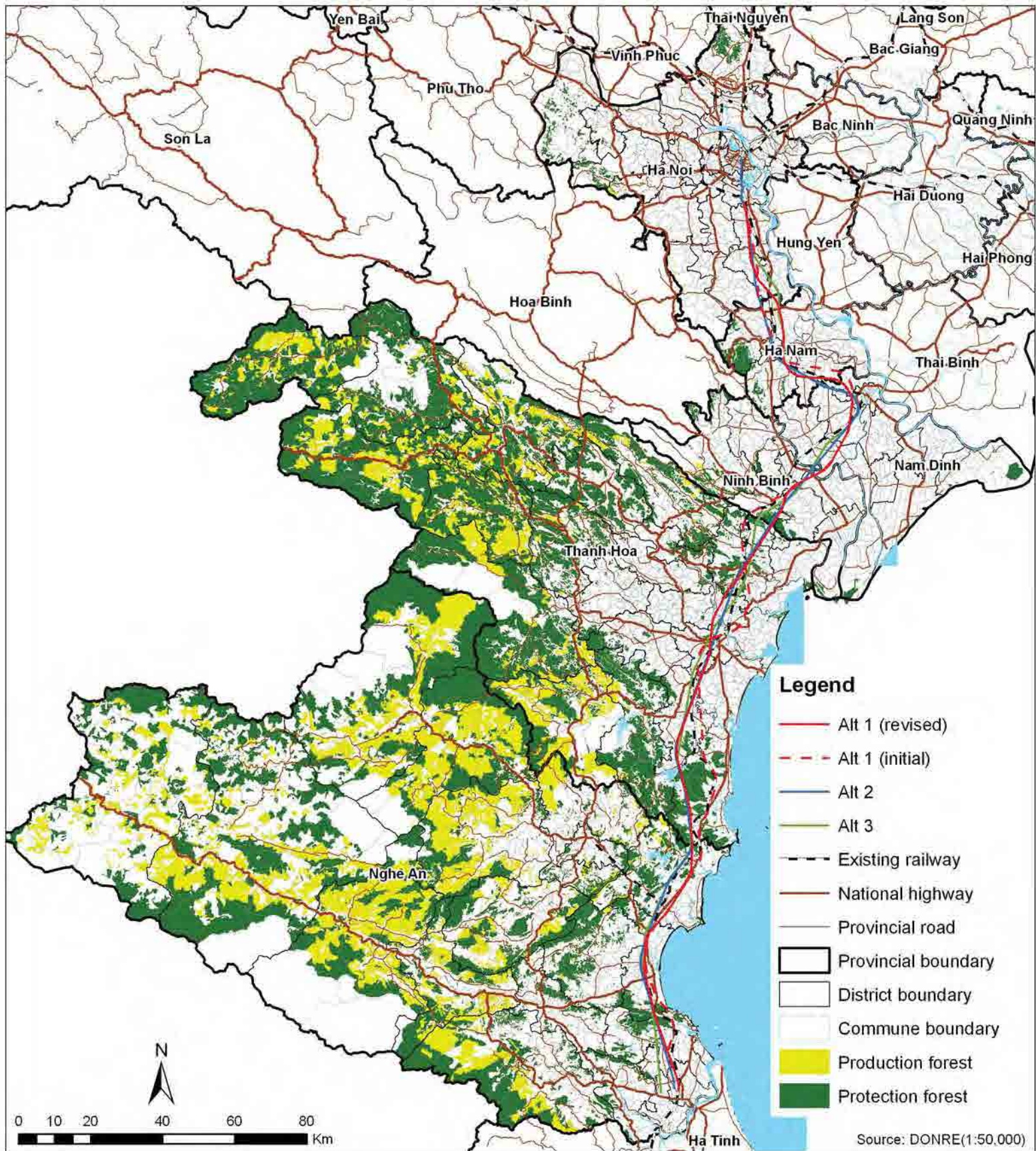
North.01	Protected Area
North.02	Protection and Production Forest
North.02_2	Distribution of Forest
North.03	Flood Prone
North.04	Landslide
North.06	Cultural Heritage
North.07	Ethnic Minority
North.07_2	Ethnic Minority Density
North.08	Population Density
North.09	Industrial Zone
North.10	Cemetery Land
North.11	Pagodas/Churches
North.12	Army Area
North.13	Development Area
North.15	Important Bird Areas and Endemic Bird Areas
North.16	Overlaid Environmental Sensitivity Map

*Missing number(s) means there was no data available to prepare the map.

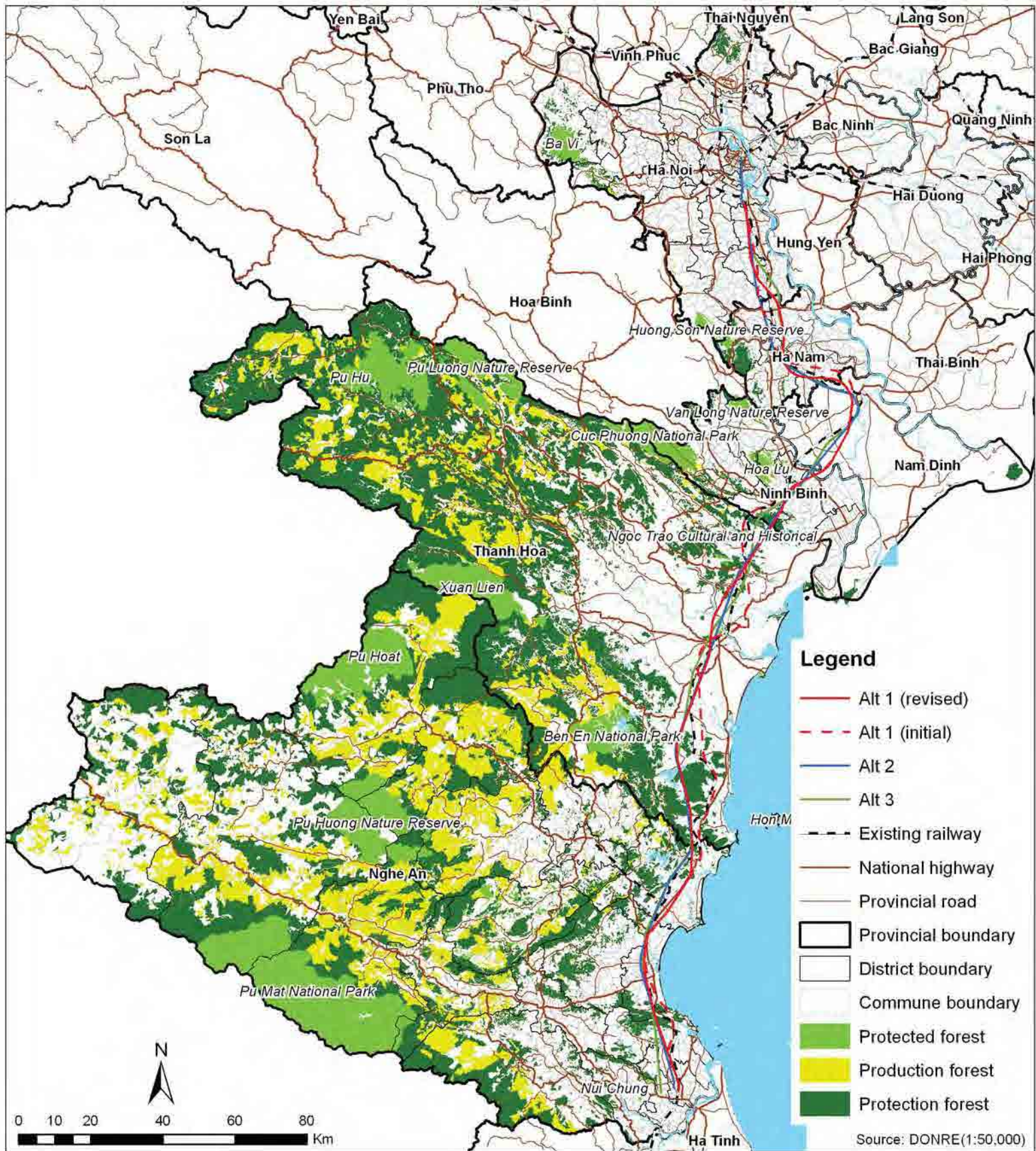
[North.01] - Protected Area



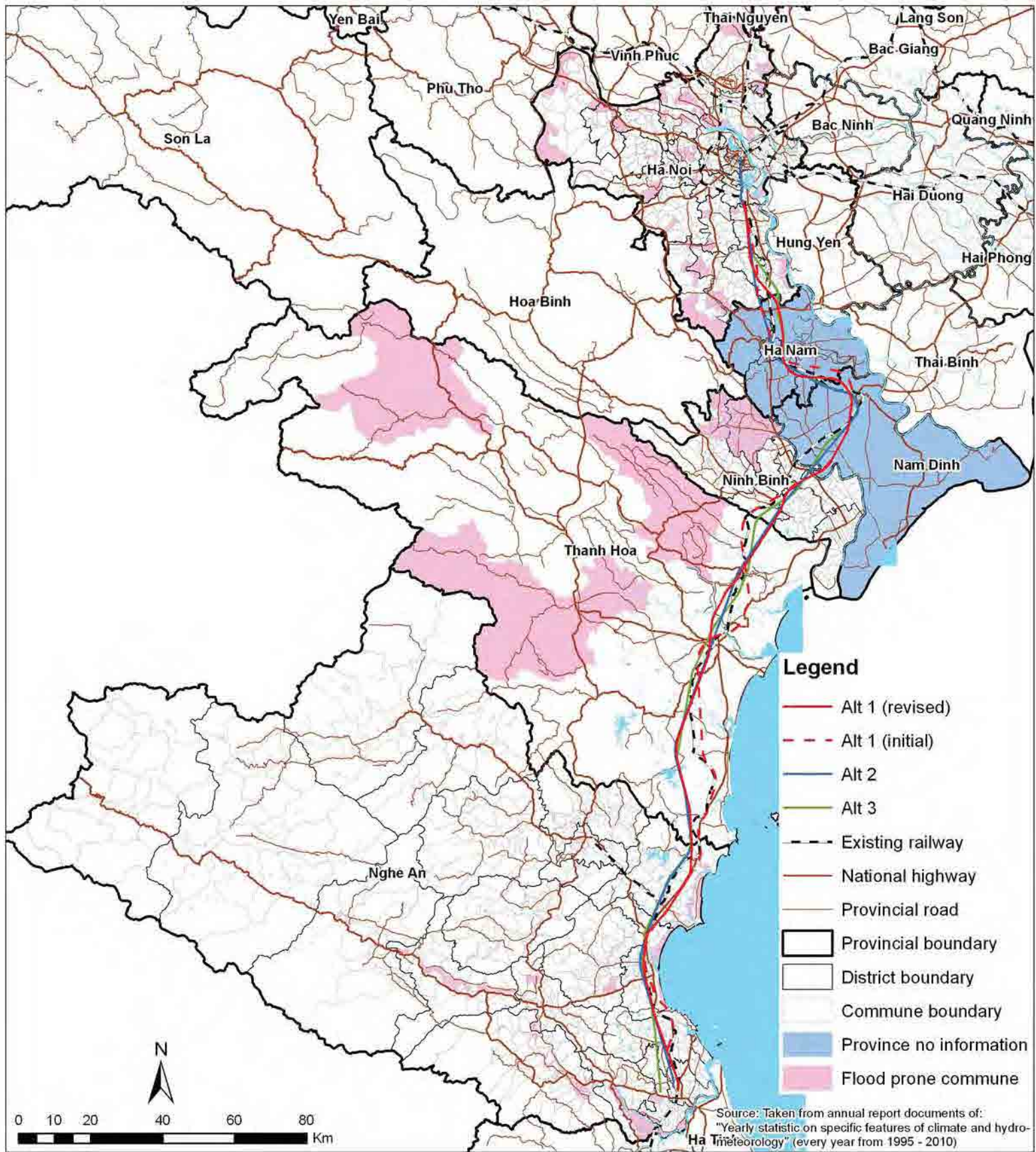
[North.02] - Protection and Production Forest



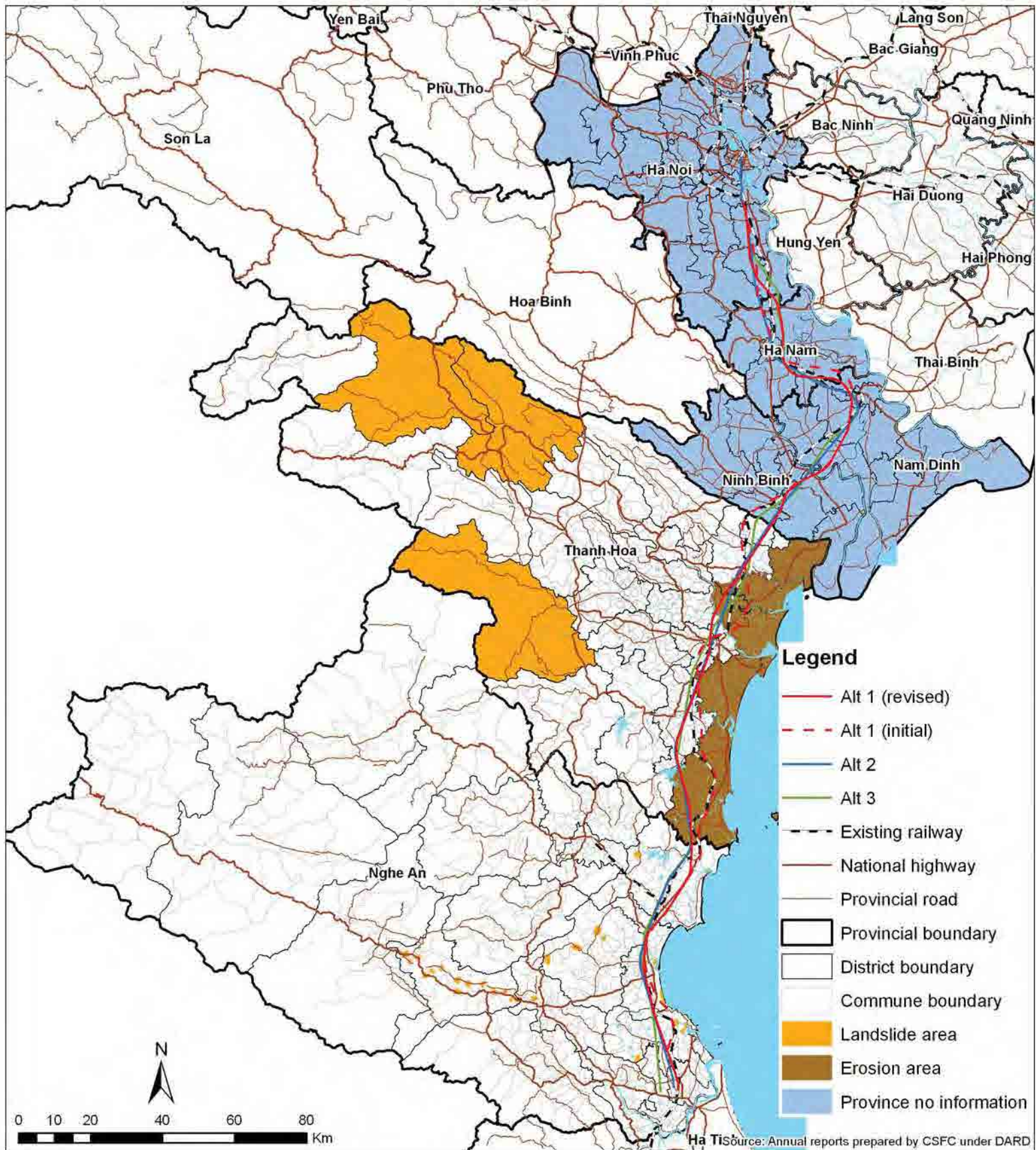
[North.02_2] - Distribution of Forest



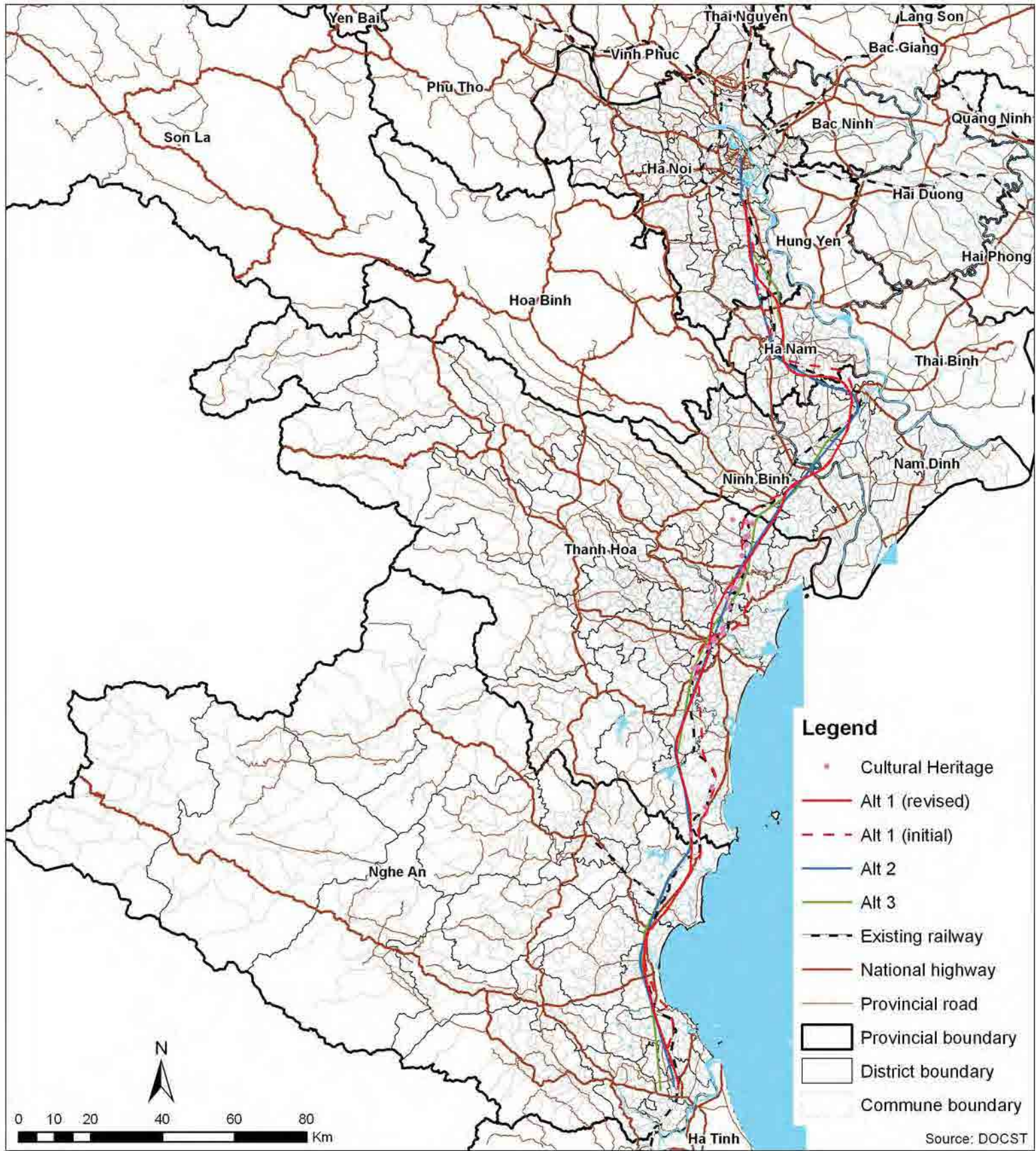
[North.03] - Flood Prone



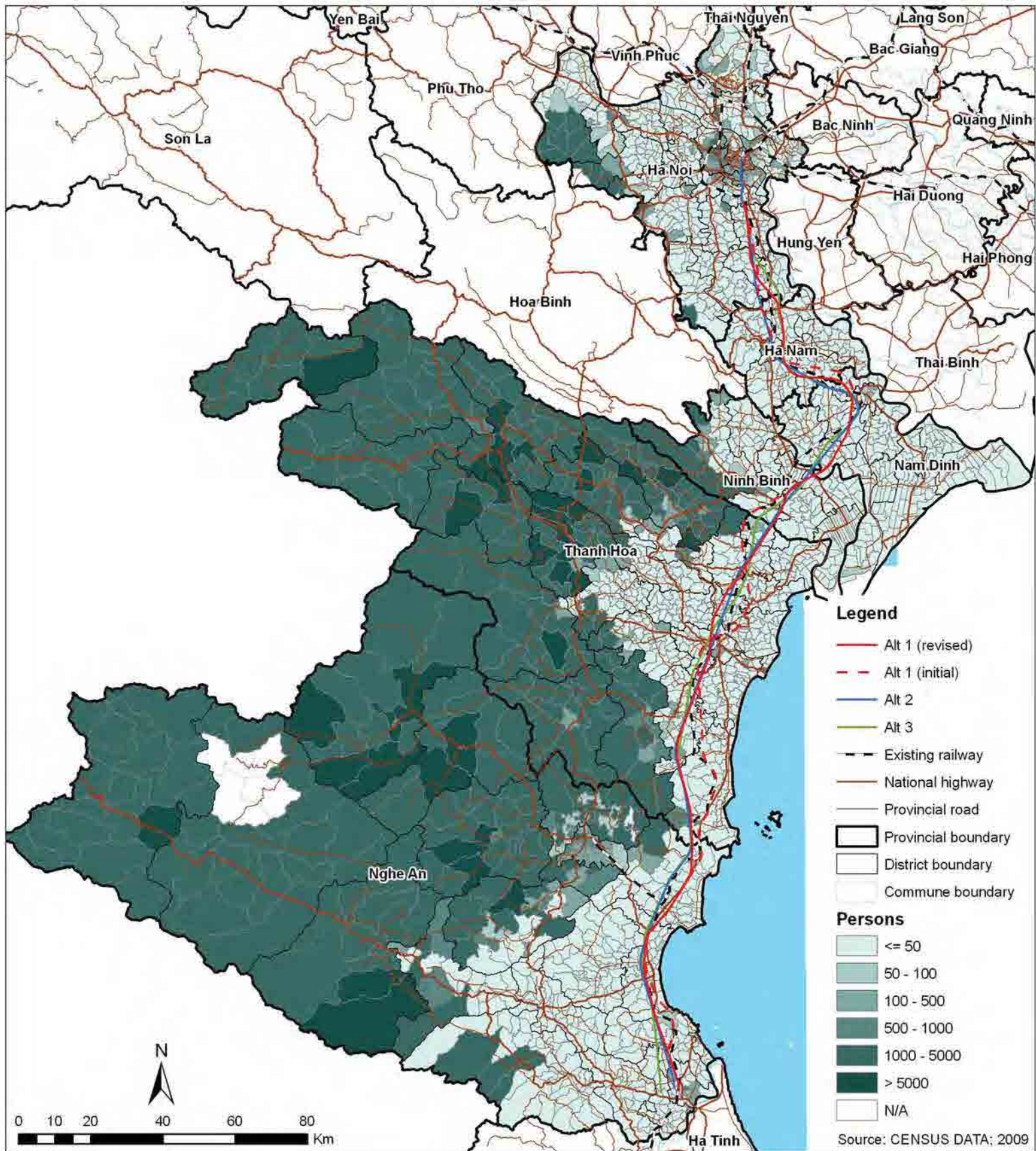
[North.04] - Landslide



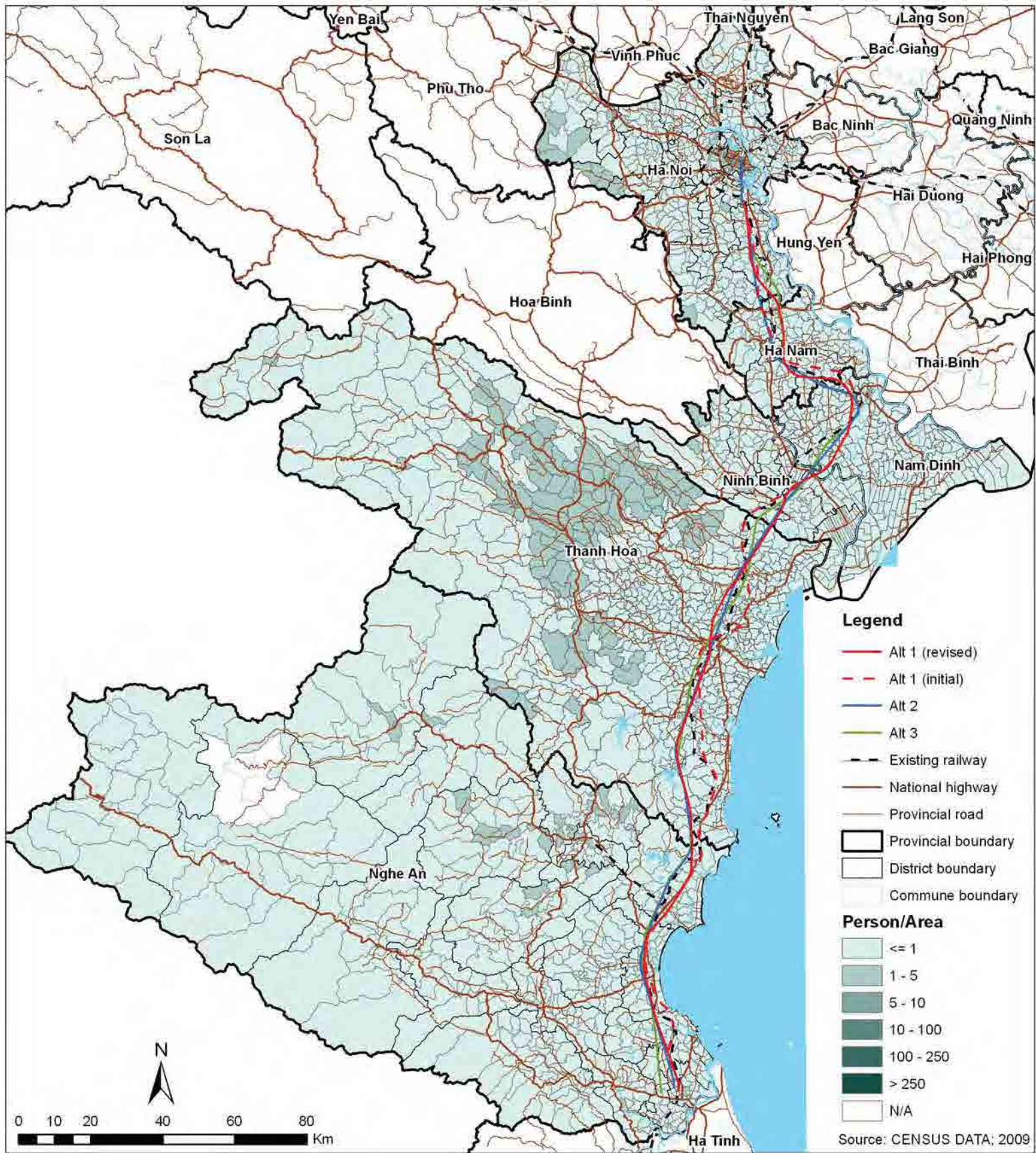
[North.06] - Cultural Heritage



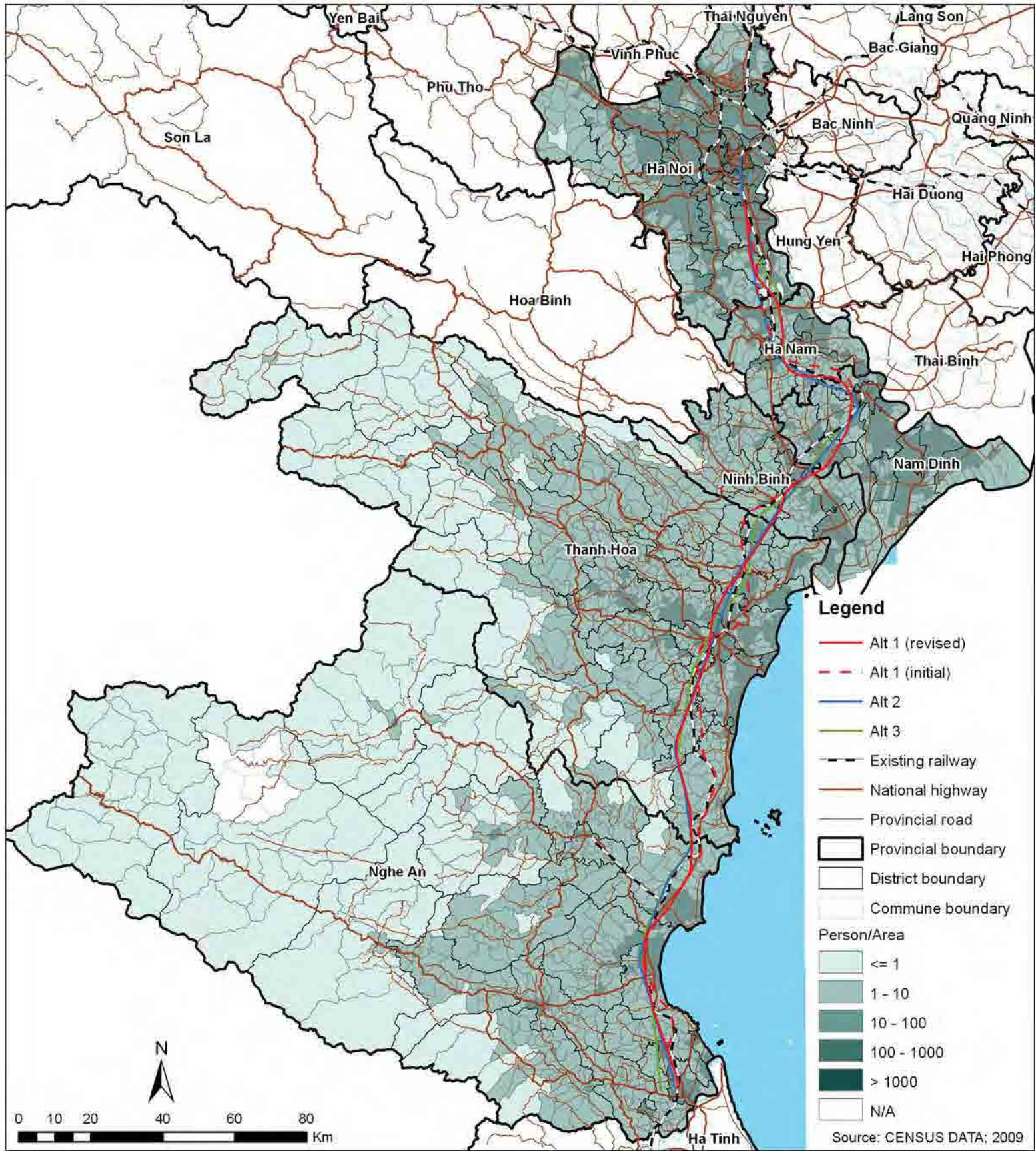
[North.07] - Ethnic Minority



[North.07_2] - Ethnic Minority Density



[North.08] - Population Density



Legend

- Alt 1 (revised)
- - - Alt 1 (initial)
- Alt 2
- Alt 3
- - - Existing railway
- National highway
- Provincial road
- ▭ Provincial boundary
- ▭ District boundary
- ▭ Commune boundary

Person/Area

Lightest green	≤ 1
Light green	1 - 10
Medium green	10 - 100
Dark green	100 - 1000
Darkest green	> 1000
White	N/A

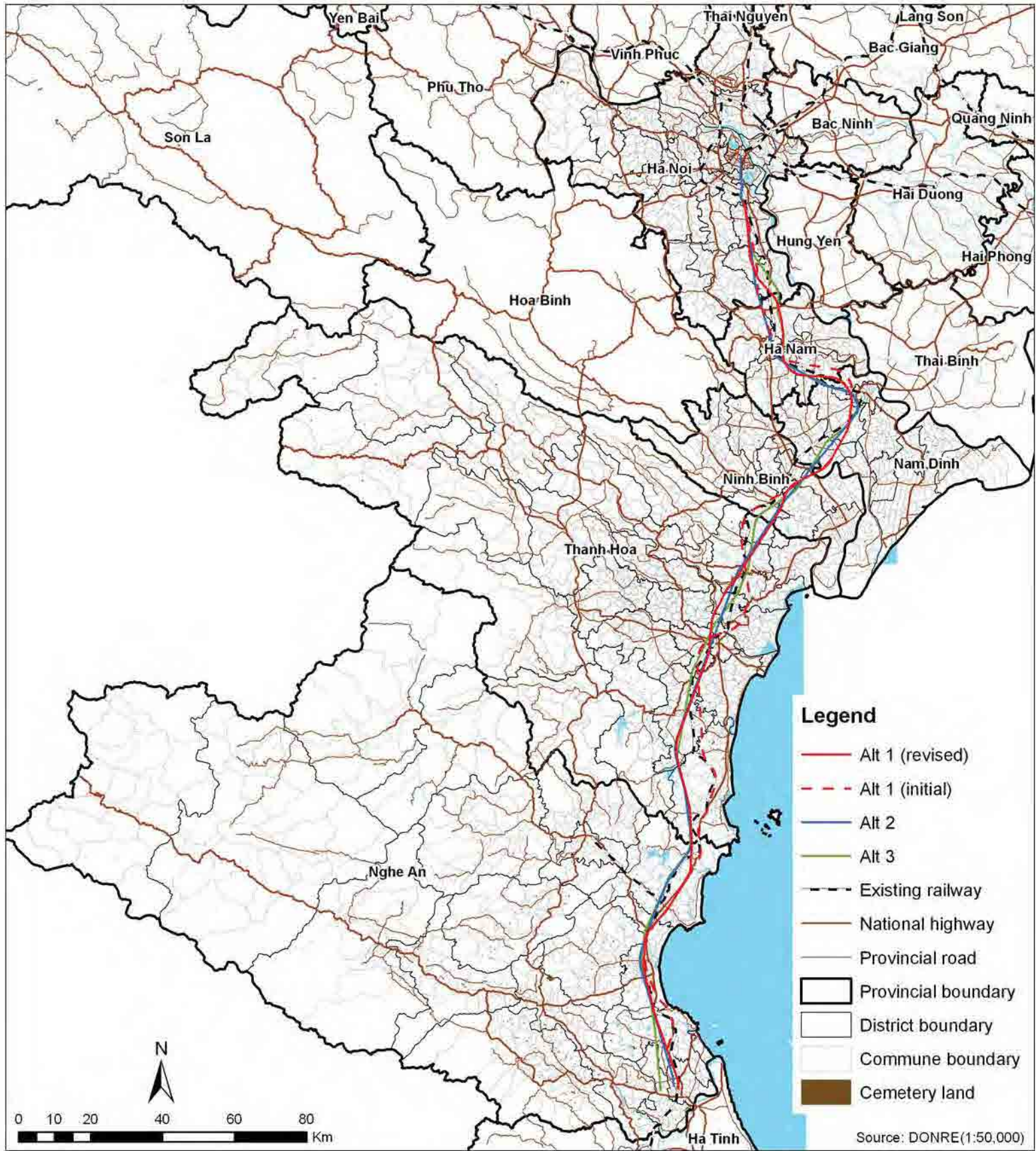
Source: CENSUS DATA; 2009

[North.09] - Industrial Zone

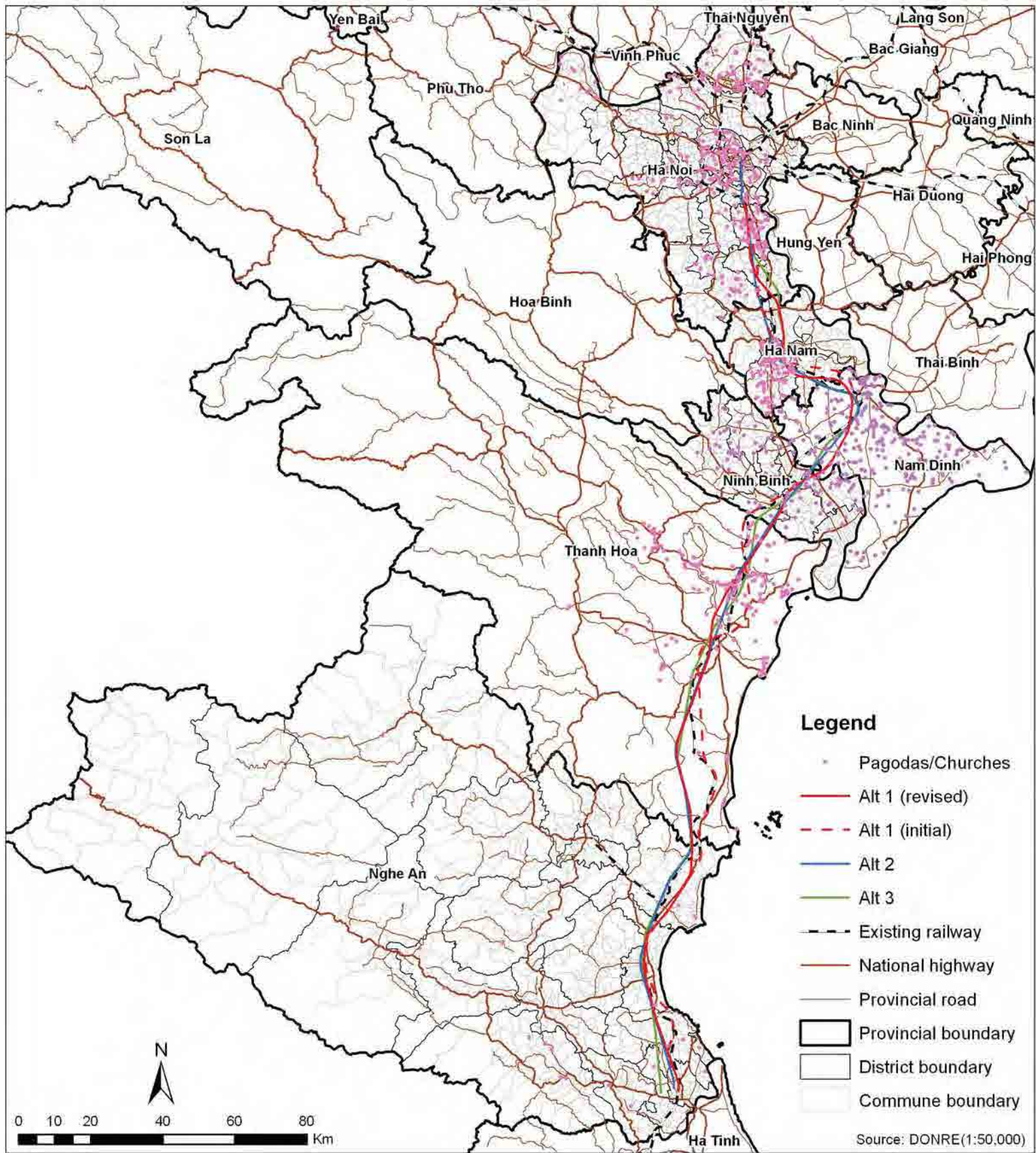


- Legend**
- Alt 1 (revised)
 - - - Alt 1 (initial)
 - Alt 2
 - Alt 3
 - - - Existing railway
 - National highway
 - Provincial road
 - ▭ Provincial boundary
 - ▭ District boundary
 - ▭ Commune boundary
 - ▭ Industrial zone land
- Source: DONRE (1:50,000)

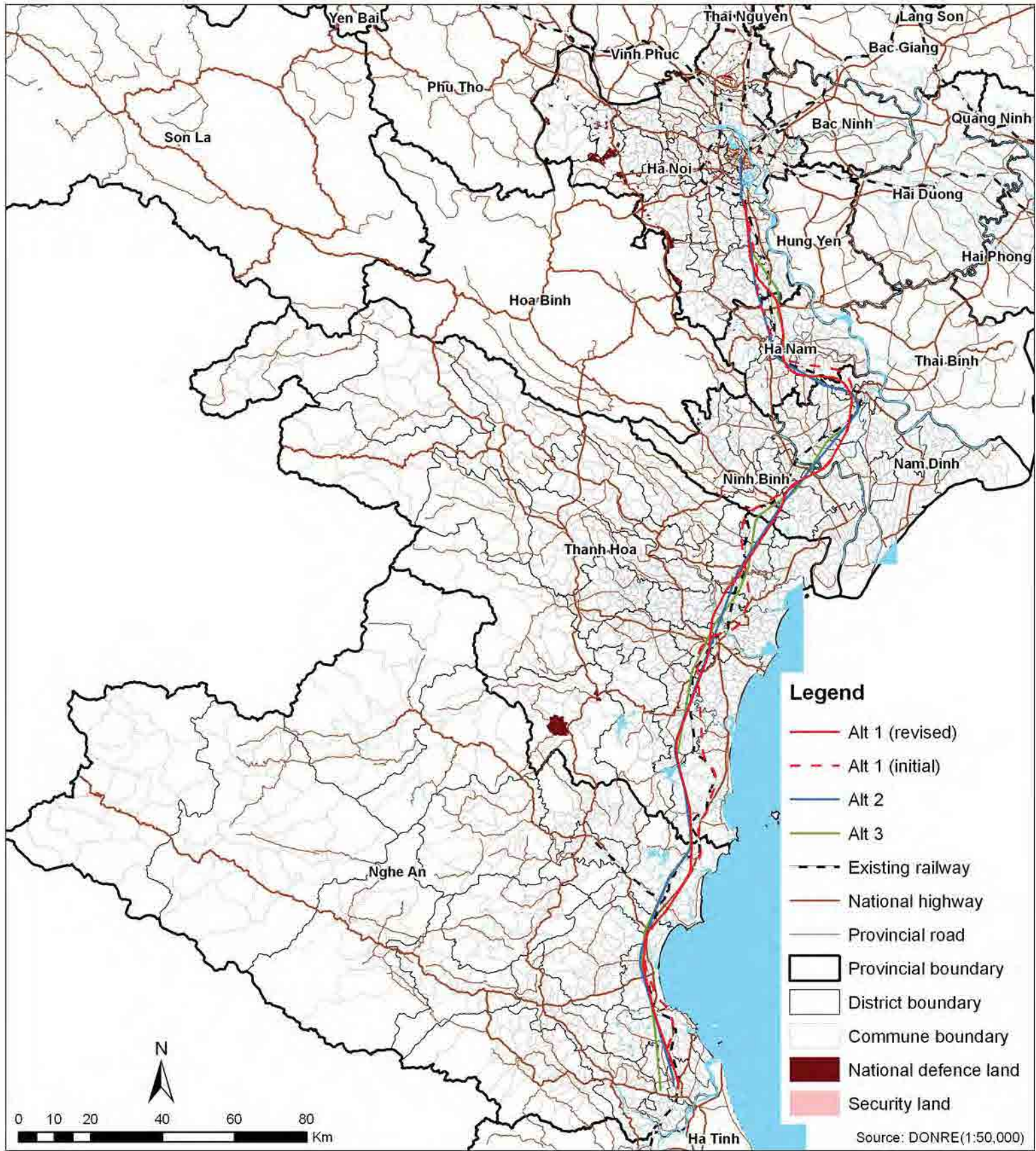
[North.10] - Cemetery Land



[North.11] - Pagodas/Churches

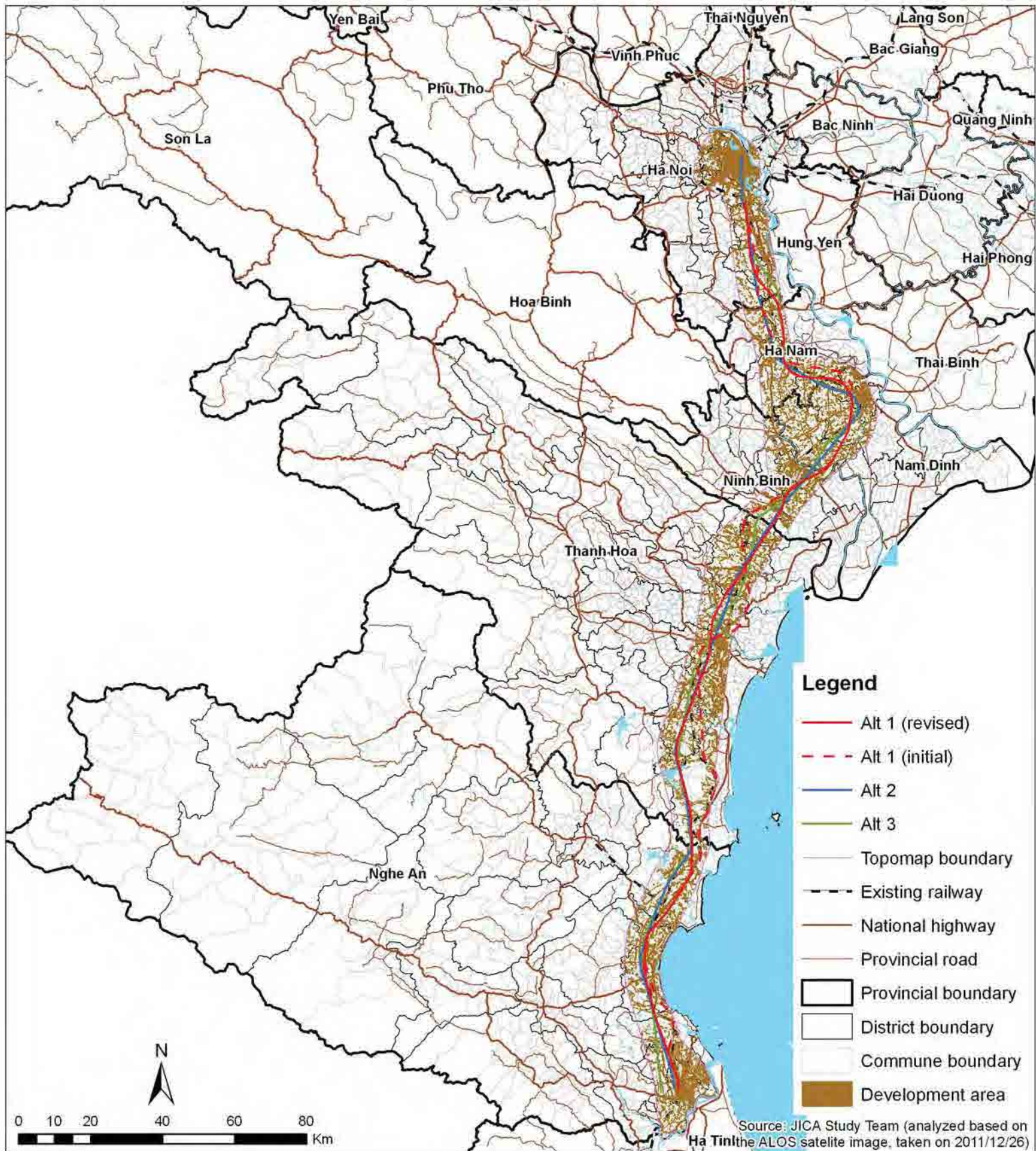


[North.12] - Army Area

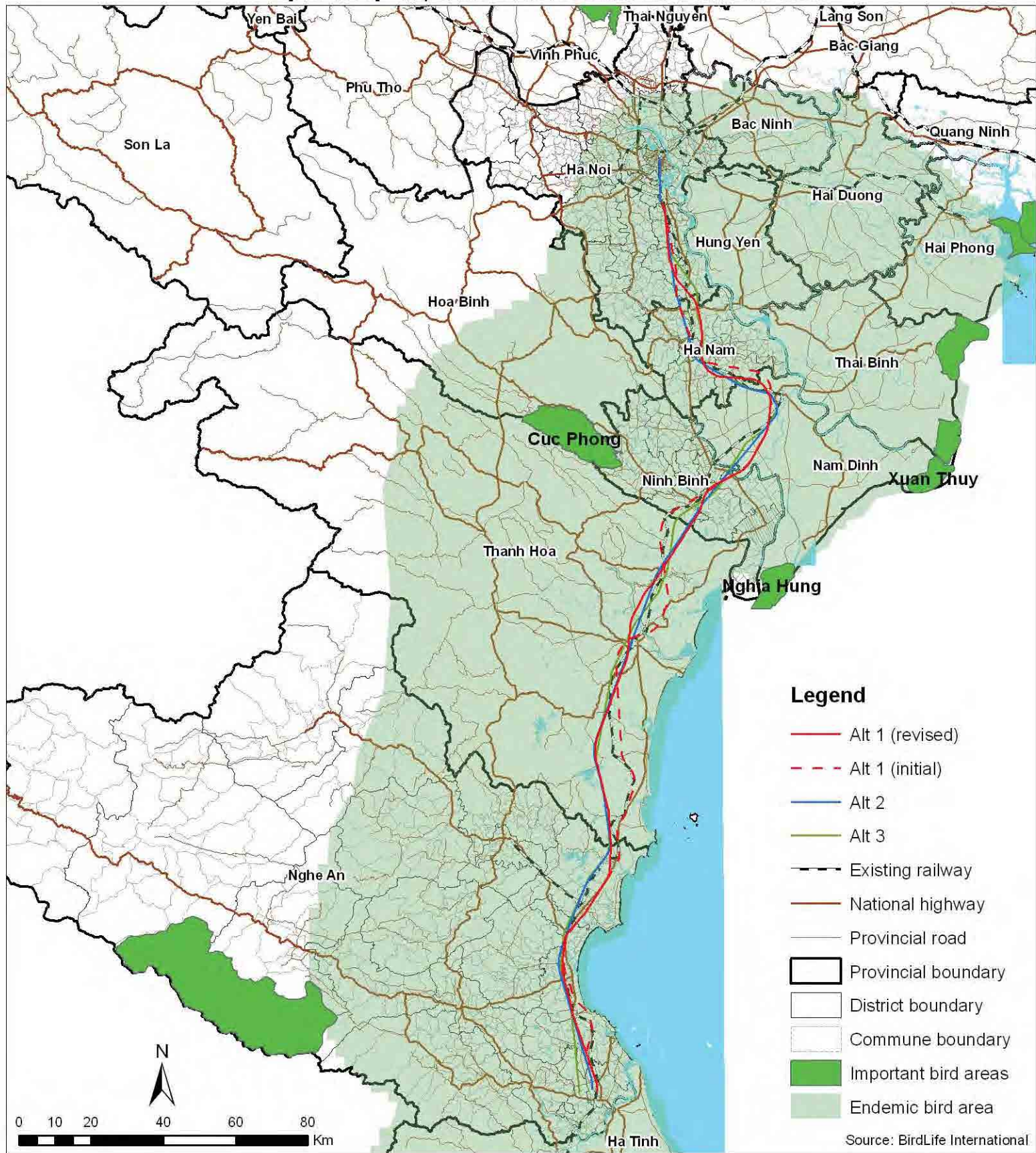


- Legend**
- Alt 1 (revised)
 - - - Alt 1 (initial)
 - Alt 2
 - Alt 3
 - - - Existing railway
 - National highway
 - Provincial road
 - ▭ Provincial boundary
 - ▭ District boundary
 - ▭ Commune boundary
 - National defence land
 - Security land
- Source: DONRE (1:50,000)

[North.13] - Development Area



[North.15] - Important Bird Areas and Endemic Bird Areas

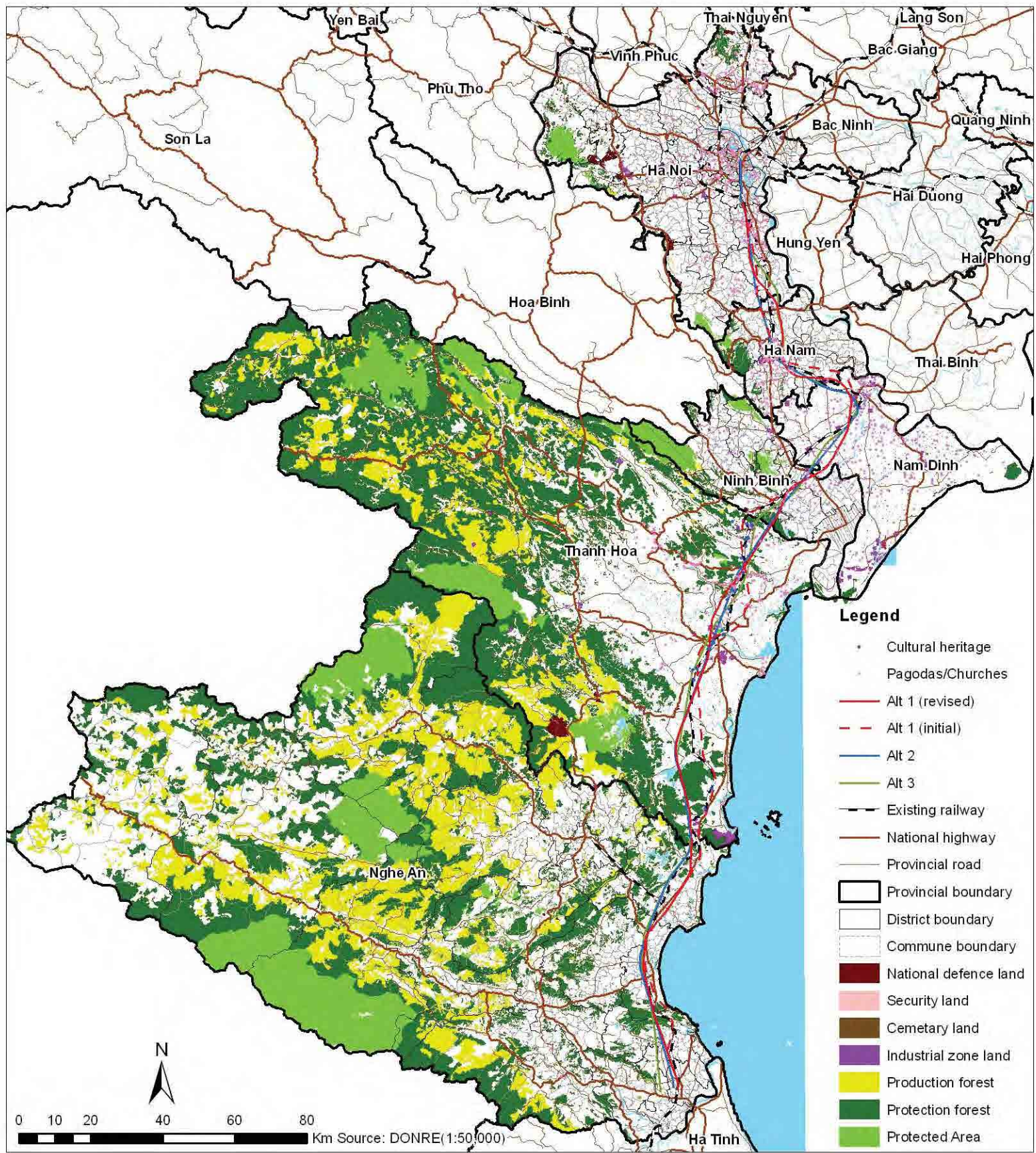


Legend

- Alt 1 (revised)
- - - Alt 1 (initial)
- Alt 2
- Alt 3
- Existing railway
- National highway
- Provincial road
- ▭ Provincial boundary
- ▭ District boundary
- ▭ Commune boundary
- Important bird areas
- Endemic bird area

Source: BirdLife International

[North.16] - Overlaid Environmental Sensitivity Map

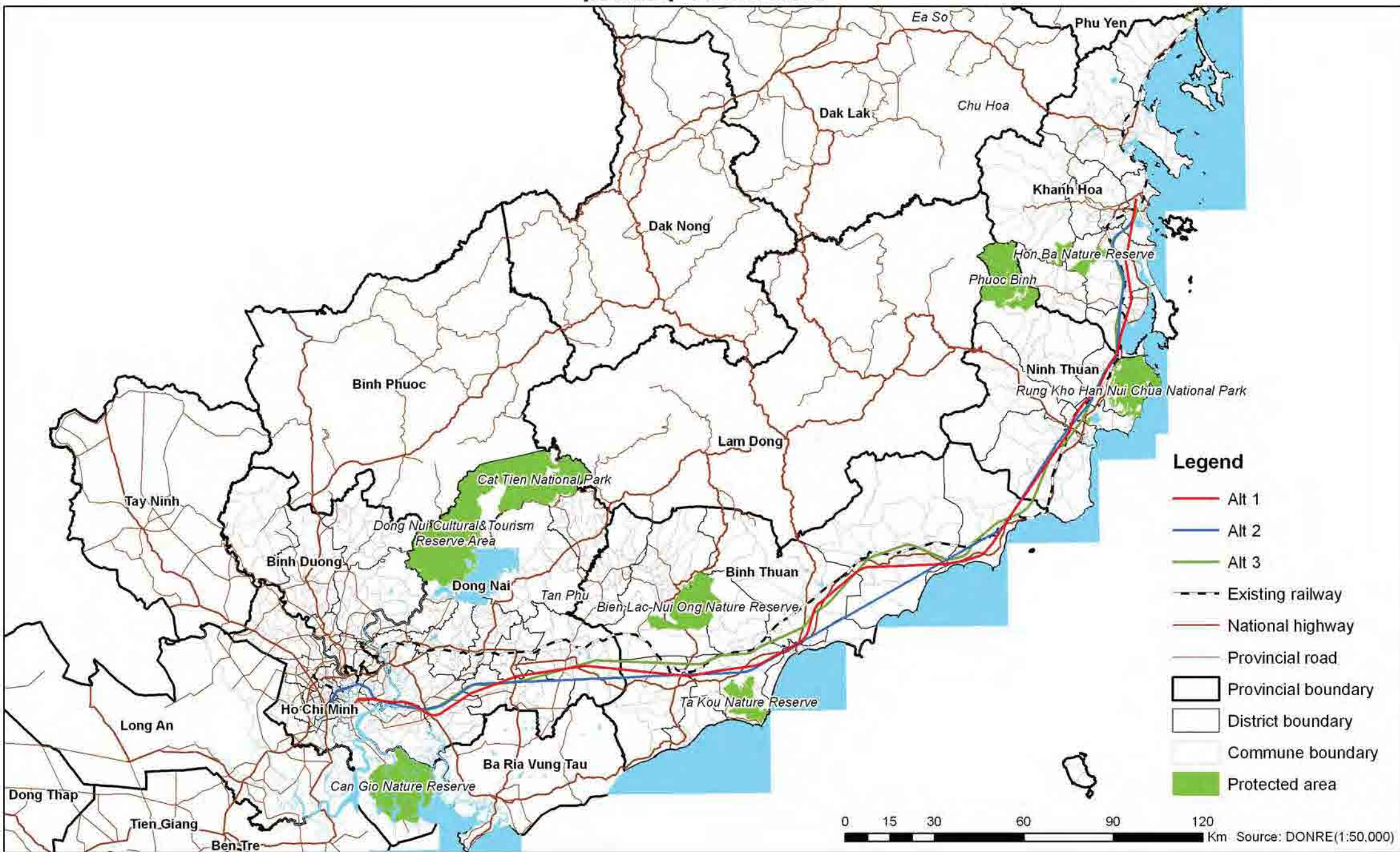


South Section

South.01	Protected Area
South.02	Protection and Production Forest
South.02_2	Distribution of Forest
South.03	Flood Prone
South.04	Landslide
South.05	Geology
South.06	Cultural Heritage
South.07	Ethnic Minority
South.07_2	Ethnic Minority Density
South.08	Population Density
South.09	Industrial Zone
South.10	Cemetery Land
South.11	Pagodas/Churches
South.12	Army Area
South.13	Development Area
South.14	Typhoon Prone
South.15	Important Bird Areas and Endemic Bird Areas
South.16	Overlaid Environmental Sensitivity Map

*Missing number(s) means there was no data available to prepare the map.

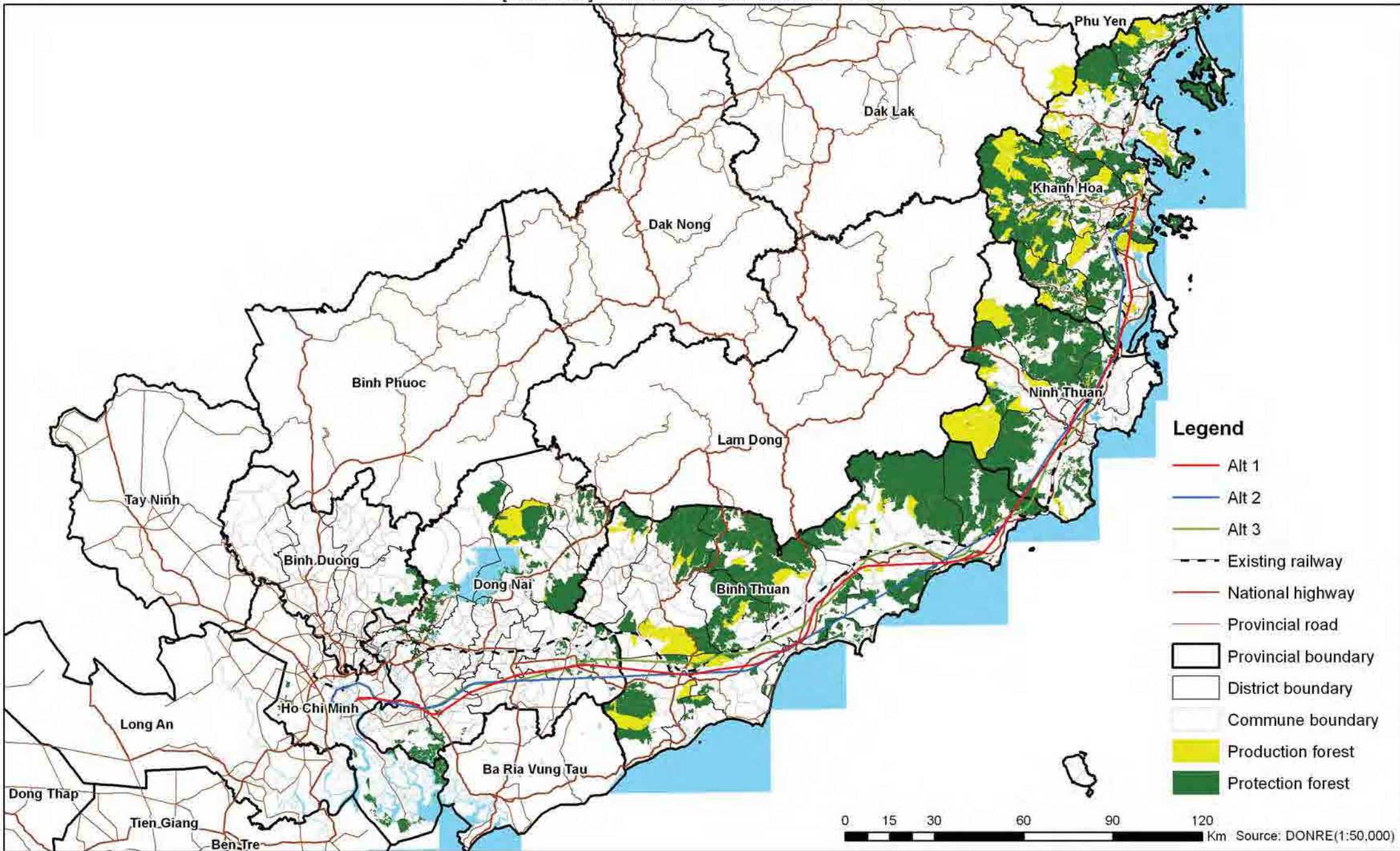
[South.01] - Protected Area



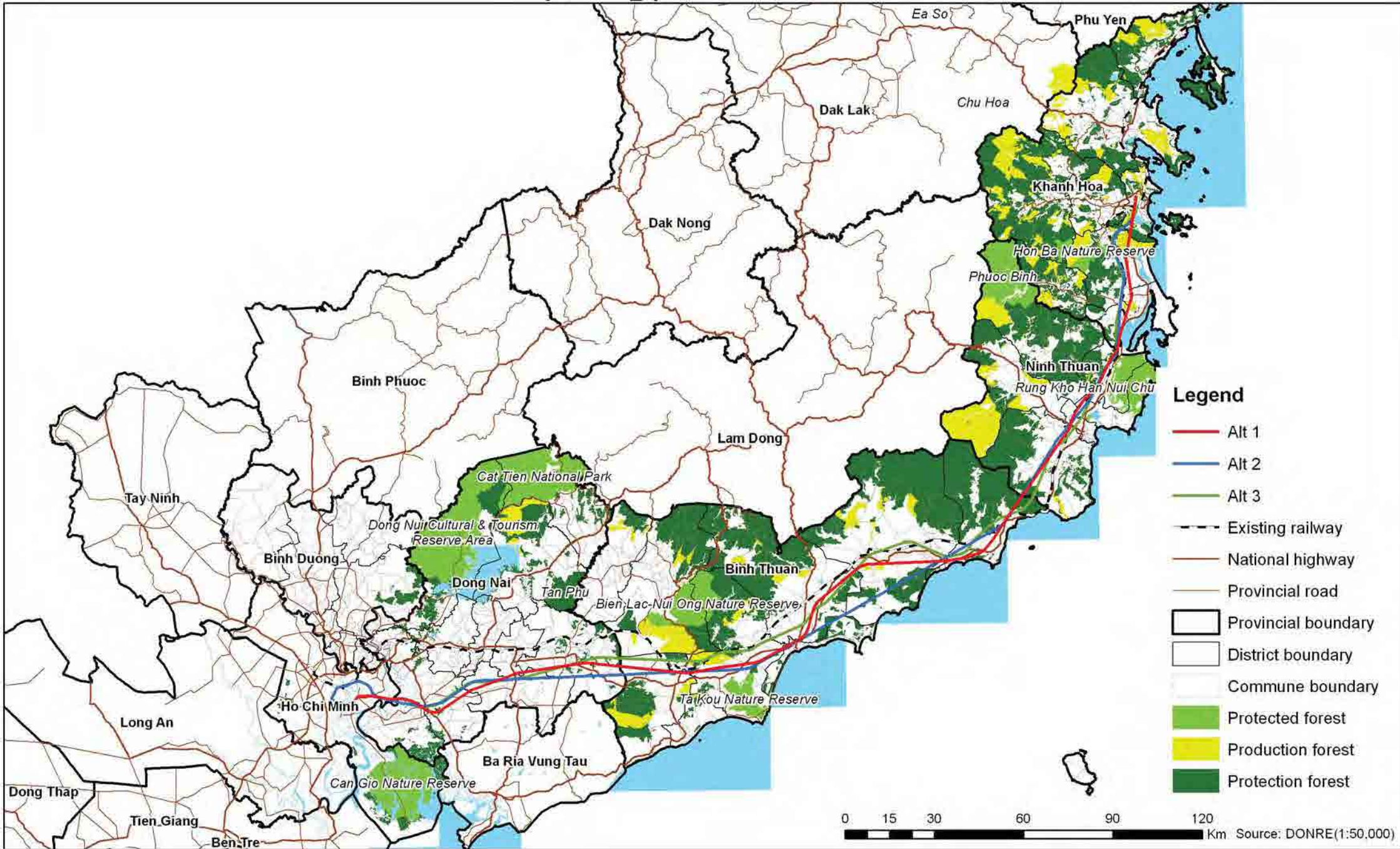
- Legend**
- Alt 1
 - Alt 2
 - Alt 3
 - Existing railway
 - National highway
 - Provincial road
 - Provincial boundary
 - District boundary
 - Commune boundary
 - Protected area

0 15 30 60 90 120 Km Source: DONRE(1:50,000)

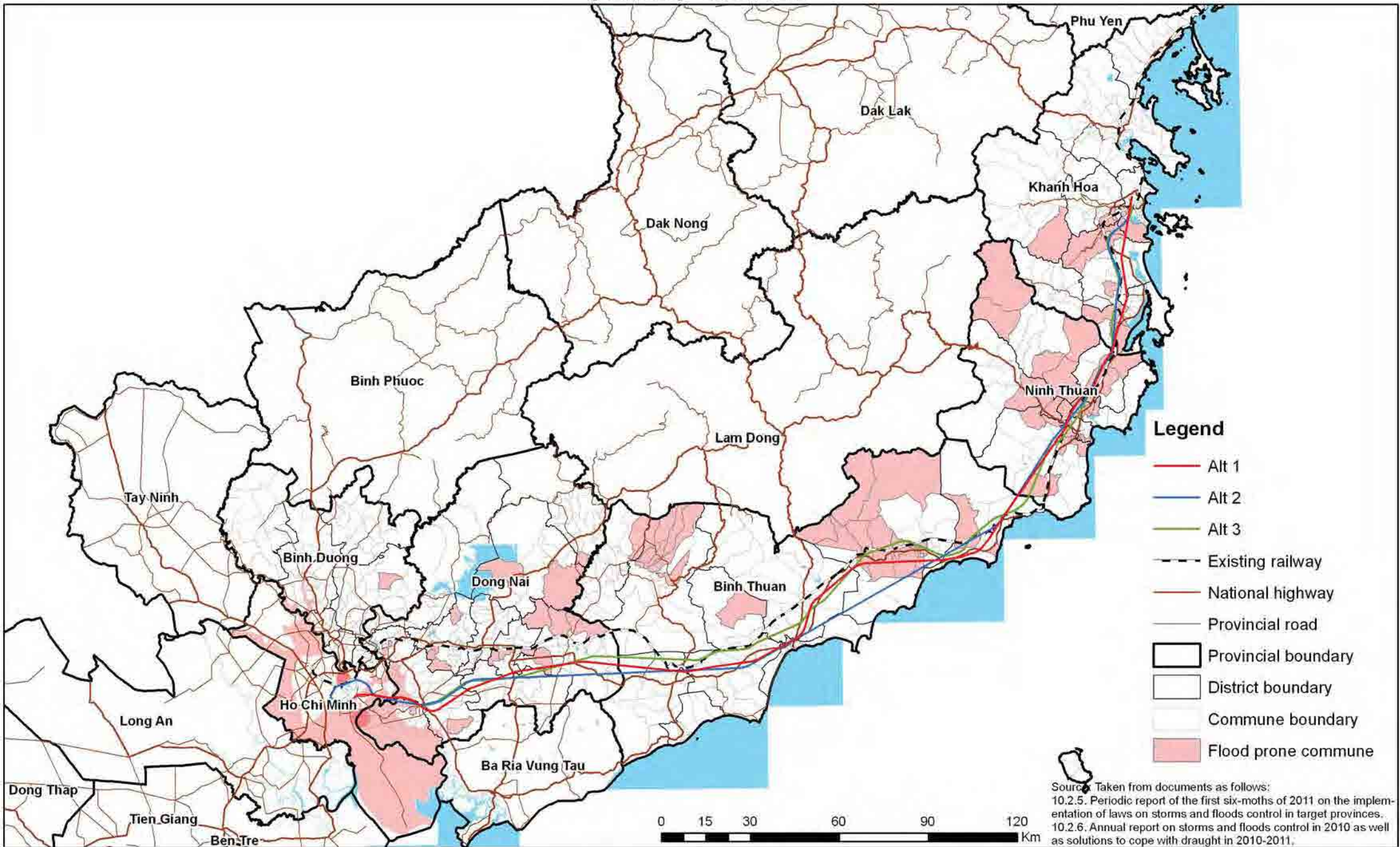
[South.02] - Protection and Production Forest



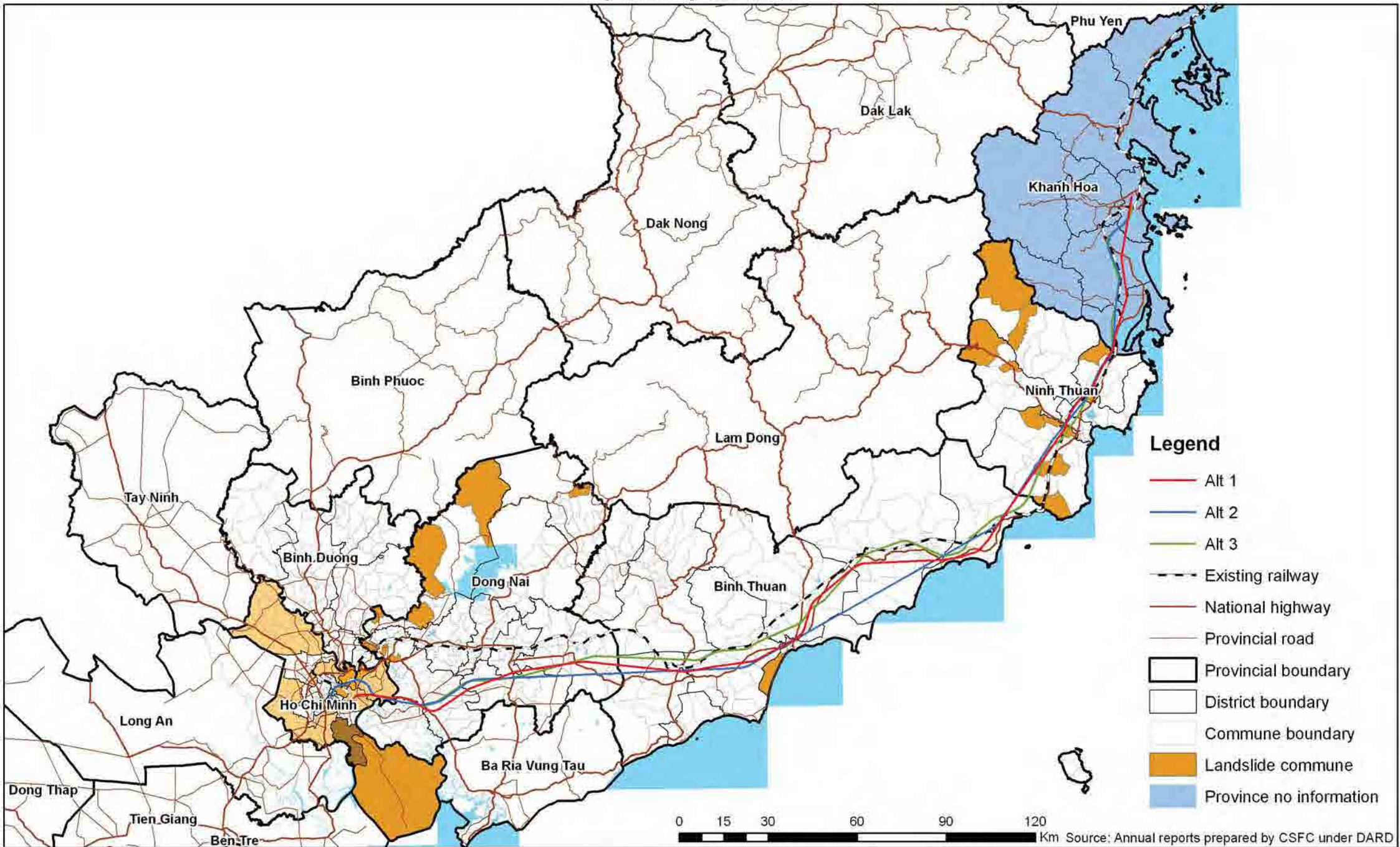
[South.02_2] - Distribution of Forest



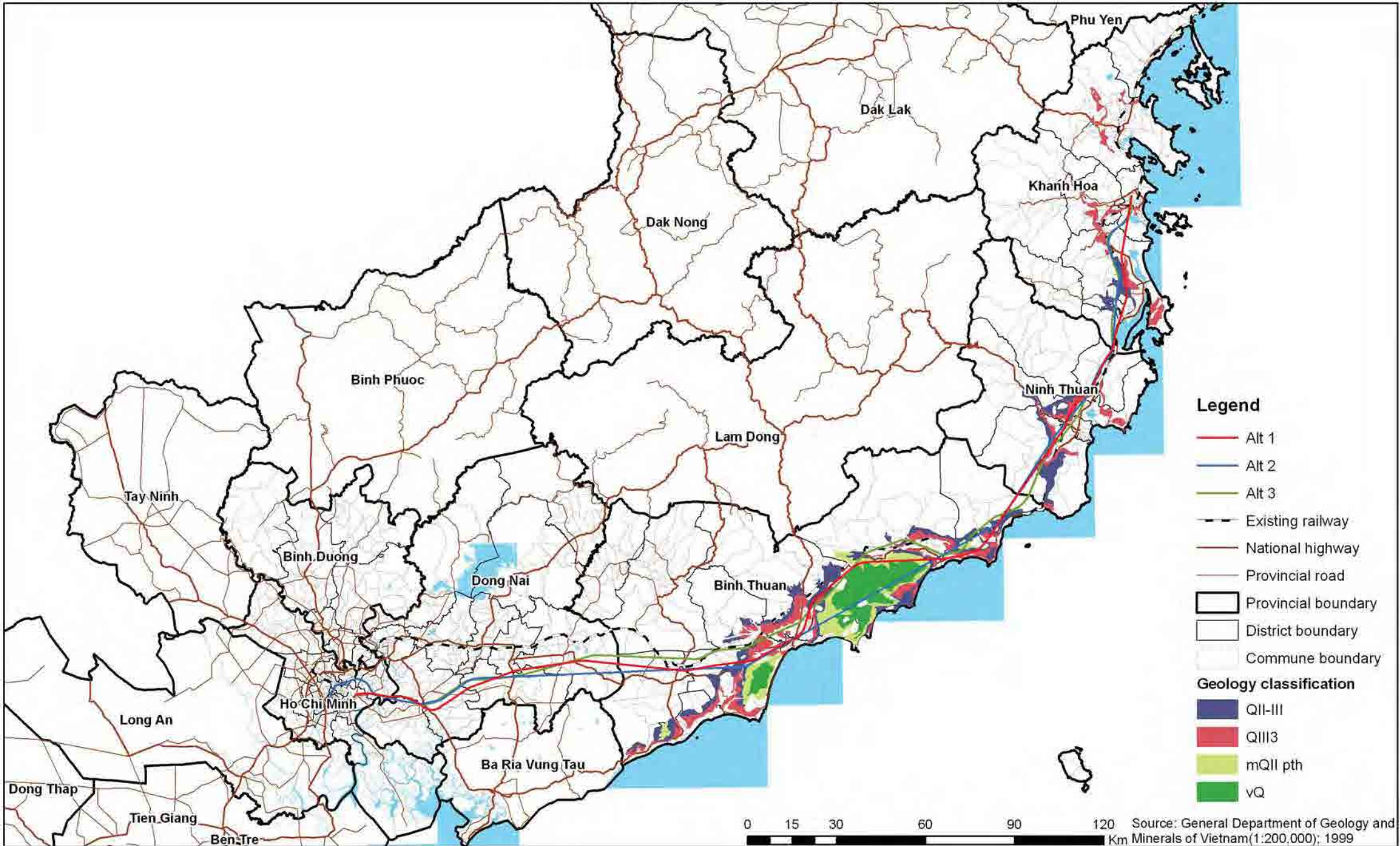
[South.03] - Flood Prone



[South.04] - Landslide



[South.05] - Geology



Legend

- Alt 1
- Alt 2
- Alt 3
- Existing railway
- National highway
- Provincial road
- ▭ Provincial boundary
- ▭ District boundary
- ▭ Commune boundary

Geology classification

- ▭ QII-III
- ▭ QIII3
- ▭ mQII pth
- ▭ vQ

0 15 30 60 90 120 Source: General Department of Geology and Minerals of Vietnam(1:200,000); 1999
Km

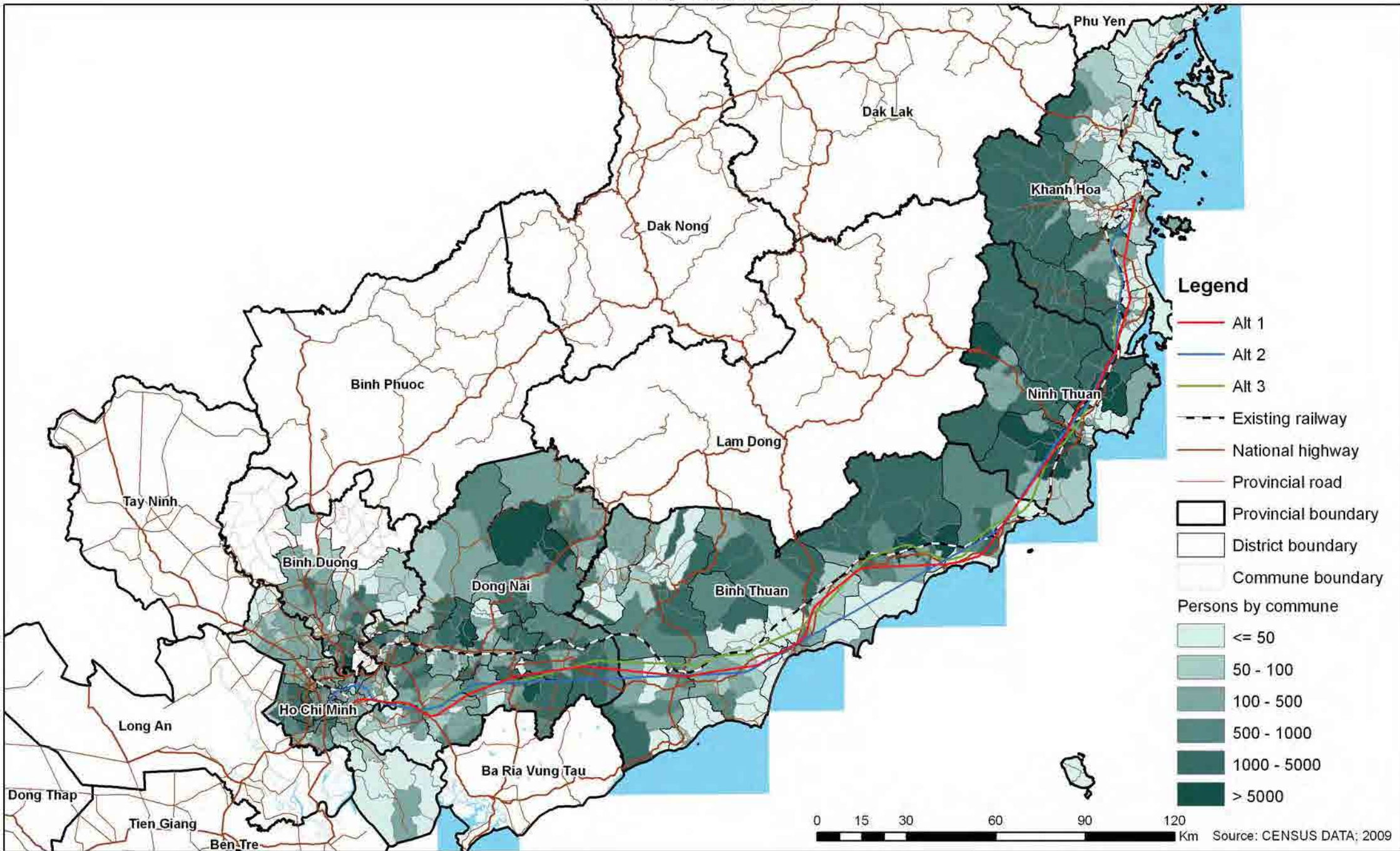
[South.06] - Cultural Heritage



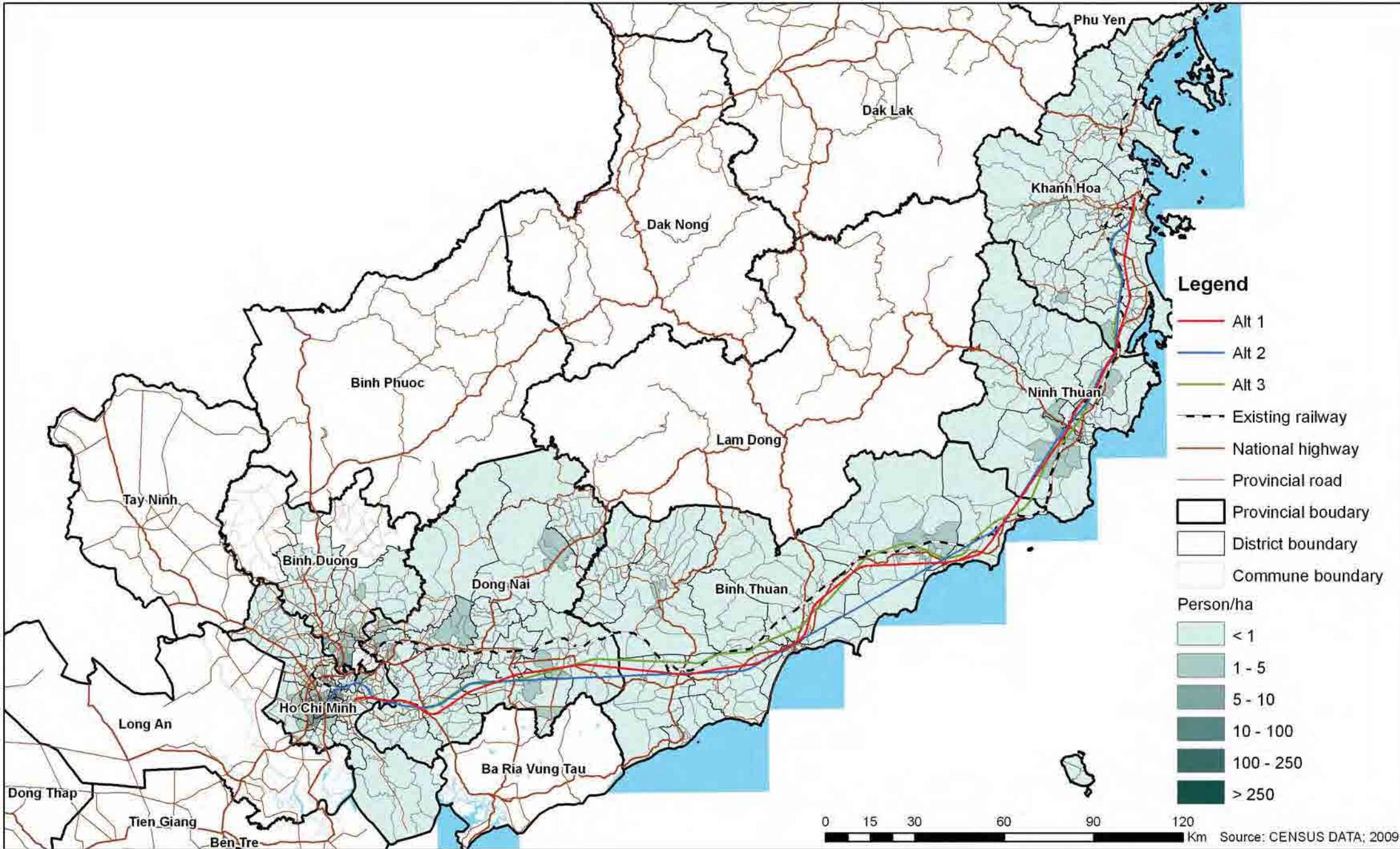
- Legend**
- Cultural heritage
 - Alt 1
 - Alt 2
 - Alt 3
 - - - Existing railway
 - National highway
 - Provincial road
 - ▭ Provincial boundary
 - ▭ District boundary
 - ▭ Commune boundary

0 15 30 60 90 120 Km Source: DOCSTs

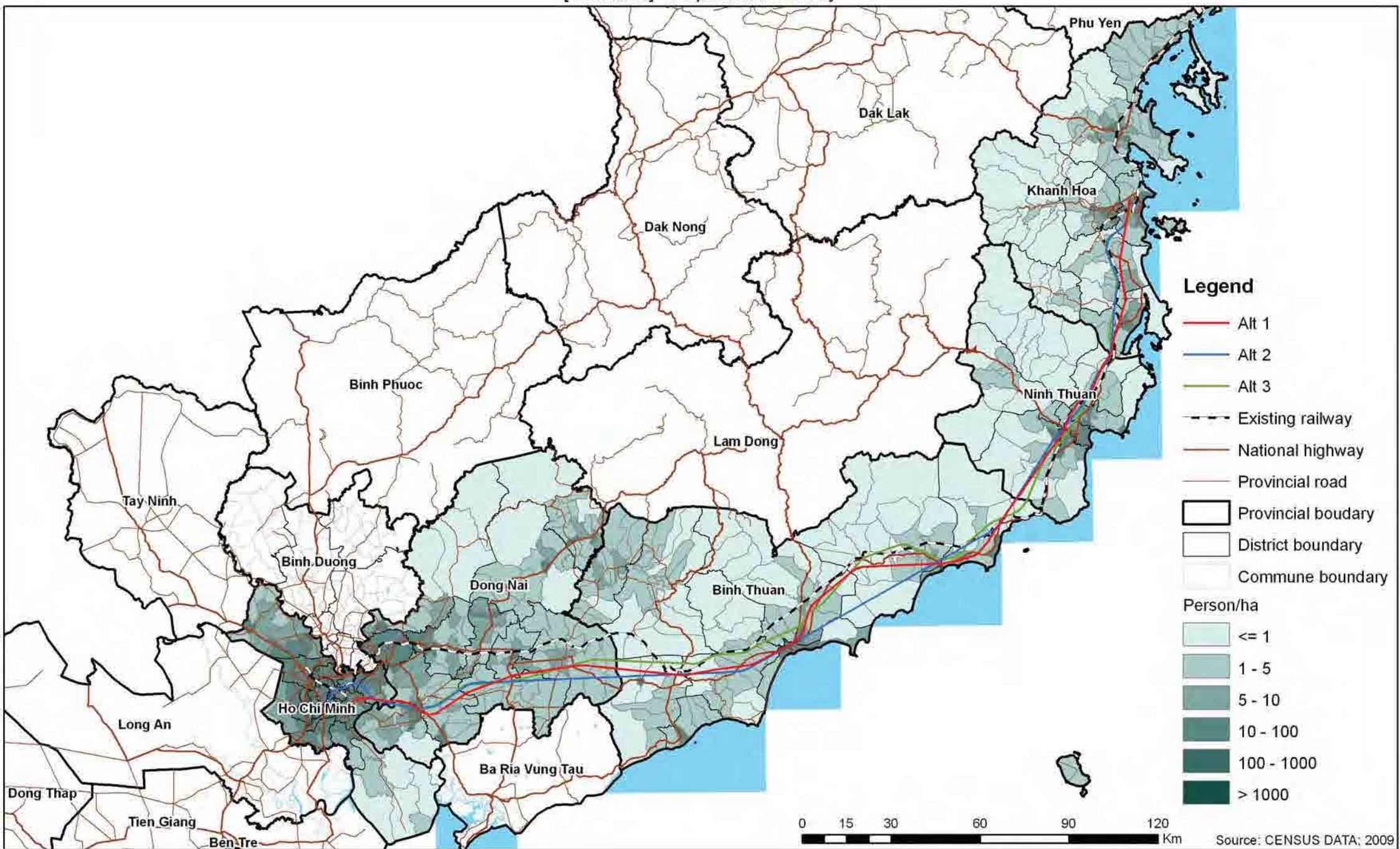
[South.07] - Ethnic Minority



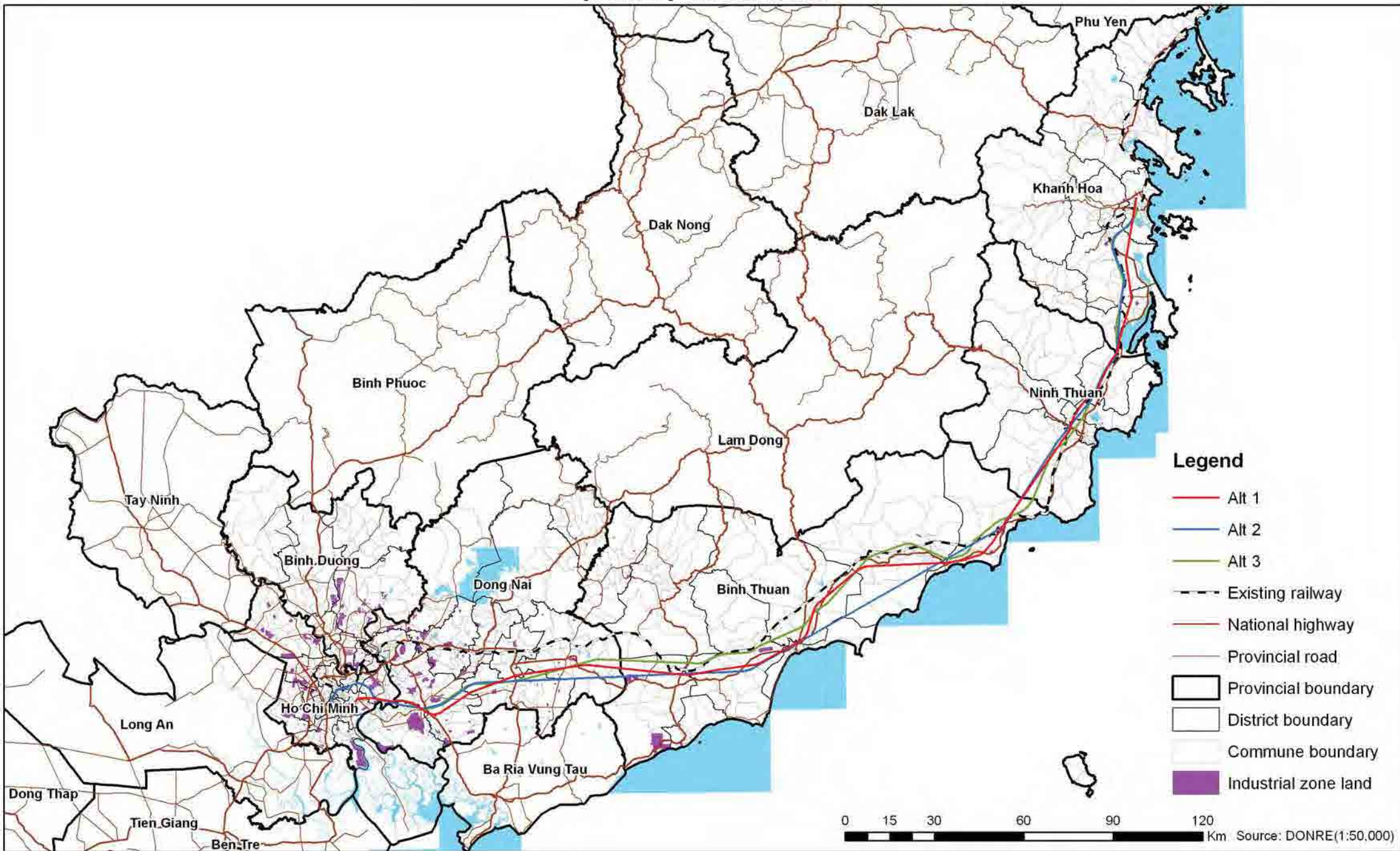
[South.07_2] - Ethnic Minority Density



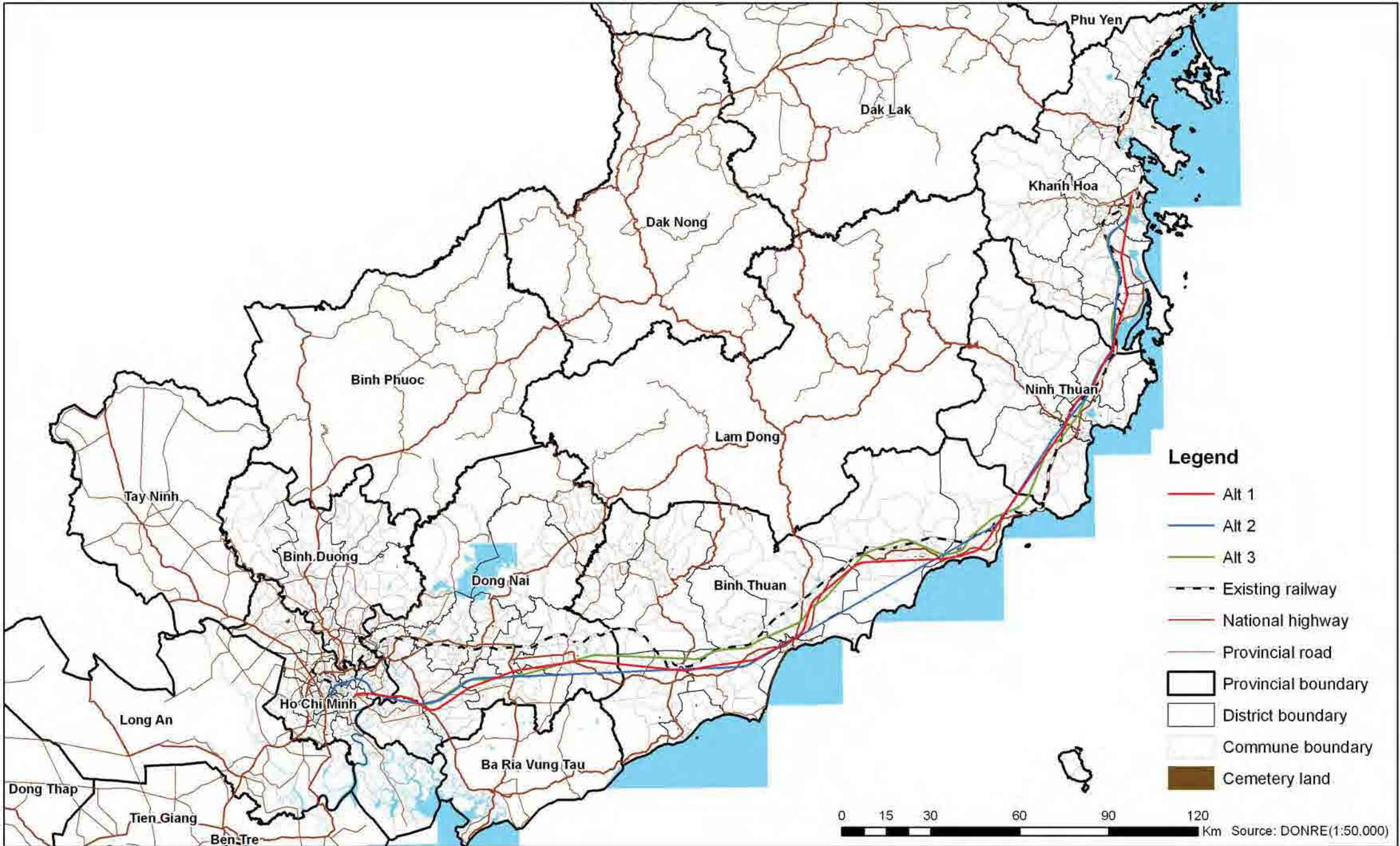
[South.08] - Population Density



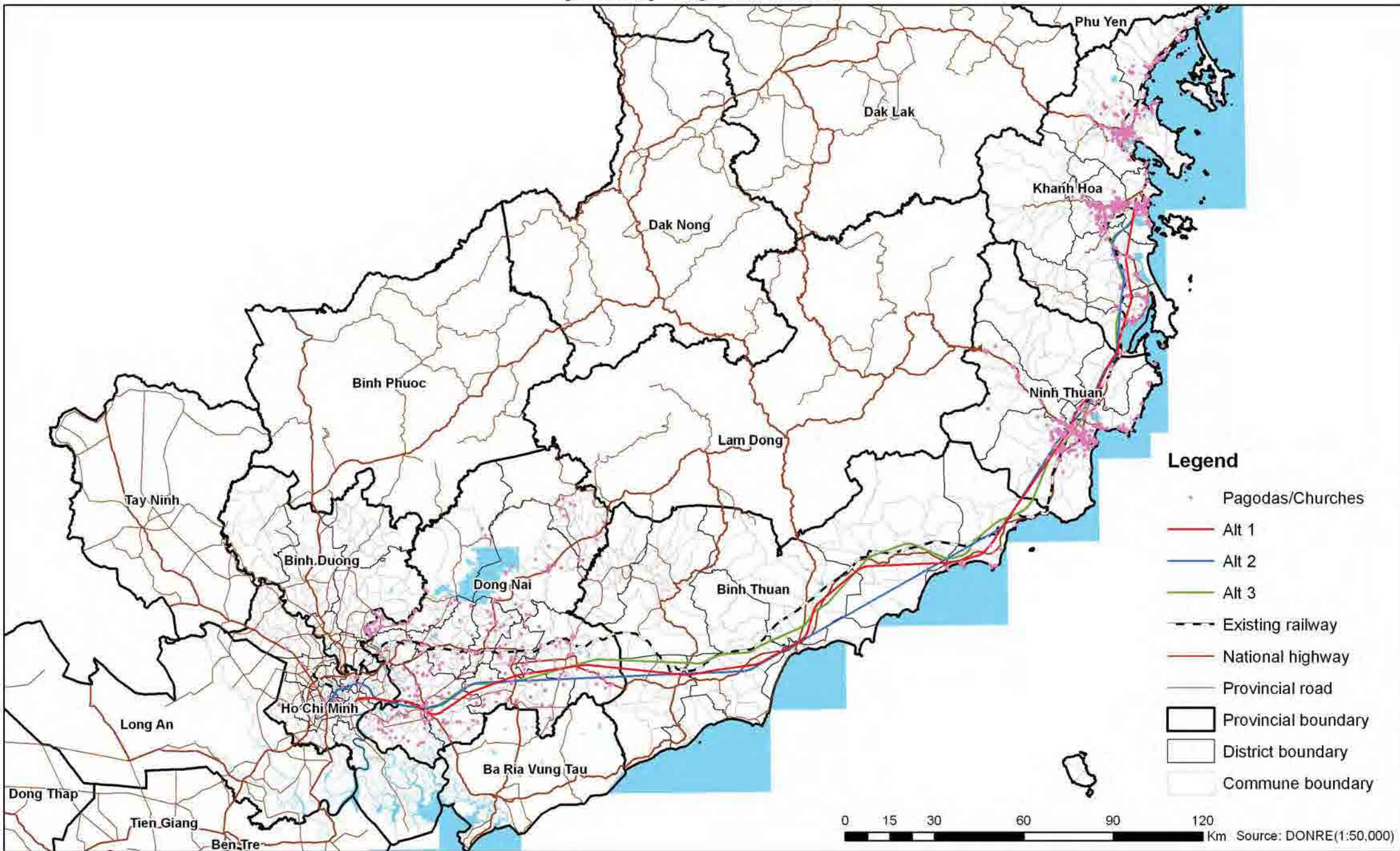
[South.09] - Industrial Zone



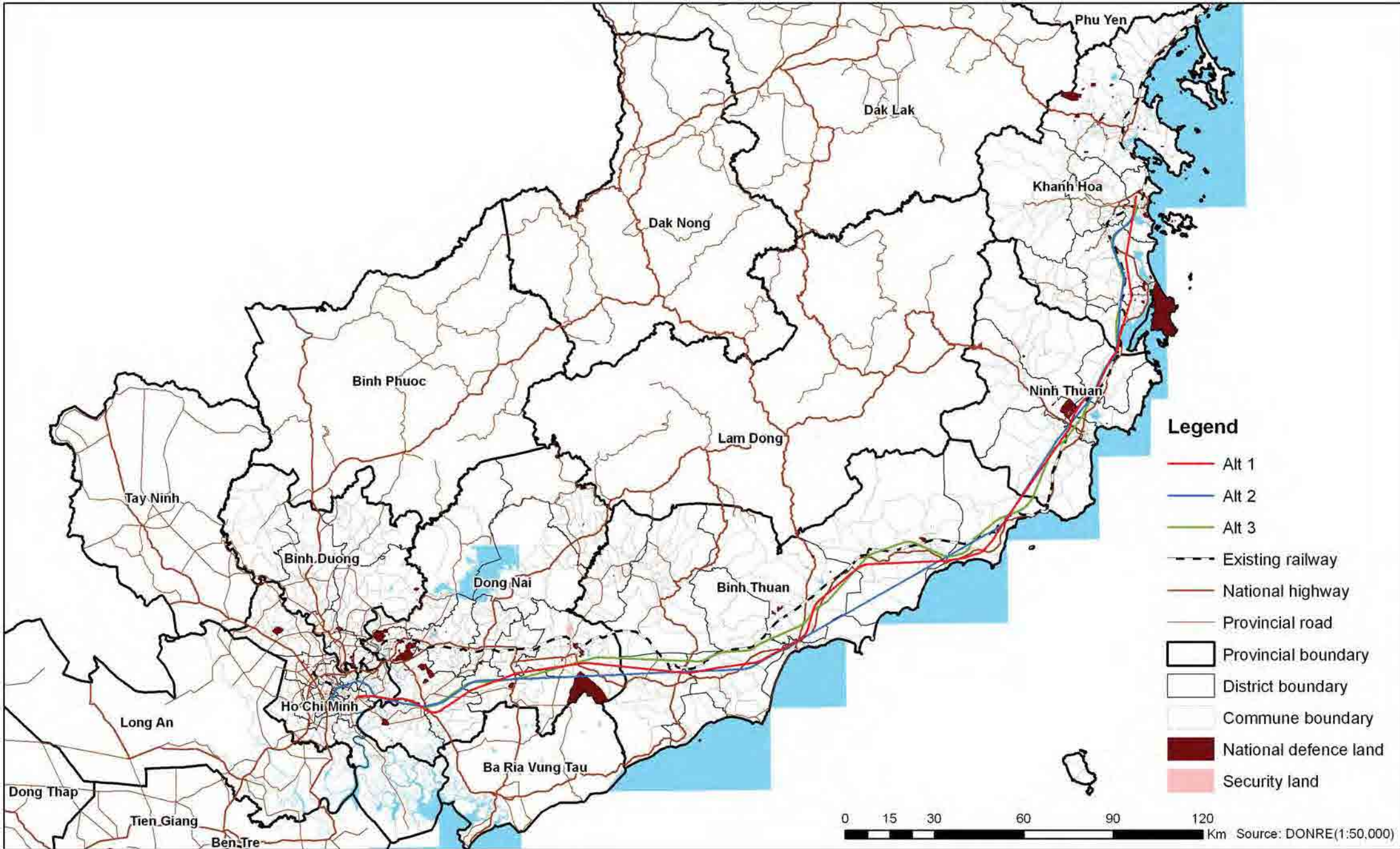
[South.10] - Cemetery Land



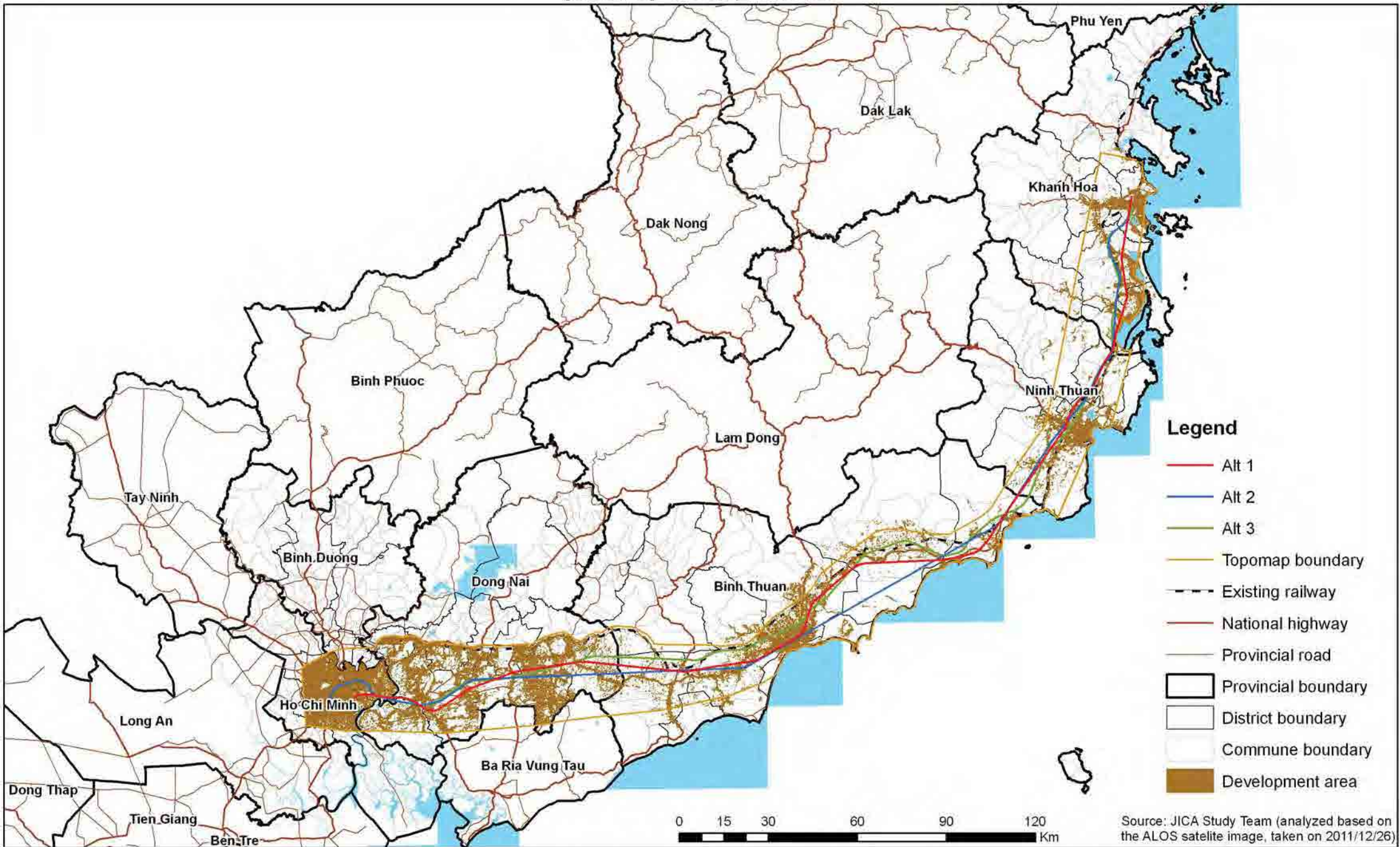
[South.11] - Pagodas/Churches



[South.12] - Army Area

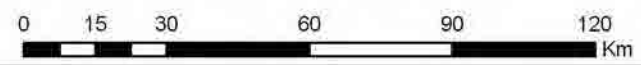


[South.13] - Development Area



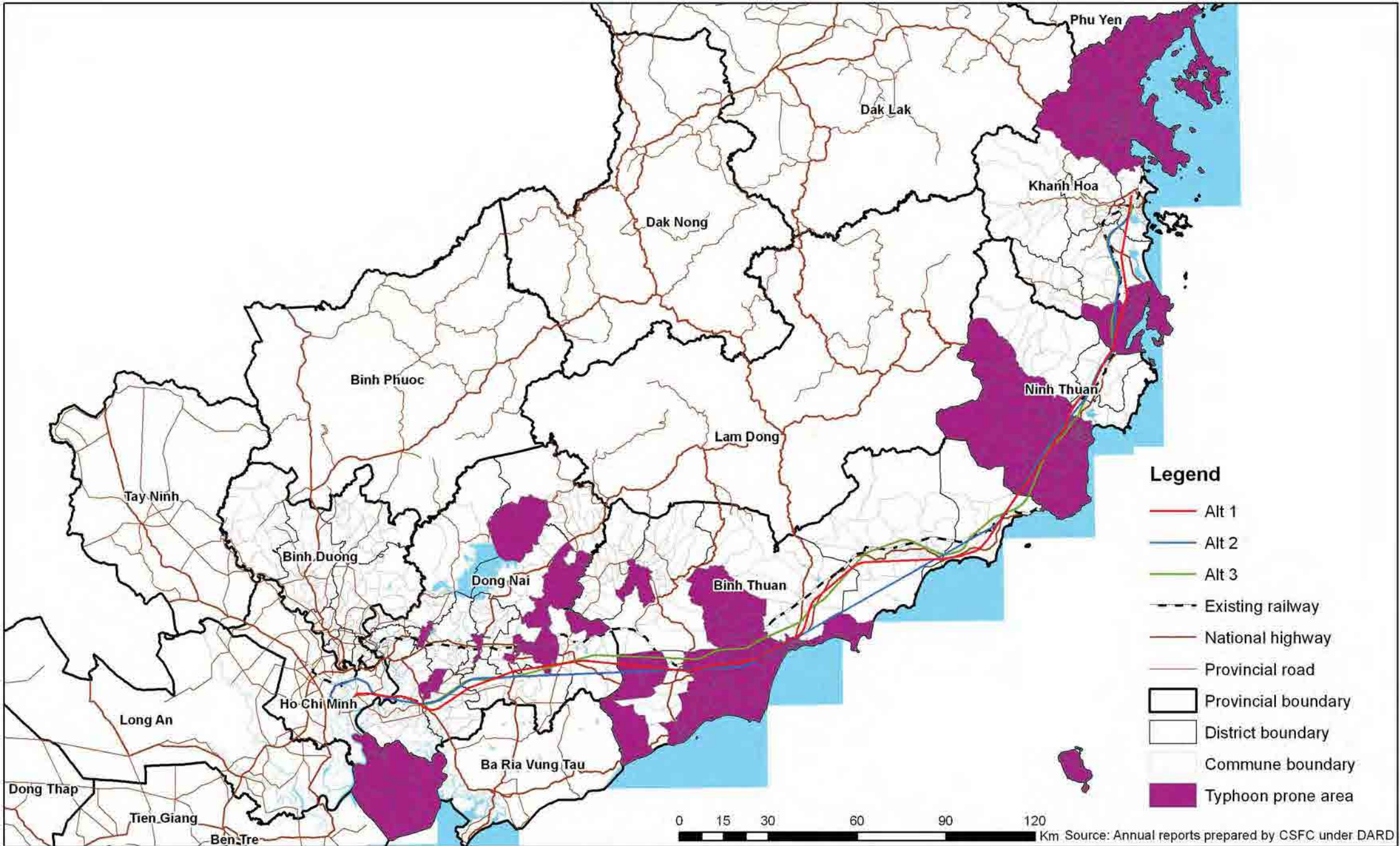
Legend

- Alt 1
- Alt 2
- Alt 3
- Topomap boundary
- Existing railway
- National highway
- Provincial road
- Provincial boundary
- District boundary
- Commune boundary
- Development area

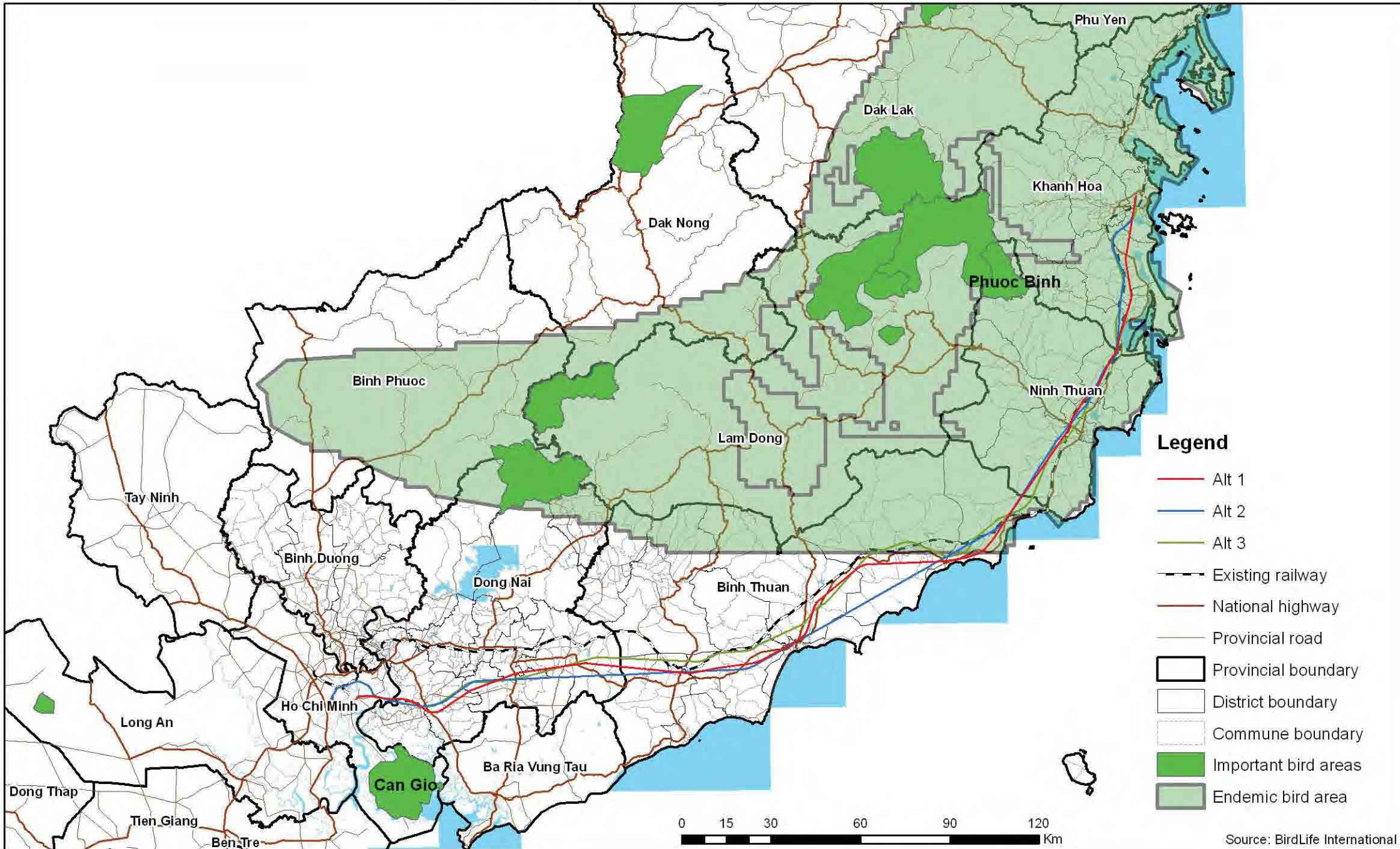


Source: JICA Study Team (analyzed based on the ALOS satellite image, taken on 2011/12/26)

[South.14] - Typhoon Prone

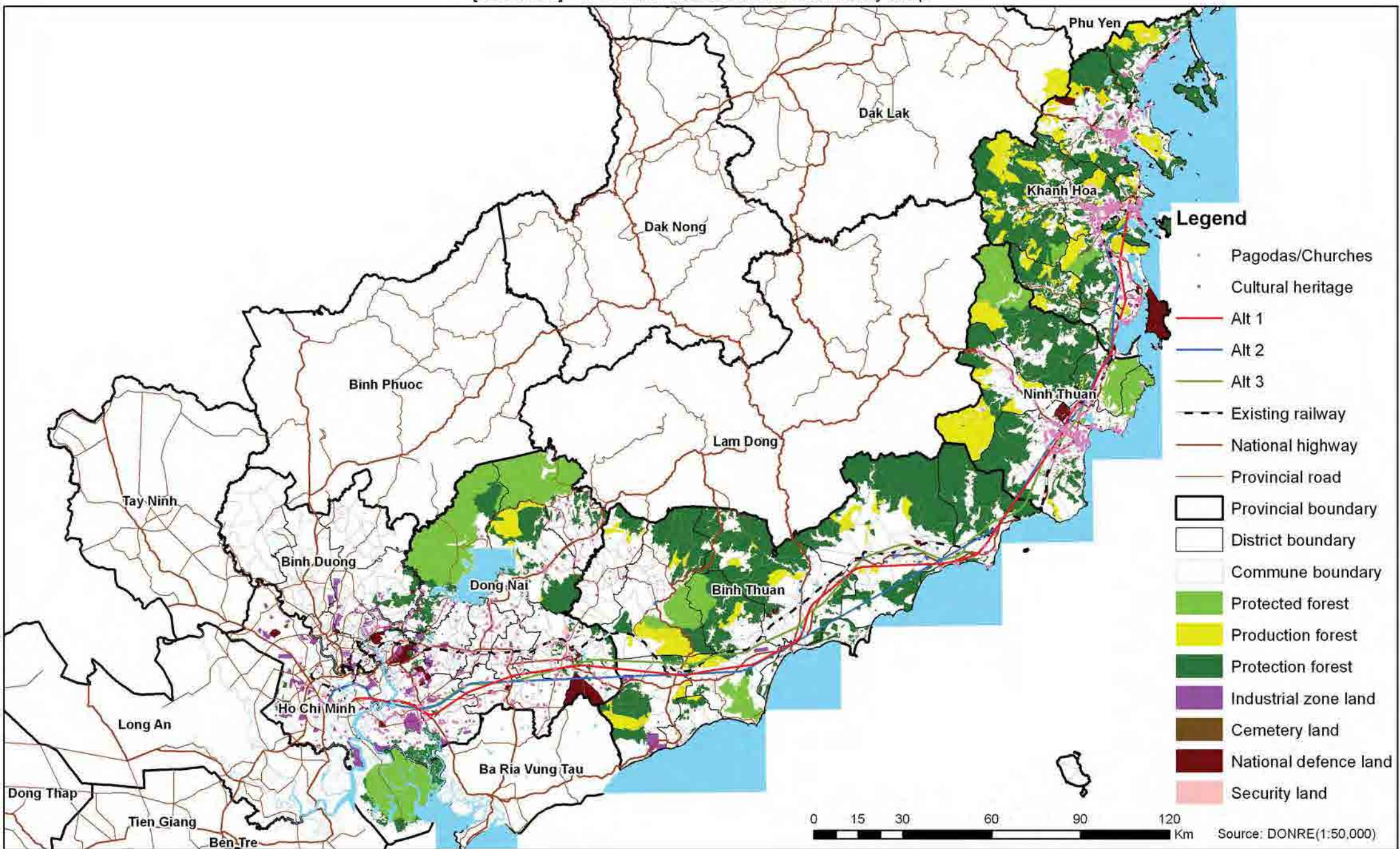


[South.15] - Important Bird Areas and Endemic Bird Areas



Source: BirdLife International

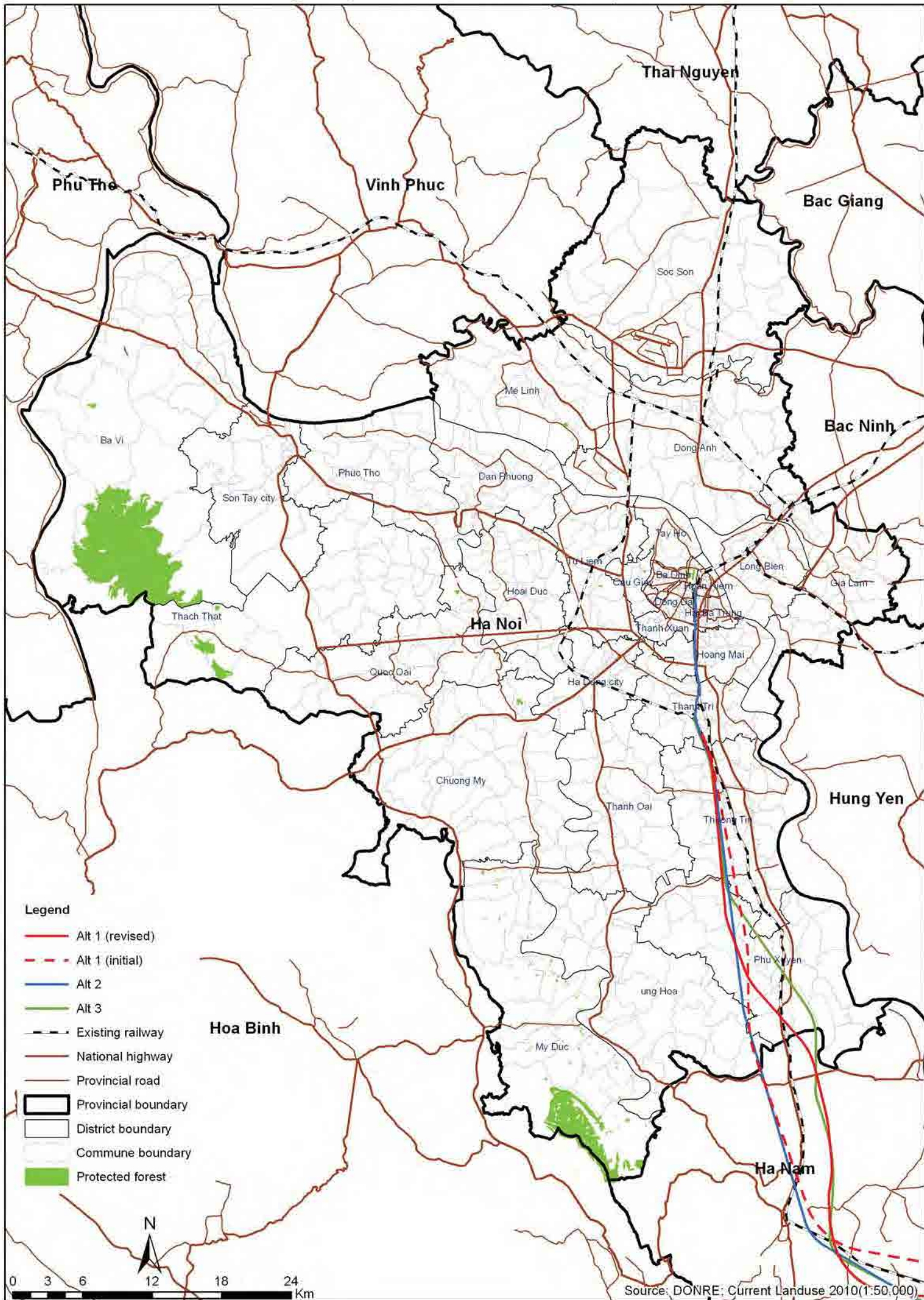
[South.16] - Overlaid Environmental Sensitivity Map

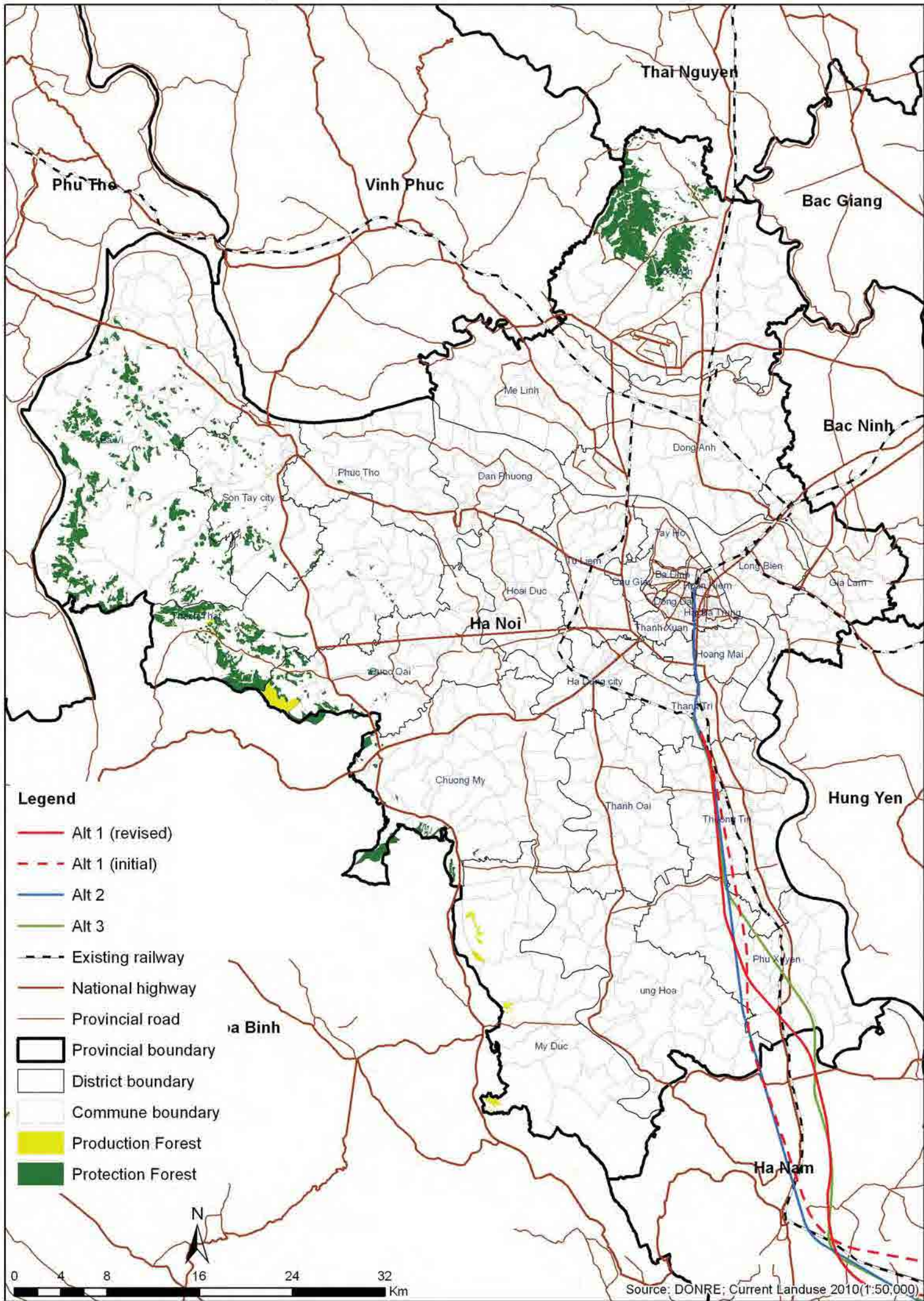


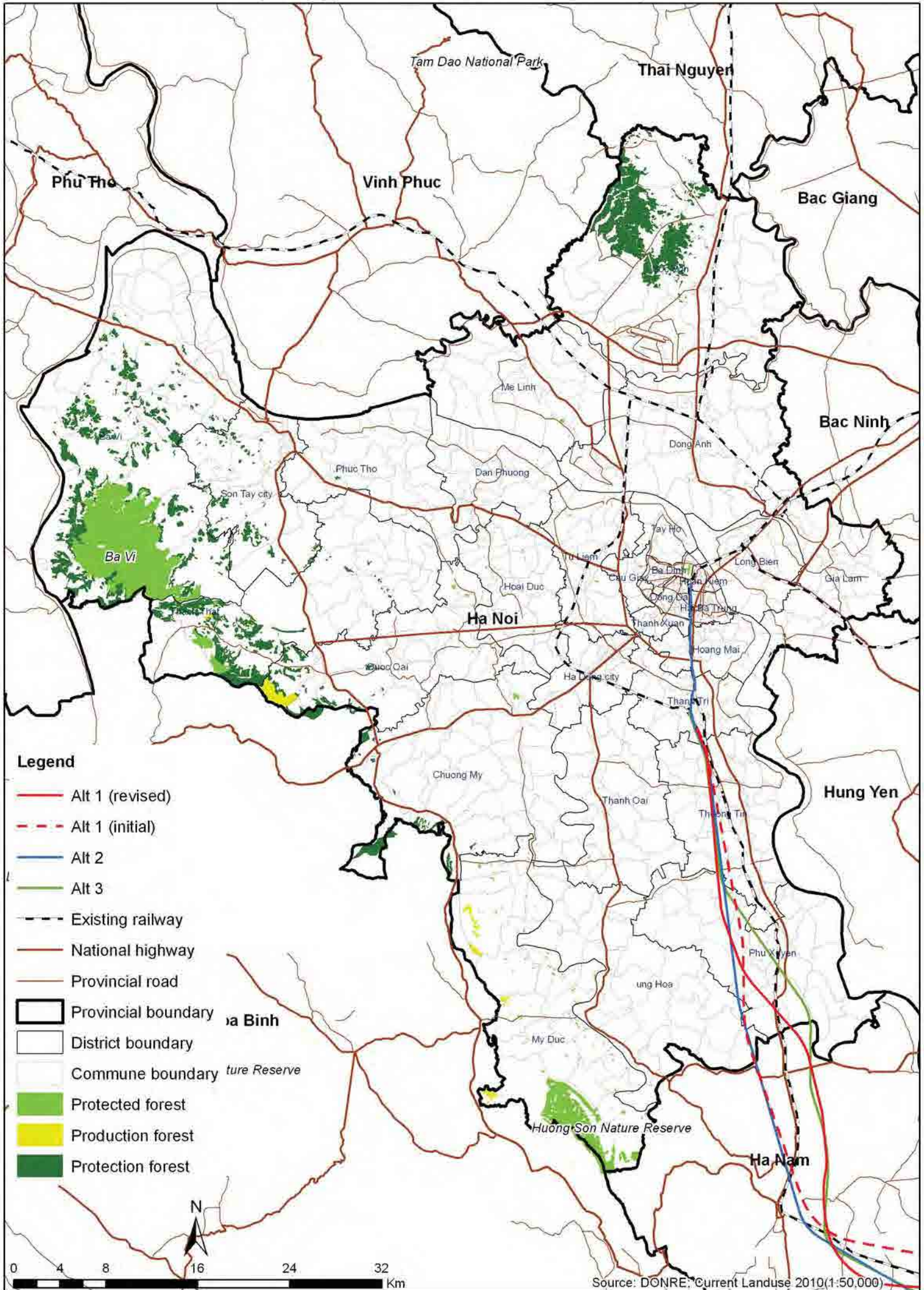
HA NOI CITY

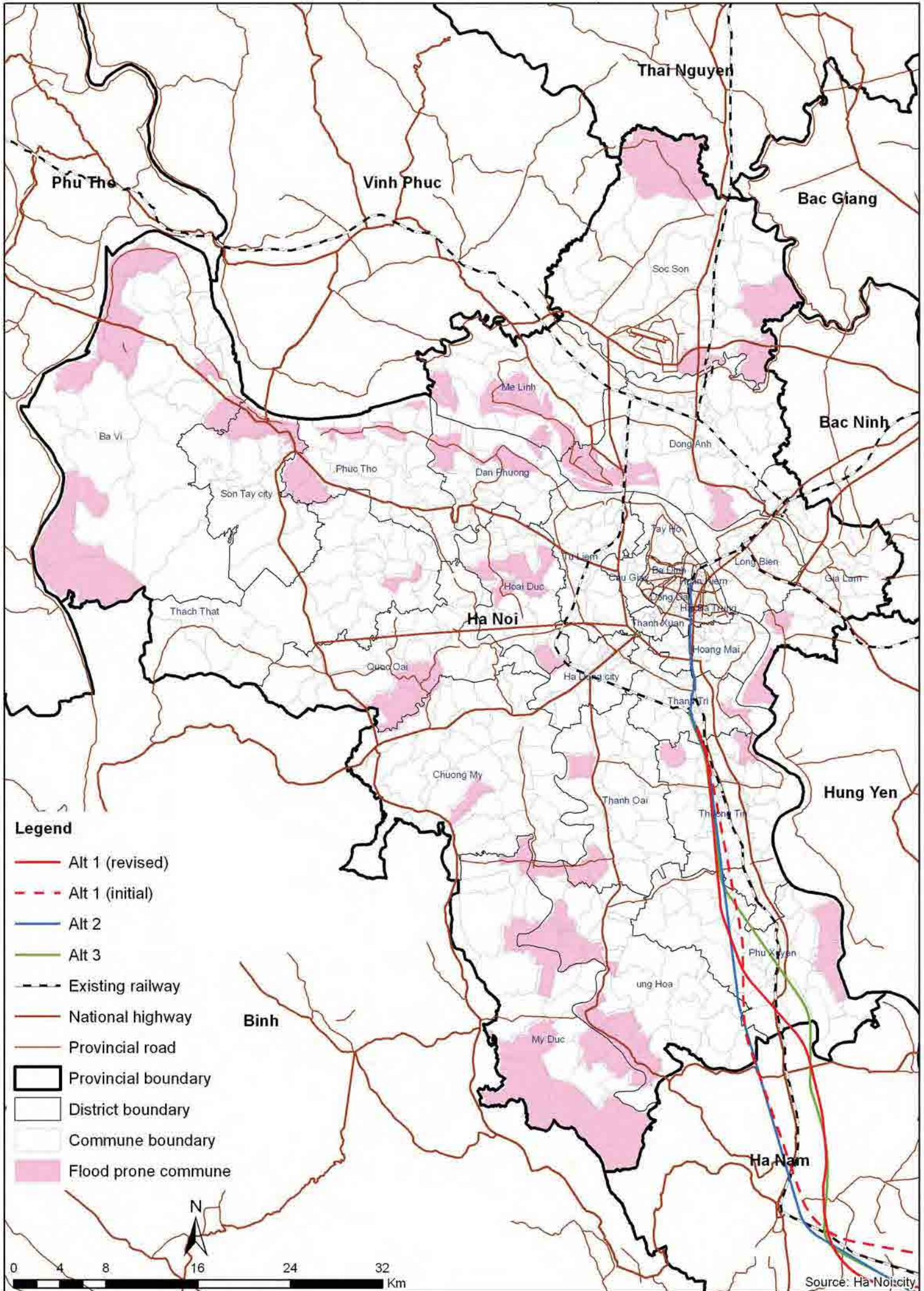
01.01	Protected Area
01.02	Protection and Production Forest
01.02_2	Distribution of Forest
01.03	Flood Prone
01.07	Ethnic Minority
01.07_2	Ethnic Minority Density
01.08	Population Density
01.09	Industrial Zone
01.10	Cemetery Land
01.11	Pagodas/Churches
01.12	Army Area
01.13	Development Area
01.15	Important Bird Areas and Endemic Bird Areas
01.16	Overlaid Environmental Sensitivity Map

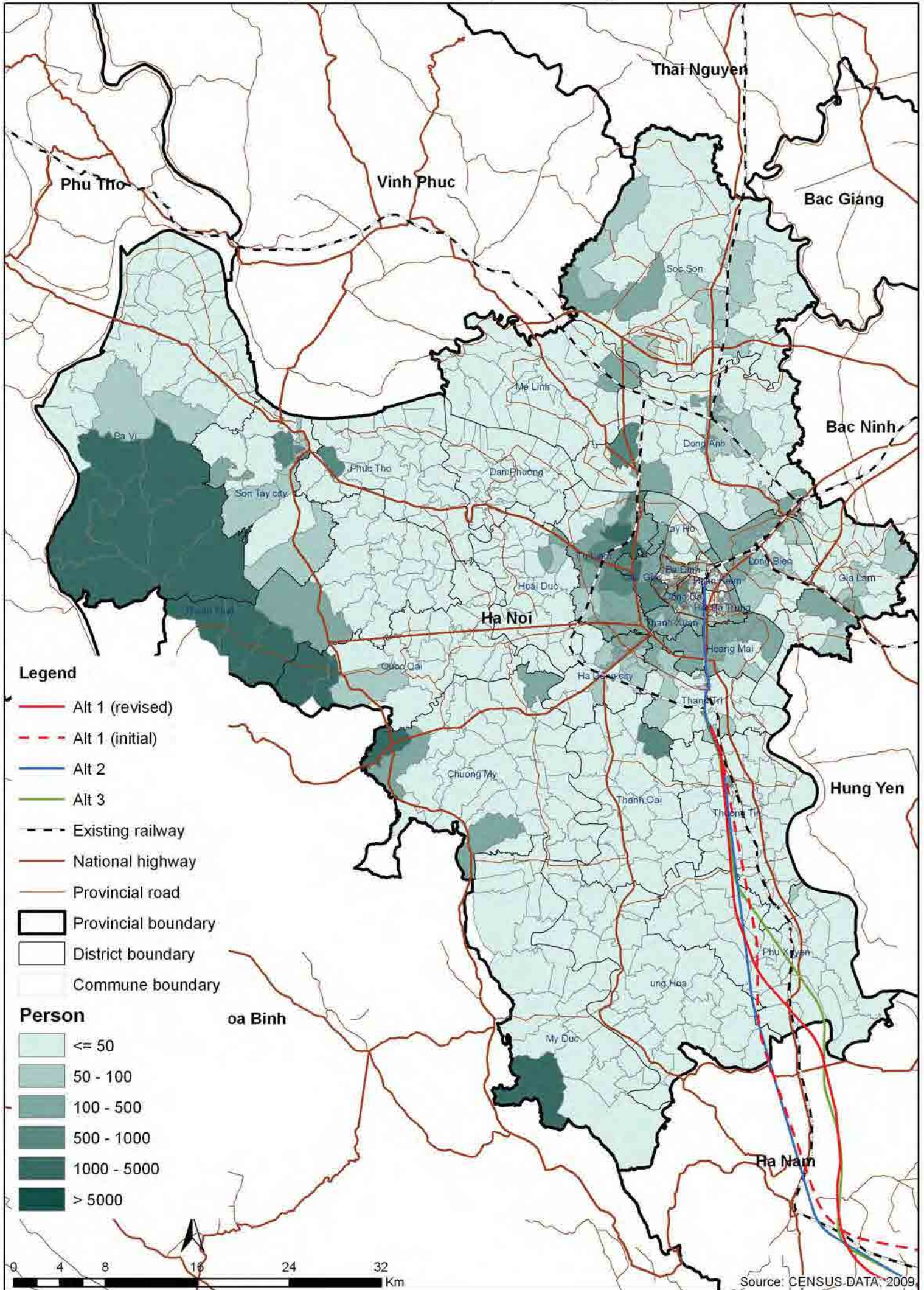
*Missing number(s) means there was no data available to prepare the map.

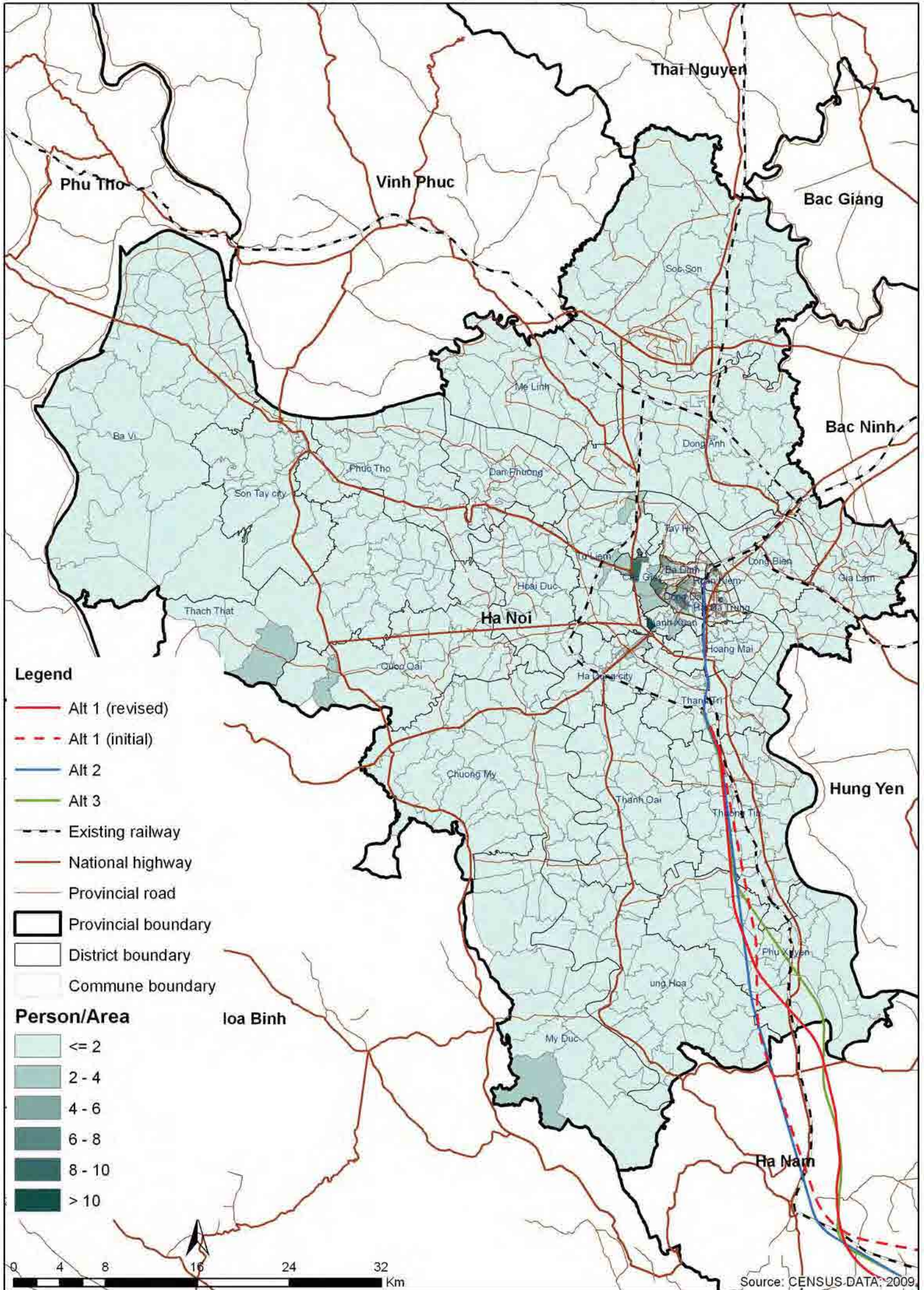










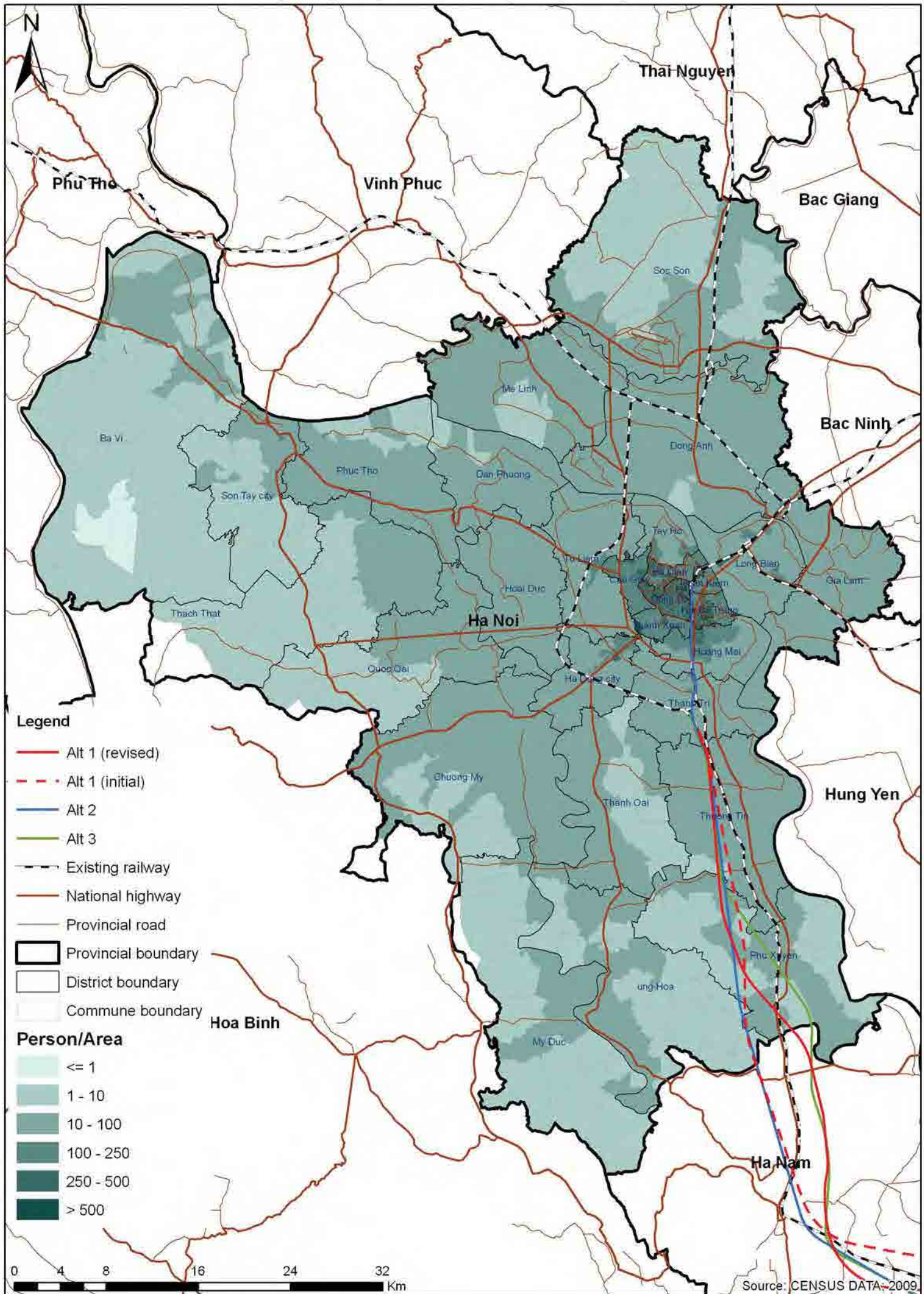


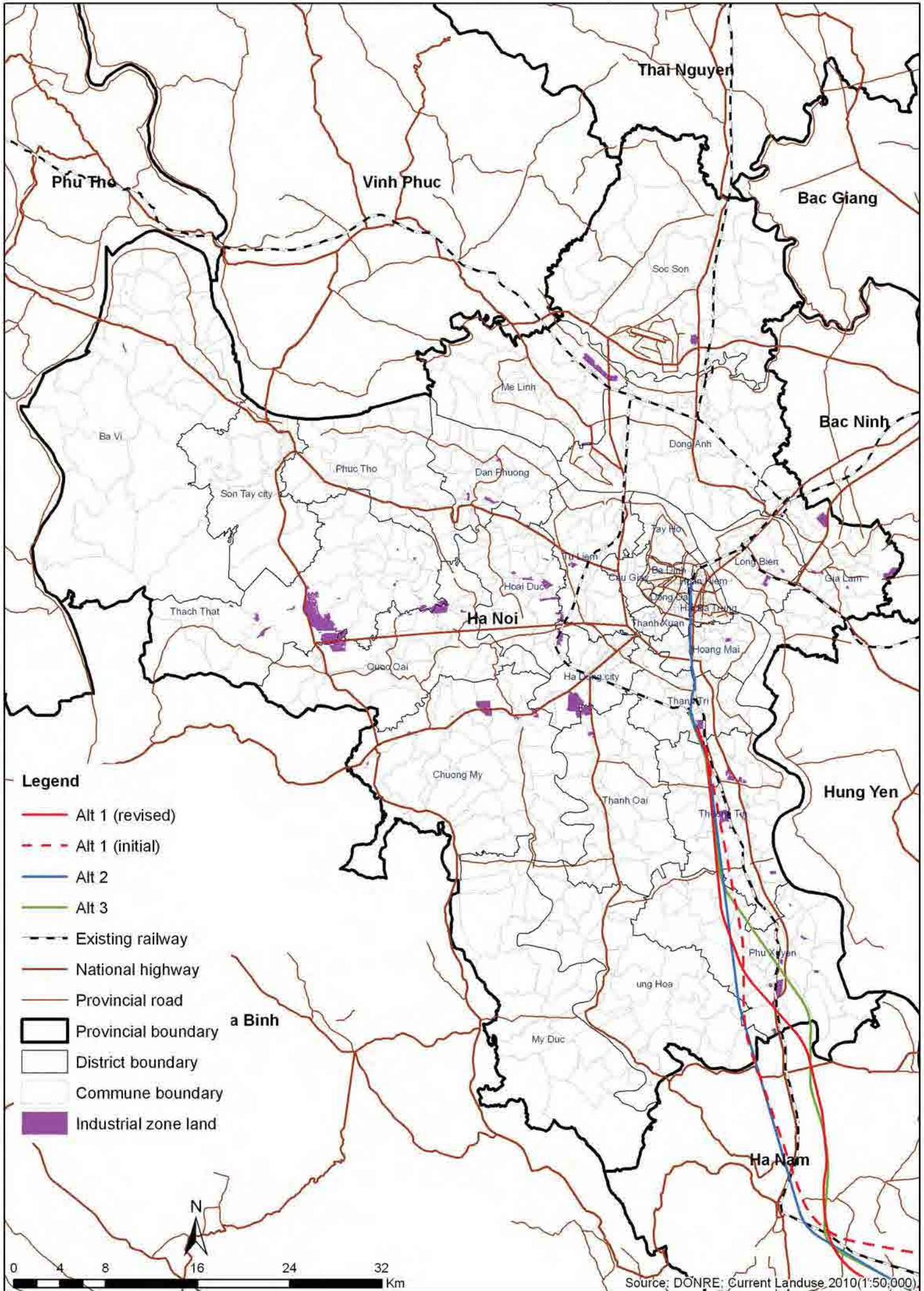
Legend

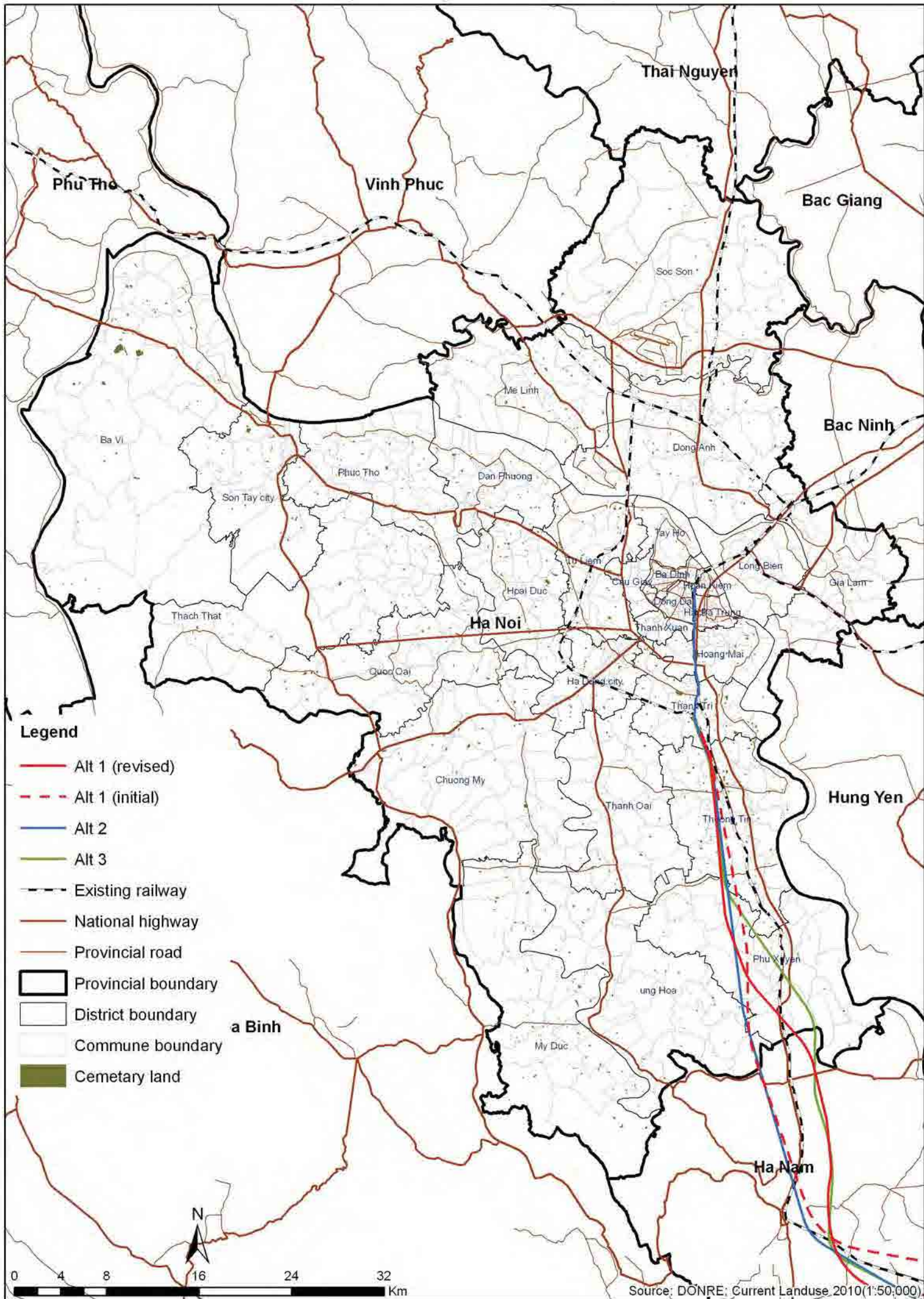
- Alt 1 (revised)
- - - Alt 1 (initial)
- Alt 2
- Alt 3
- Existing railway
- National highway
- Provincial road
- Provincial boundary
- District boundary
- Commune boundary

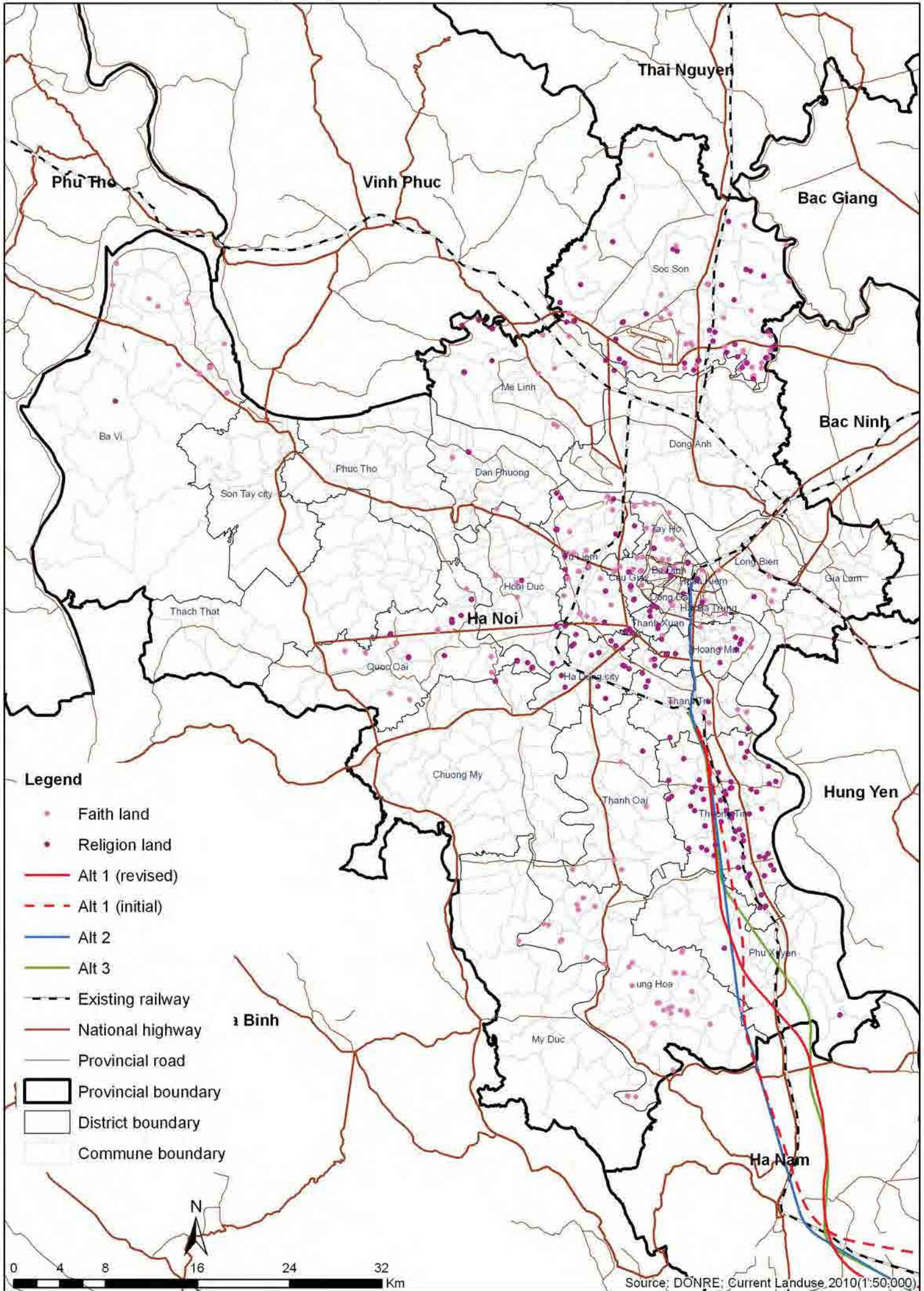
Person/Area

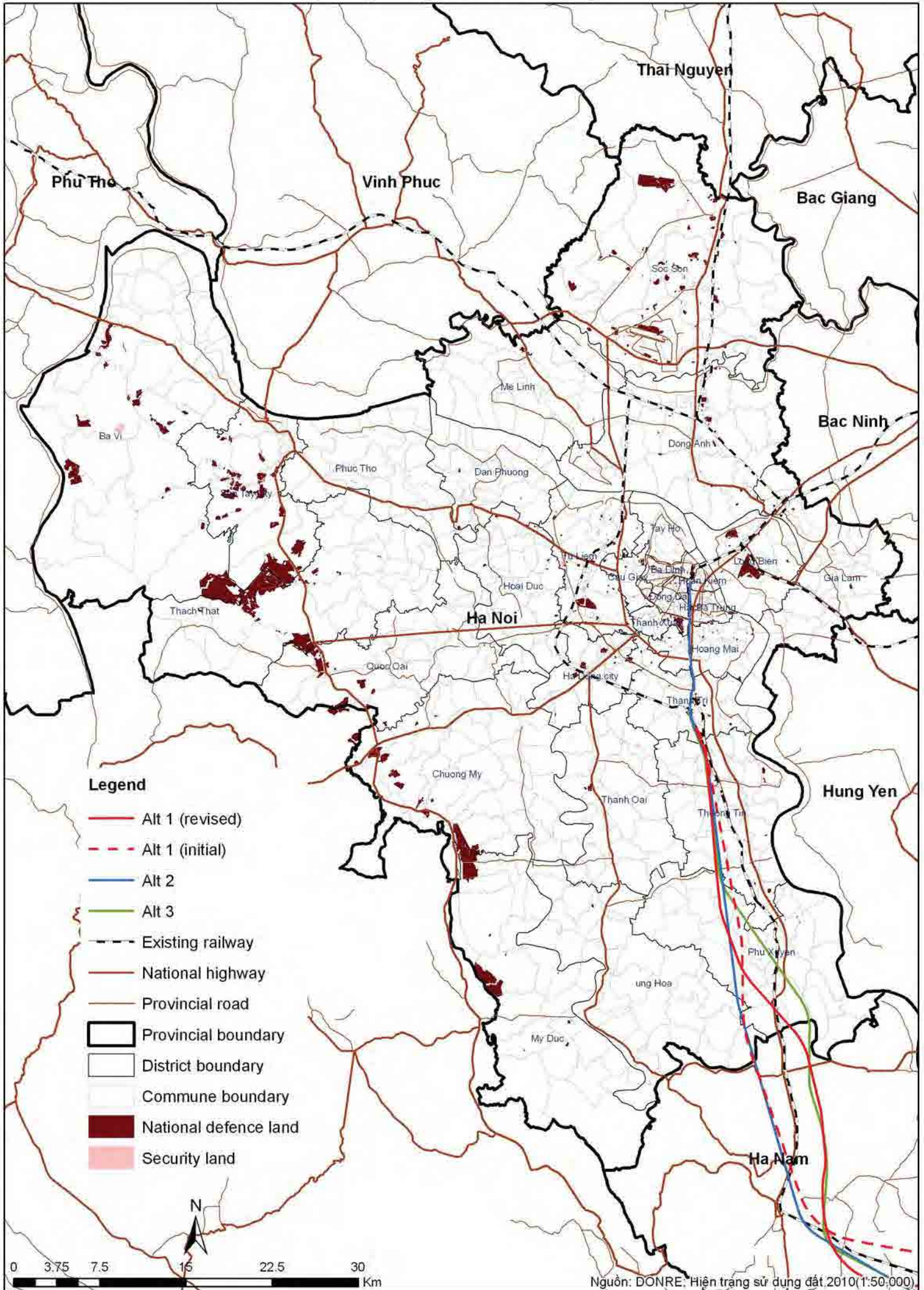
- <= 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- > 10

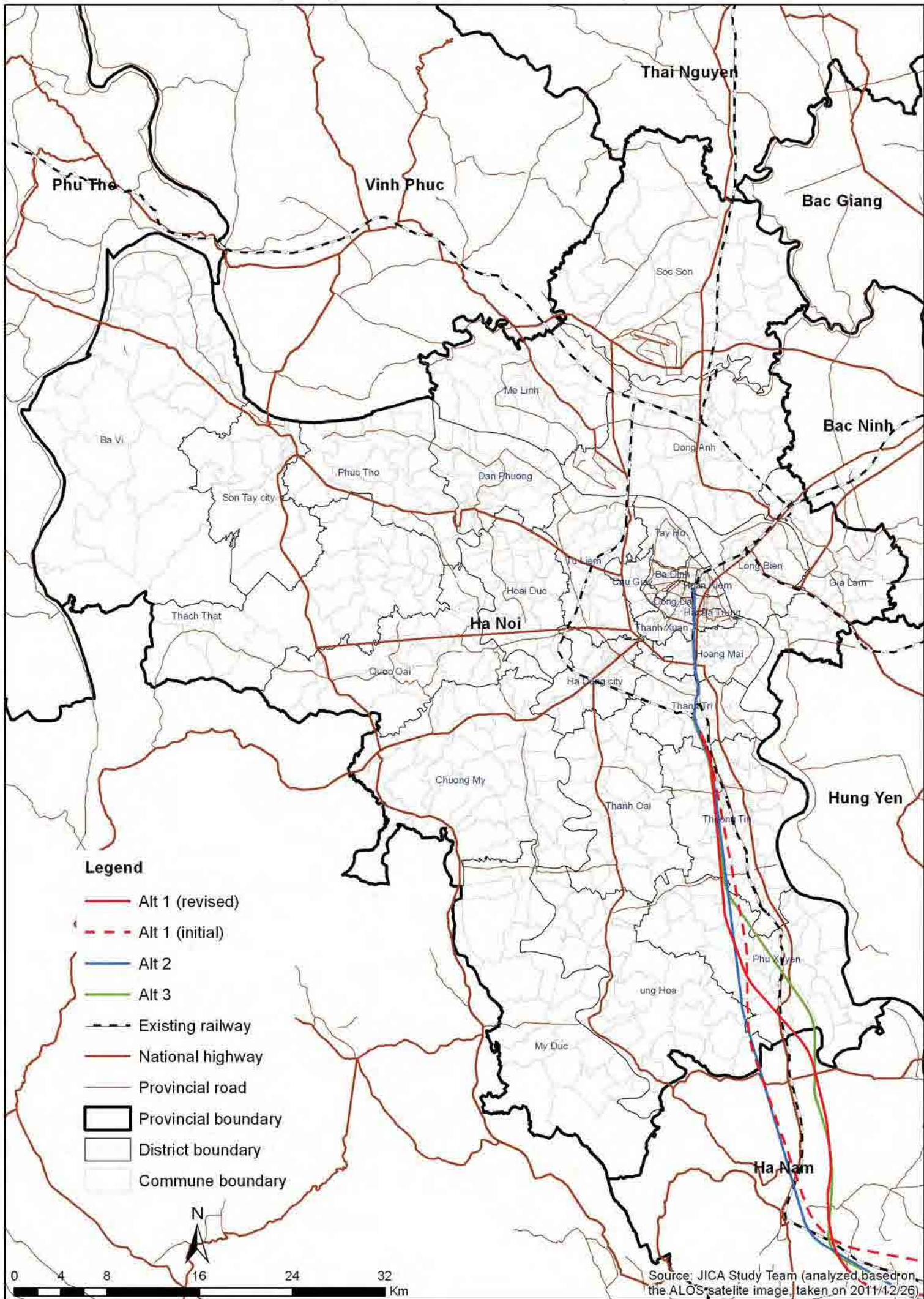






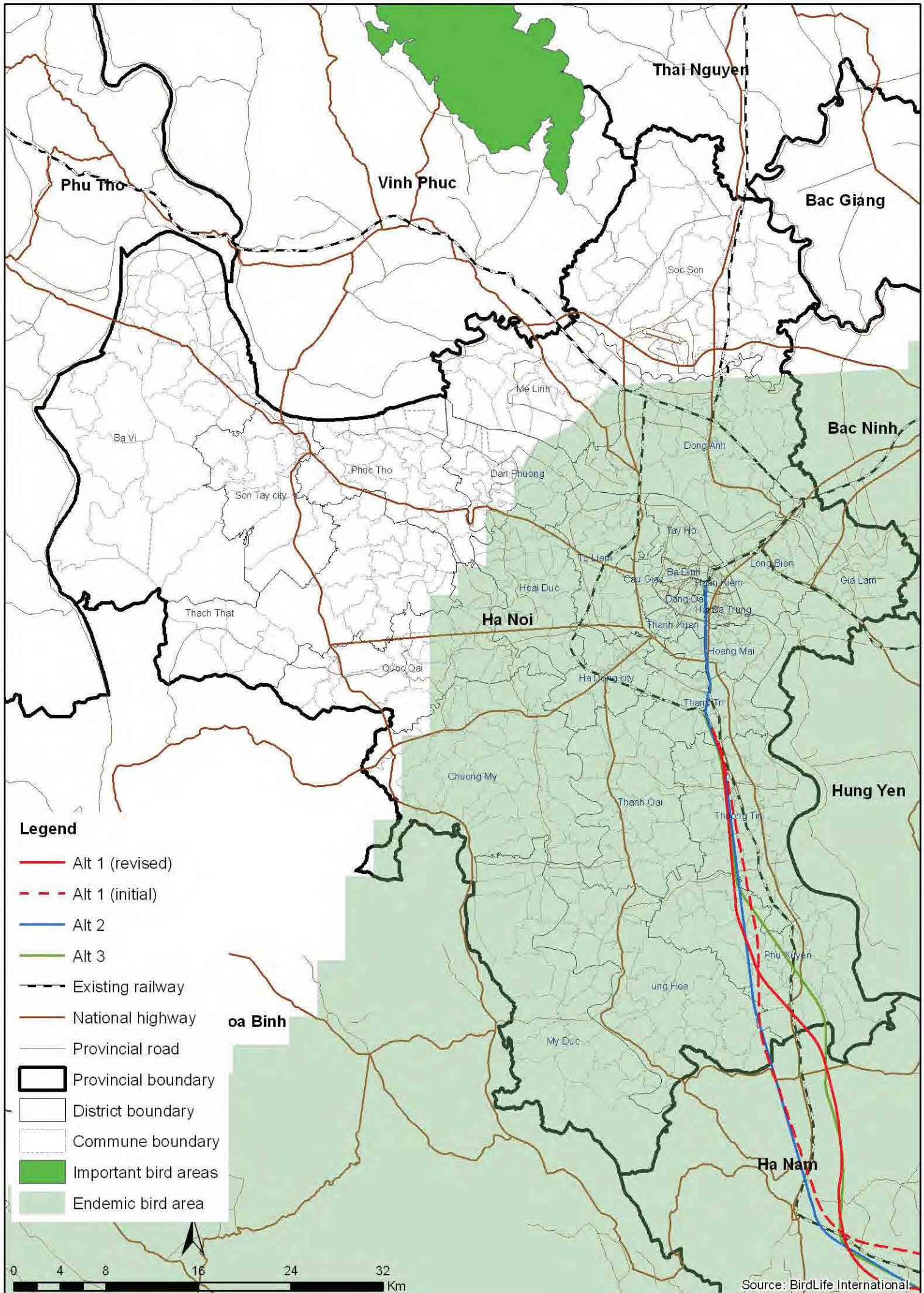






Source: JICA Study Team (analyzed based on the ALOS satellite image taken on 2011/12/26)

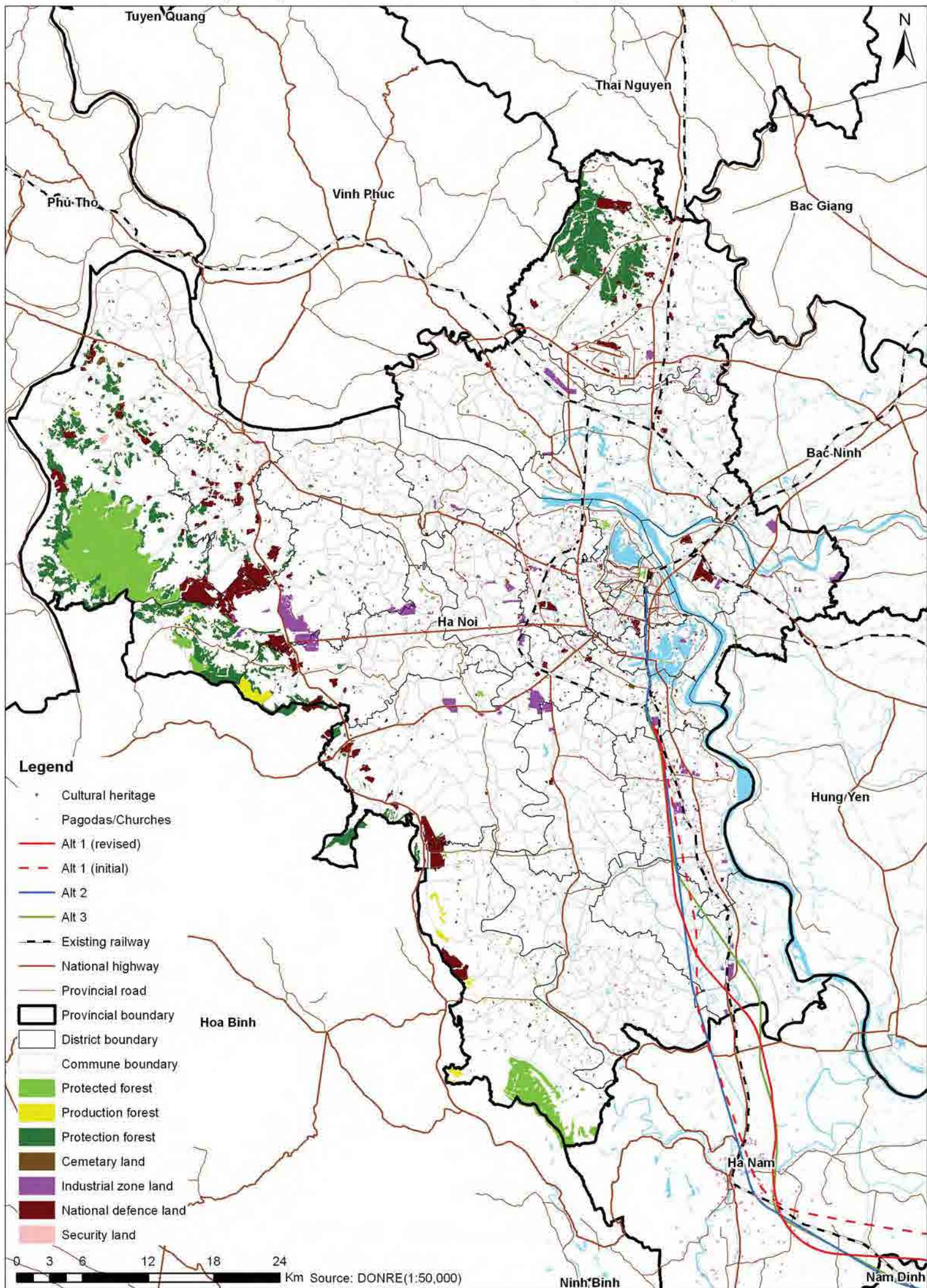
[01.15] - Important Bird Areas and Endemic Bird Areas - Ha Noi Capital



Legend

- Alt 1 (revised)
- - - Alt 1 (initial)
- Alt 2
- Alt 3
- Existing railway
- National highway
- Provincial road
- Provincial boundary
- District boundary
- Commune boundary
- Important bird areas
- Endemic bird area

[01.16] - Overlaid Environmental Sensivity Map - Ha Noi Capital



Legend

- Cultural heritage
- Pagodas/Churches
- Alt 1 (revised)
- - - Alt 1 (initial)
- Alt 2
- Alt 3
- Existing railway
- National highway
- Provincial road
- ▭ Provincial boundary
- ▭ District boundary
- ▭ Commune boundary
- ▭ Protected forest
- ▭ Production forest
- ▭ Protection forest
- ▭ Cemetary land
- ▭ Industrial zone land
- ▭ National defence land
- ▭ Security land

0 3 6 12 18 24 Km Source: DONRE(1:50,000)