Spatial Analysis for Mitigation the Environmental impacts of Ho Chi Minh Road

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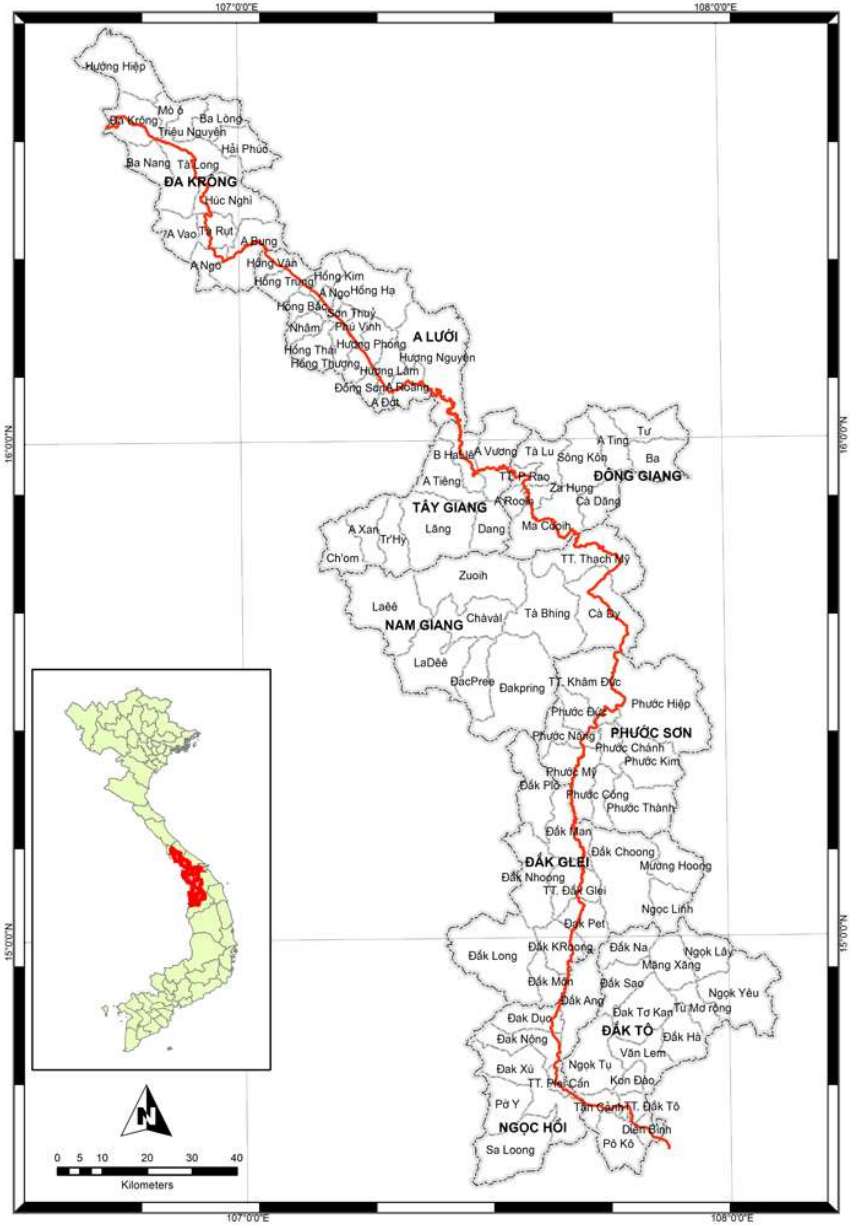
INTRODUCTION

- Ho Chi Minh roads is in the area which is home to unique and *endangered species* such as the saola, doucs, tiger and elephant. The landscape also has immense cultural importance for numerous *indigenous people*, who lead a lifestyle closely associated with natural resources.
- Environmental impacts of the road in term of *landscape ecology*, can be recognized by spatial analysis to the landscape assessment: Identification bisects forest areas; District level quantification of habitat breakages caused by road construction; Identification of key sites for forest corridor restoration.
- Recommendations for the *restoration of forest corridors* bisected by the road

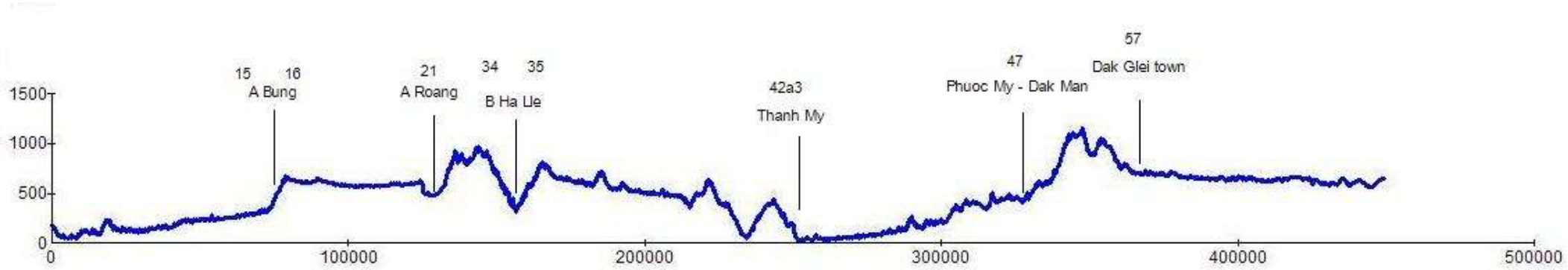
The study area

Four provinces:

- Quang Tri;
- Thua Thien – Hue;
- Quang Nam and
- Kon Tum



The study area

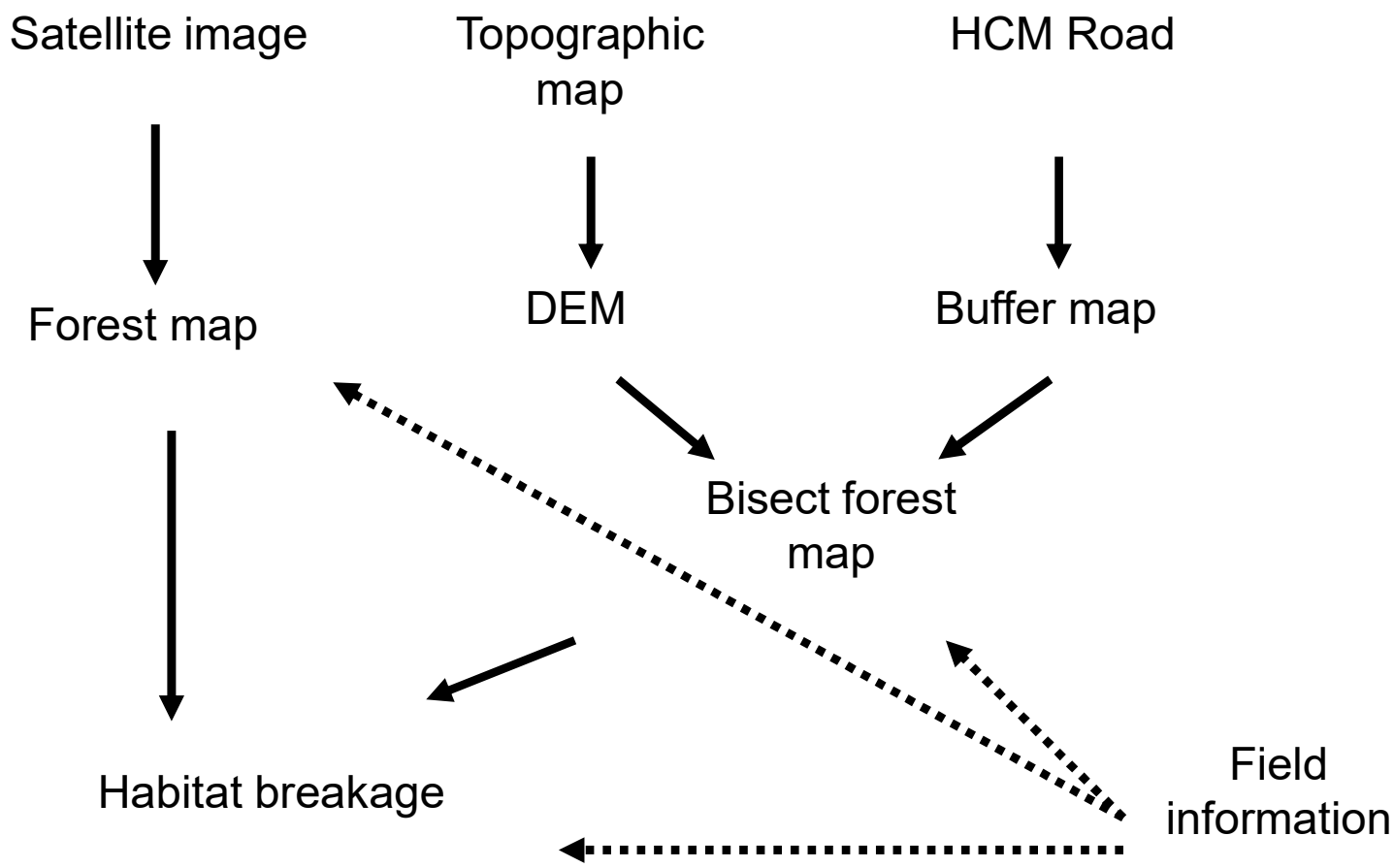


Section	From - to		Topographic condition	
	Commune	Field point	Elevation	Slope
1	Dak Rong – A Bung	1 - 15	<500m; mainly 100m to 300m	Gently
2	A Bung – A Roang	16 - 21	500 to 700m a.s.l	Gently
3	Aroang – B Ha Le	22 - 34	500 to 1000m a.s.l	Steeply
4	B Ha Le – Thanh My	35 - 42	100 to 600m, mainly 500 to 600m	Steeply
5	Thanh My – Phuoc My	42 - 47	50m to 400m	Gently to steeply
6	Phuoc My – Dak Glei	47 - 57	400m to 1200m	Steeply
7	Dak Glei – Dak To	57 - 56	500m to 650m	Gently

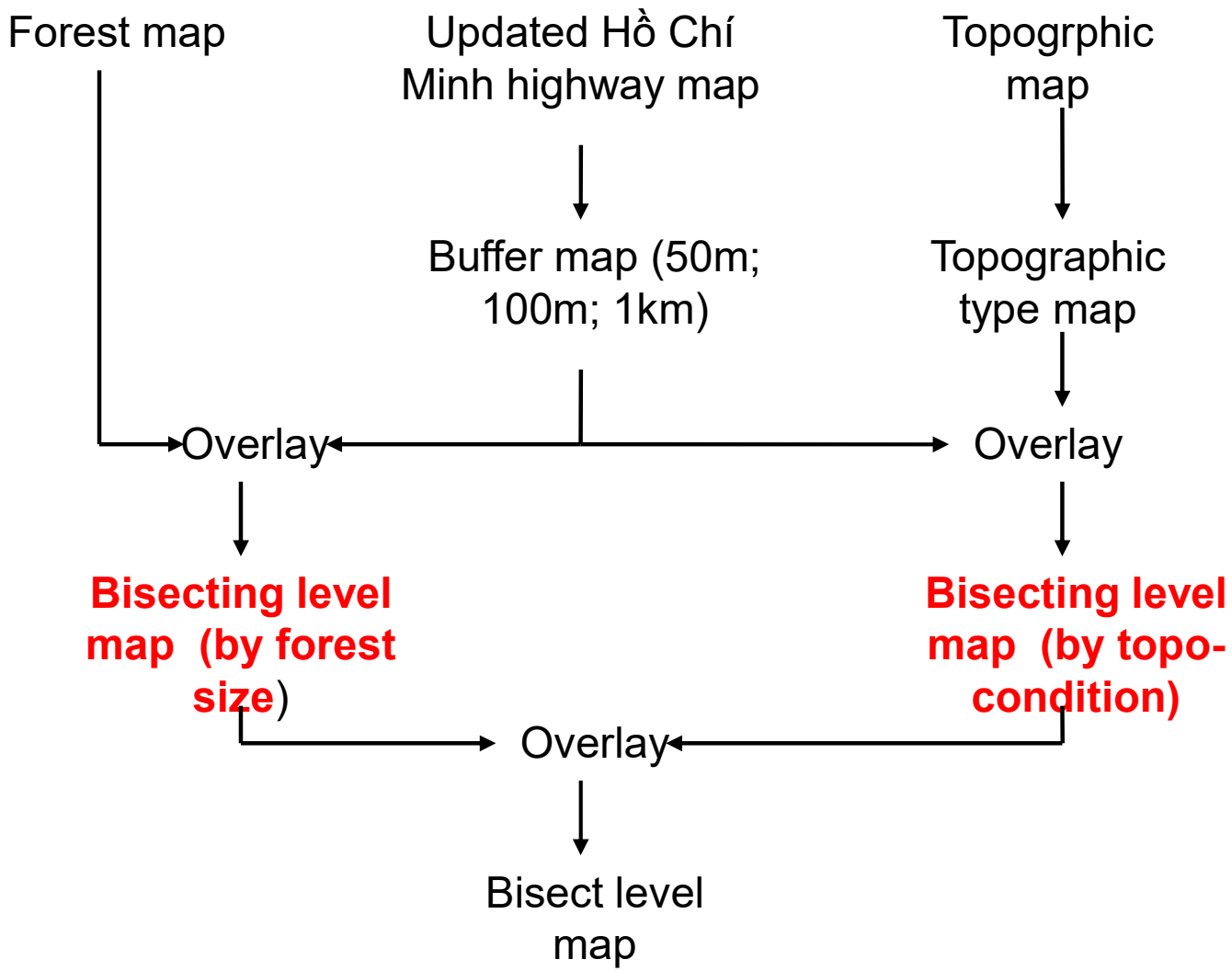
Data used

- **Topographic data**: The DEM of the study area is used to calculate the slope map; elevation map; analysis the stability index; analysis the topographic condition;
- **Satellite image**: The satellite image is used to classify the present land cove;
- **Administrative map**;
- **Hydrology map;**
- **Field points:** 78 points
- **Resident point**: more than 200

SPATIAL ANALYSIS

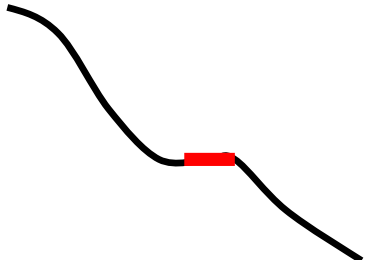


Identifying bisect areas

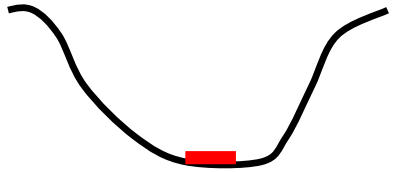


Identifying bisect areas

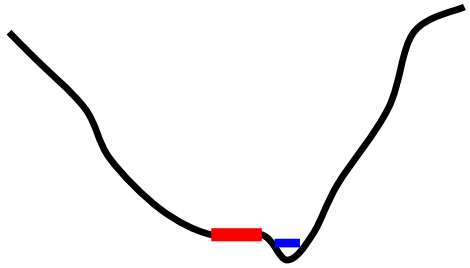
- Type 1: the Ho Chi Minh road is on slope: The bisect will be exaggerated in term of erosion due to it concentrate water and create bigger flow.
- Type 2: the Ho Chi Minh road is on pass. In this case, the HCM makes decreasing of the land cover in the pass and nearby area and it is reason to increase the soil erosion.
- Type 3: the Ho Chi Minh road is on narrow valley (with river). This types is not countable effected to the bisect due to it effect only in one side of the road beside the river can be considered as a natural bisection.
- Type 4: the Ho Chi Minh road is on wide valley (with/without river). In this case, the soil erosion is not strong in general. Hence, the bisection of the forest from HCM is considered as moderate level.
- Type 5: the Ho Chi Minh road is on flat area (or highland). This type of topography has effect to the bisection similar the above case.



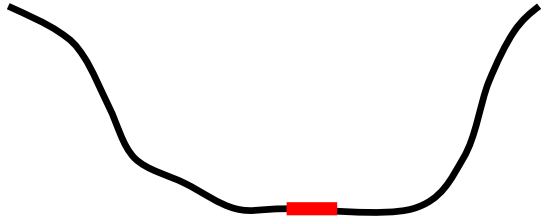
Type1: on slope



Type 2: on pass



Type 3: narrow valley



Type 4 : wide valley (with/without river)

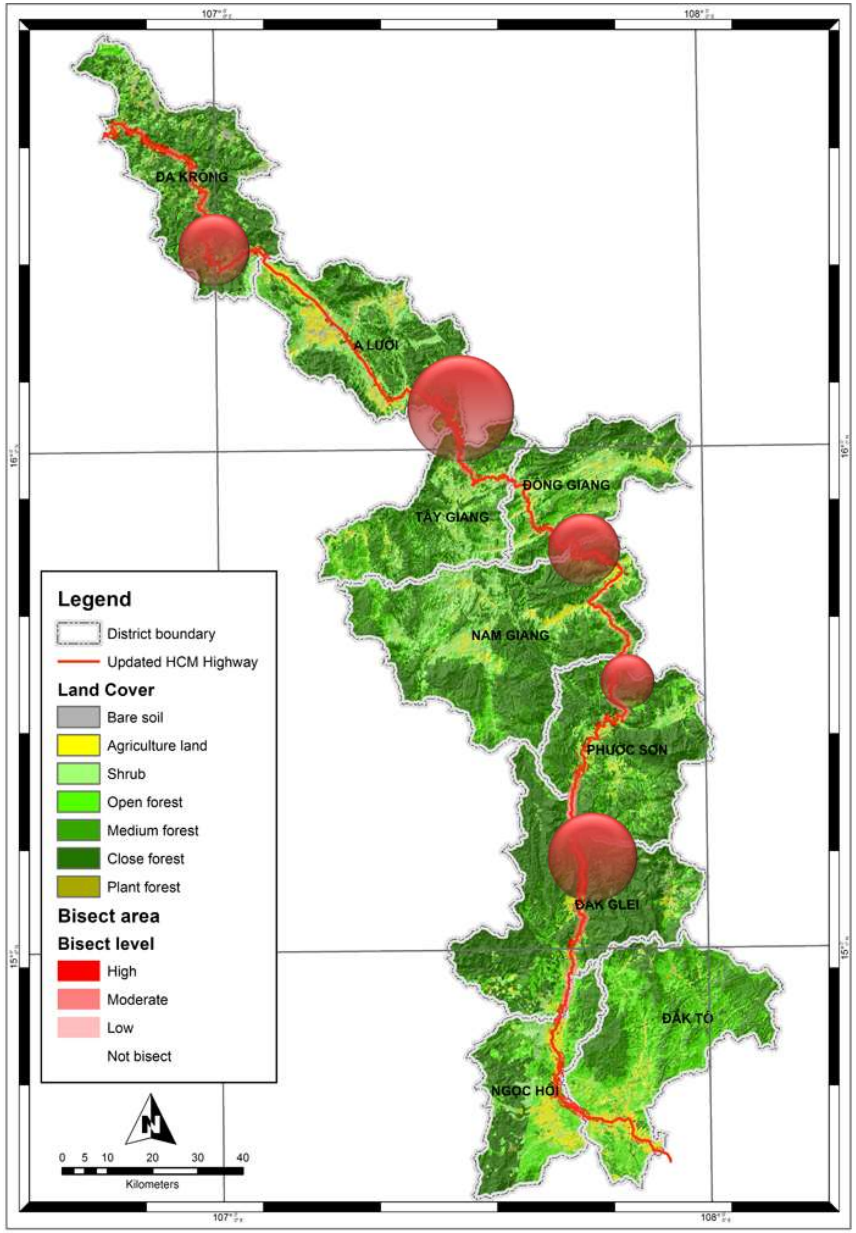
Type 5 on flat area

Identifying bisect areas

Bisecting level	*Conditions*								
	Forest buffer			*Topography*					
	50m	100m	1km	Type 1	Type 2	Type 3	Type 4	Type 5
Low	x					x			
Moderate		x					x	x
High			x	x	x				

Identifying bisect areas

From - To	Bisecting level
Inside Dak Rong commune	High
Ta Long – Huc Nghi	Moderate
Ta Rut – A Bung	High
Hong Van – A Roang	Not bisect
Huong Nguyen – Bha Lle	High
A Vuong – A Rooi	Low
Ma Cooi – Thach My	High
Thach My – Ca Dy	Low
Ca Dy – Phuoc Cong	Moderate
Dak Man – Dak Glei	High
Dak Glei – Dak KRoong	Moderate
Dak KRoong – Dak Duc	Low
Inside Plei Kan	High
Tan Canh – Dien Binh	Not bisect



Quantification of habitat breakages

Factors

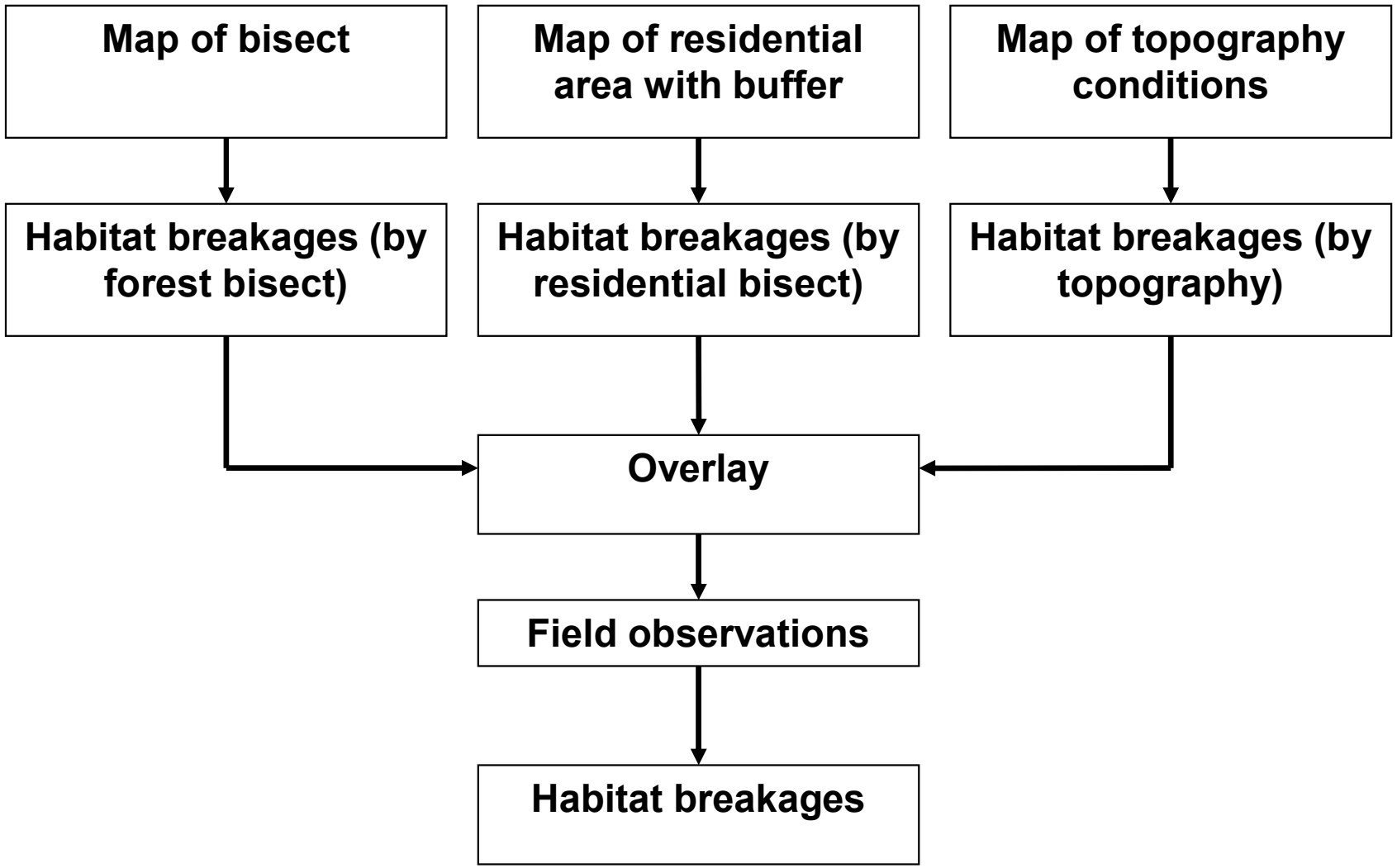
- Deforestation - Ho Chi Minh road create a better condition for forest exploitation and accordingly, the forest can be destroyed;
- Shifting cultivation or agriculture land expanding;
- Hunting;
- Building actions;
- Other actions.

Quantification of habitat breakages

Depends on:

- The natural conditions: land cover condition; topographic condition; water system condition; etc.
- The social conditions: residential area; population density; education conditions; income; etc.

Quantification of habitat breakages



Quantification of habitat breakages

- Quantification habitat breakages analysis of land cover
- Quantification habitat breakages by human activities

Bisects level	*Habitat breakages level*
Low	Low
Moderate	Moderate
High	High

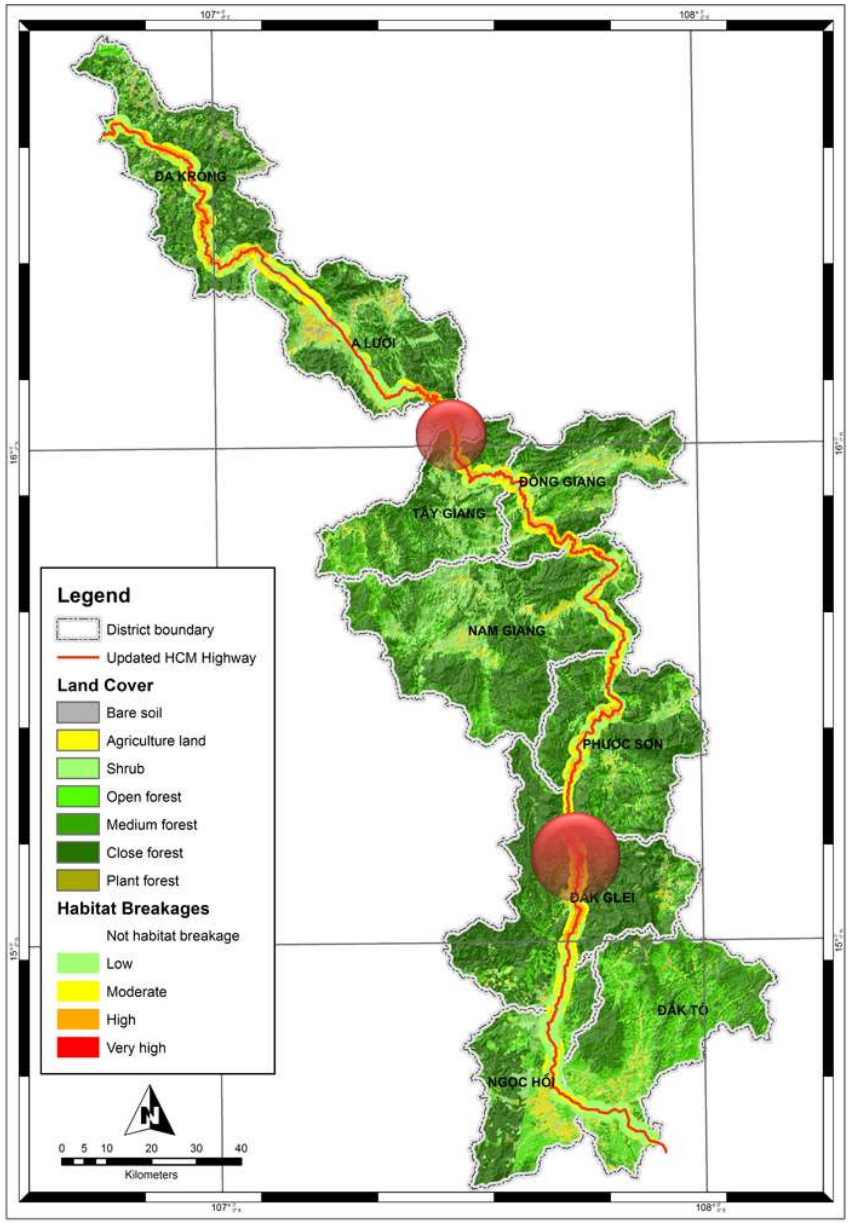
Distance from residential area	*Habitat breakages level*
100m	Very high
1km	High
2km	Moderate
5km	Low
More than 5 km	Not habitat breakages

- Quantification habitat breakages by topography

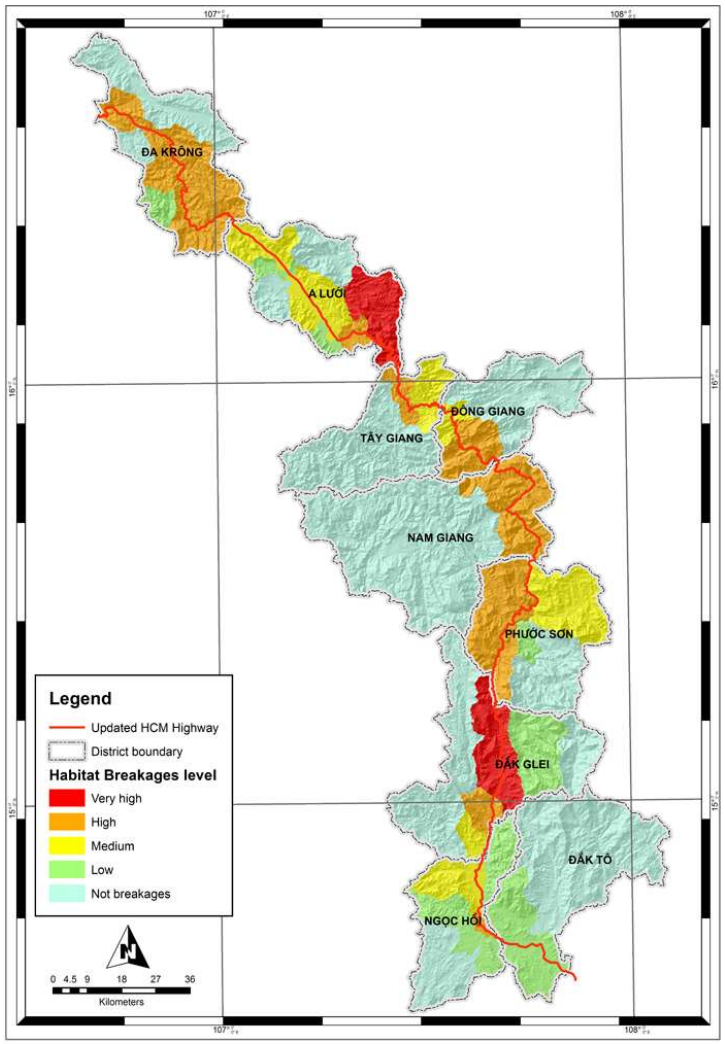
Slope	*Elevation*			
	<300	300-700	700-1000	>1000
<8	Low	Low	Moderate	Moderate
8-15	Low	Moderate	High	High
15-25	Moderate	Moderate	High	Very high
25-35	Moderate	High	Very high	Very high

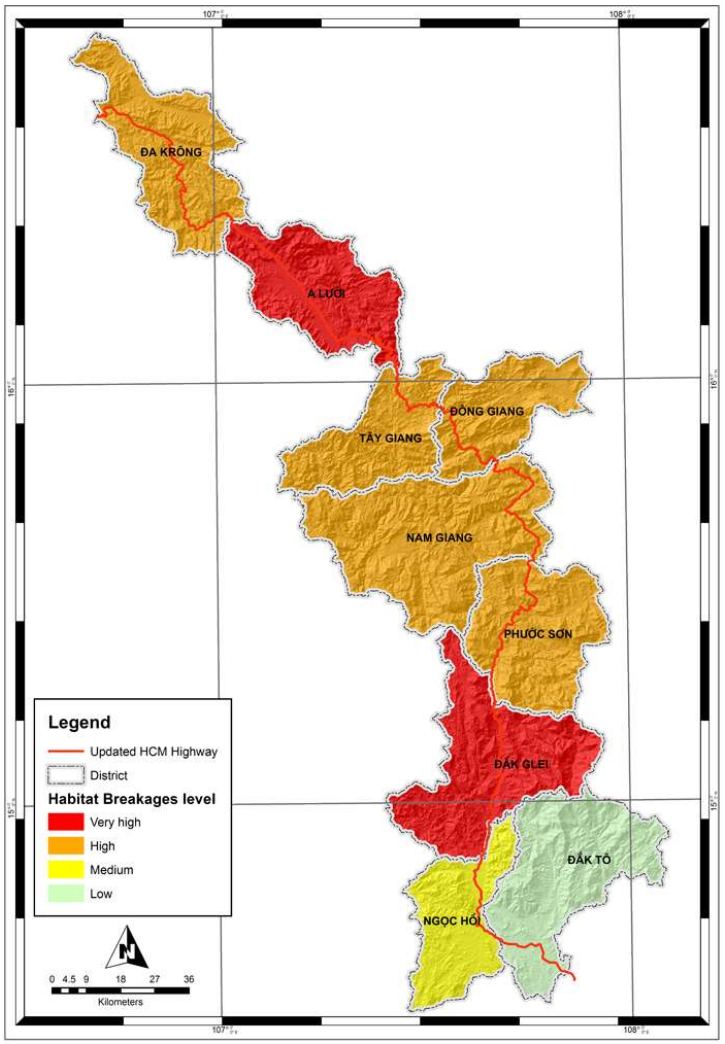
Quantification of habitat breakages

From - To	Habitat breakages level
Dak Rong – A Bung	High
A Bung – Huong Lam	Moderate
Huong Lam – A Roang	High
Inside Huong Nguyen	**Very high**
Inside BHa Lle	High
Prao – A Rooi	Moderate
A Rooi – Phuoc My	High
Phuoc My – Dak Pet	**Very high**
Dak Pet – Ngoc Hoi	Moderate
Ngoc Hoi – Dien Binh	Low



Quantification of habitat breakages





Key sites for forest corridor restoration

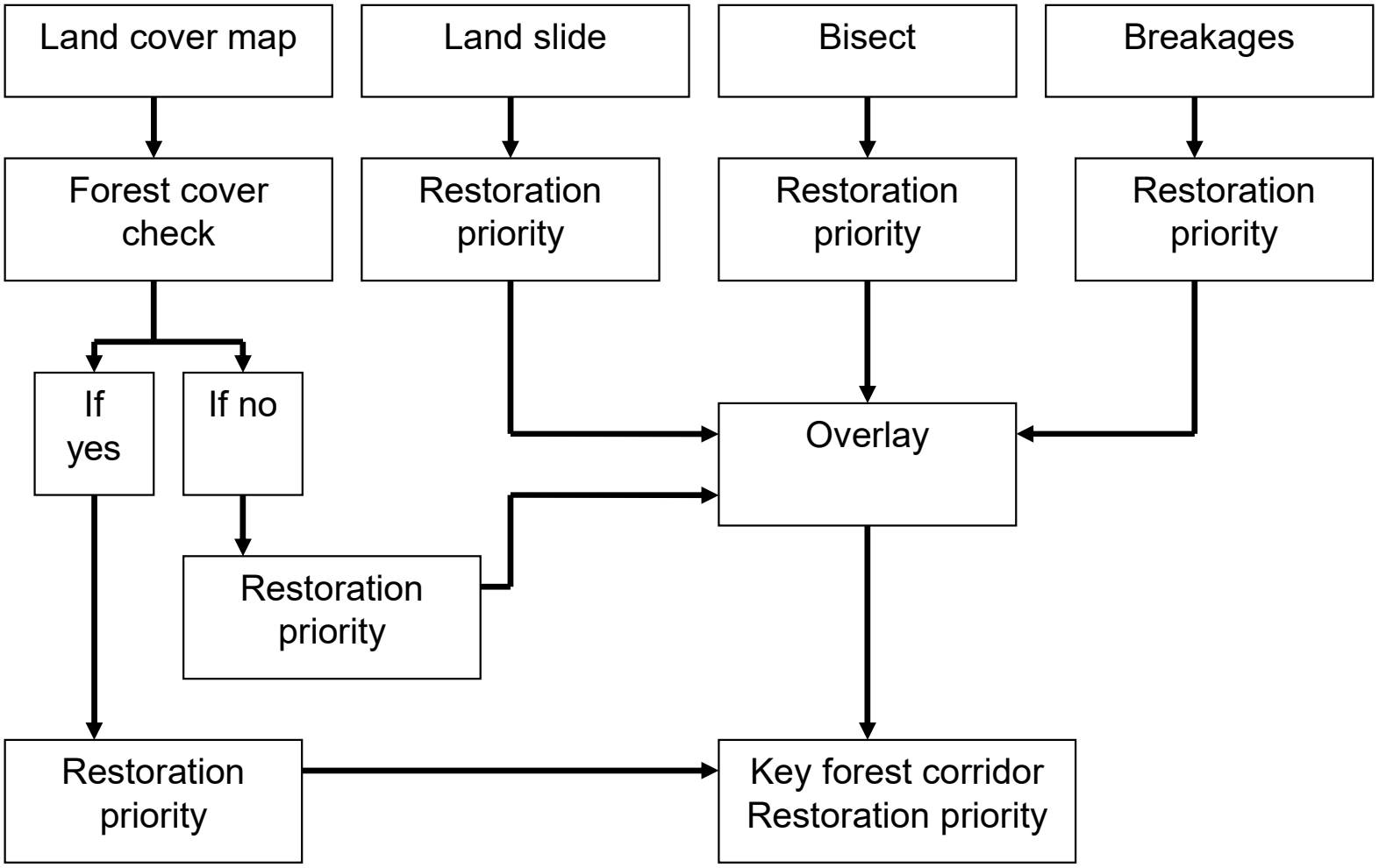
Aim to:

- Mitigation the impact of Ho Chi Minhroad on **erosion** (include land slide)
- Mitigation the impact of Ho Chi Minhroad on **habitat breakages**

Accordingly:

- Present situation of land cover is **not forest**
- The **habitat breakages** occur
- **Landslide/erosion** strongly impact.

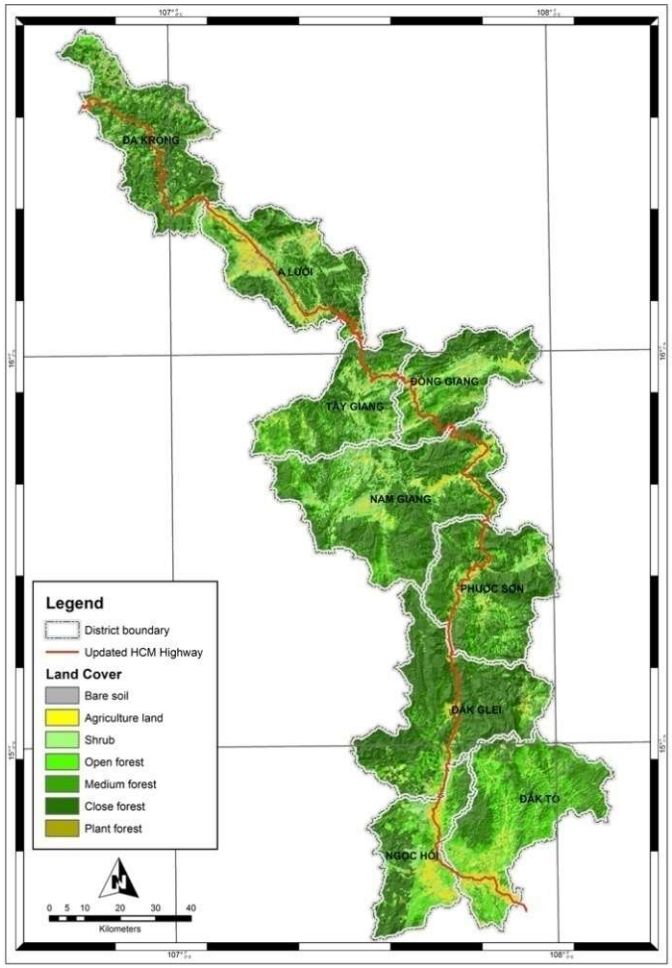
Key sites for forest corridor restoration



Key sites for forest corridor restoration

Land cover type and restoration priority

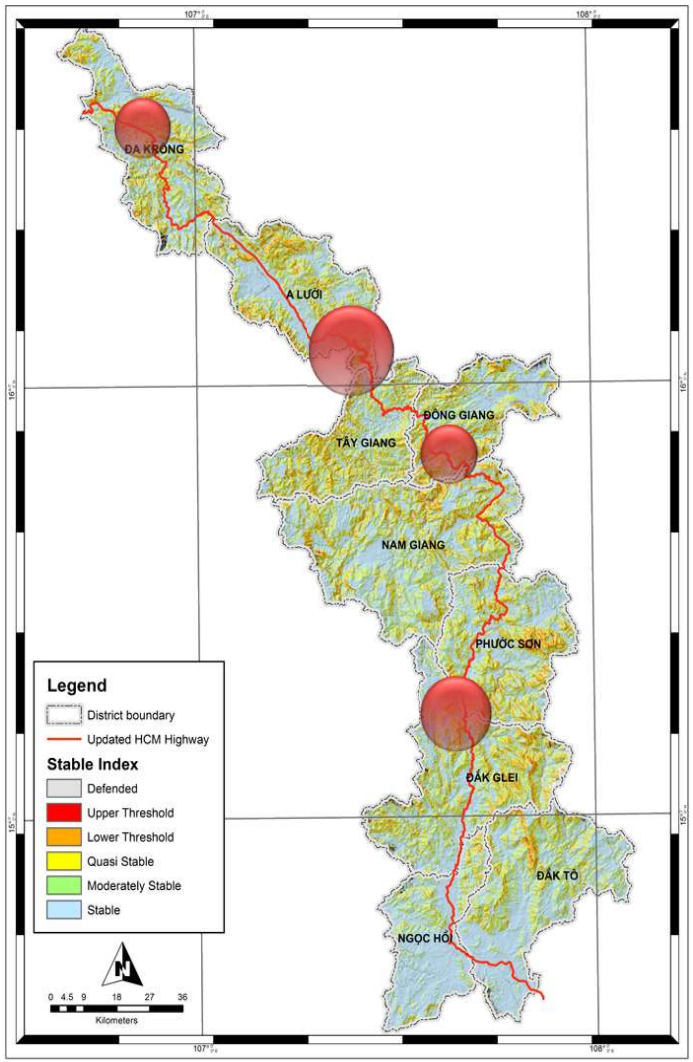
Land cover type	*Restoration priority*
Dense forest	Not priority
Medium dense forest	Not priority
Open forest	Not priority
Shrub	Low Priority
Agriculture land	Medium Priority
Bare soil	High Priority



Key sites for forest corridor restoration

- **Land slide/erosion and restoration priority**

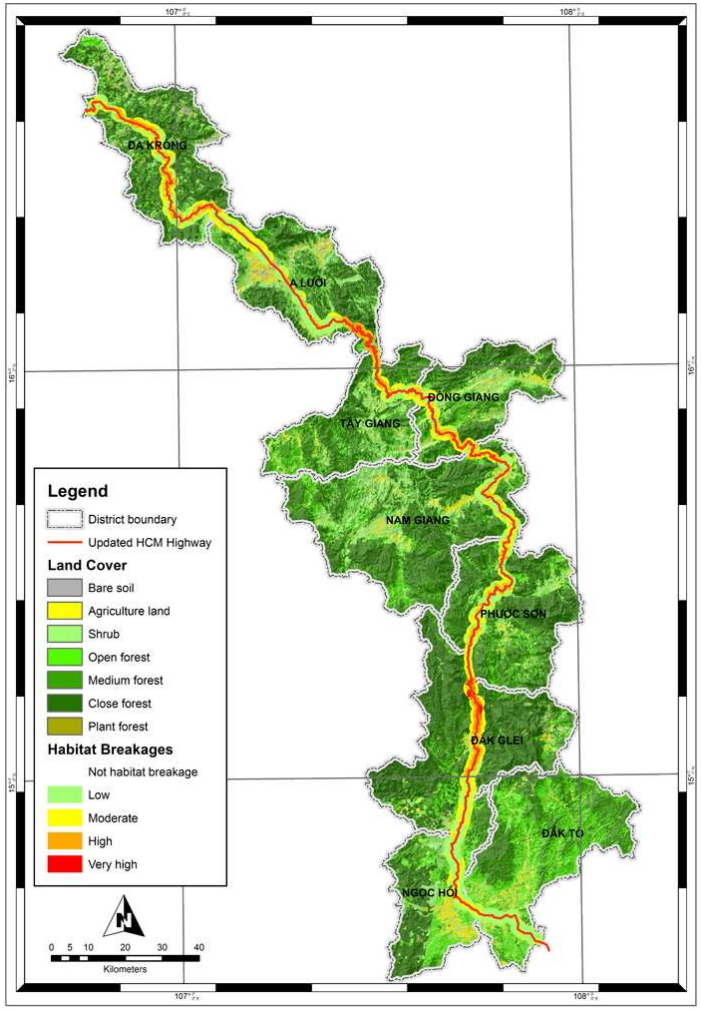
Landslide/erosion	*Restoration priority*
Stable	Not Priority
Moderately stable	Low Priority
Quasi stable	Medium Priority
Lower threshold	High Priority
Upper threshold	Very high Priority



Key sites for forest corridor restoration

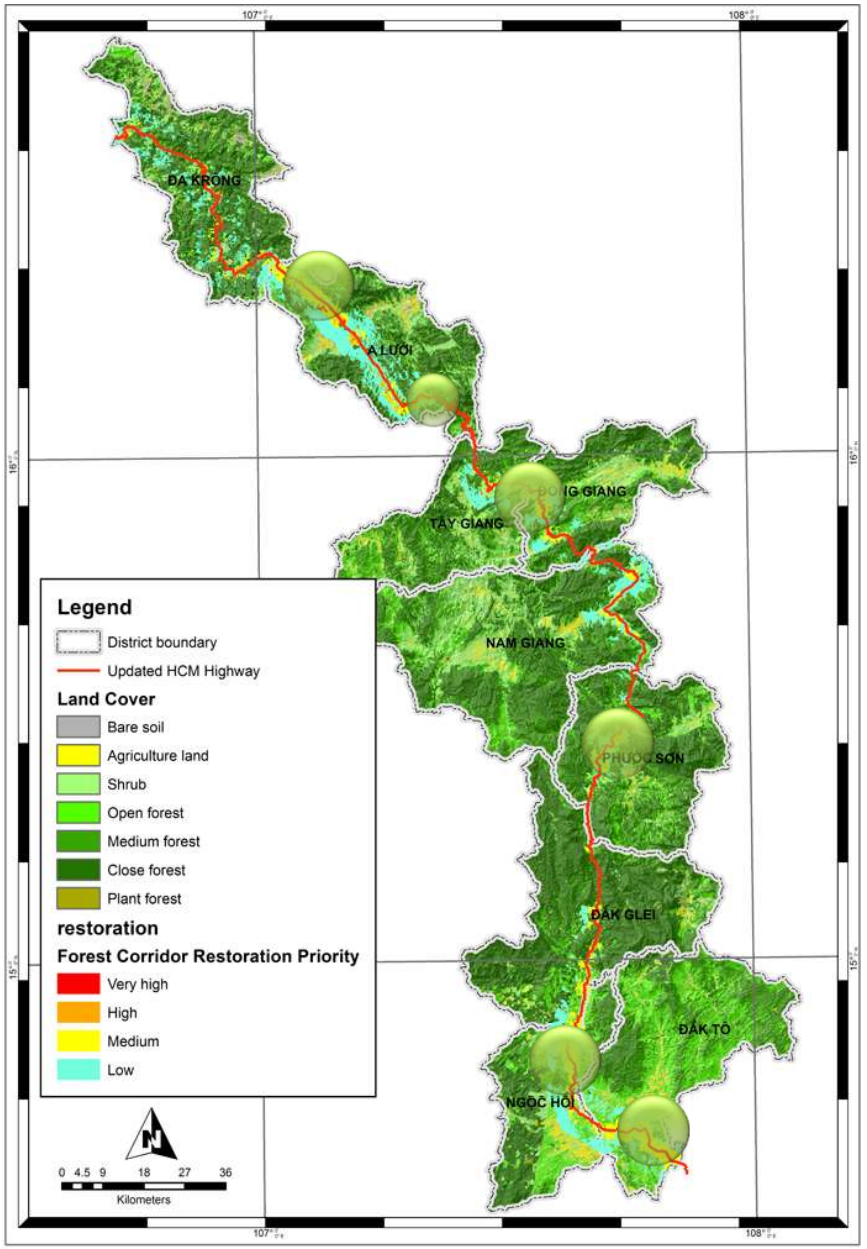
- **Habitat breakages and restoration priority**

Habitat Breakages	*Restoration priority*
Low	Low Priority
Moderate	Medium Priority
High	High Priority
Very high	Very high Priority



Key sites for forest corridor restoration

- From A Bung to Son Thuy
- From Huong Lam to A Roang
- From A Vuong to Ma Cooih
- Middle of Ca Dy commune
- Phuoc Duc to Phuoc My
- Dak Pet – Plei Kan
- Tan Canh – Dien Binh



DISCUSSION

It can be combined the key sites and the present land cover/forest map to point out the intervention method

It shows where need to be intervented and what the method should be used.

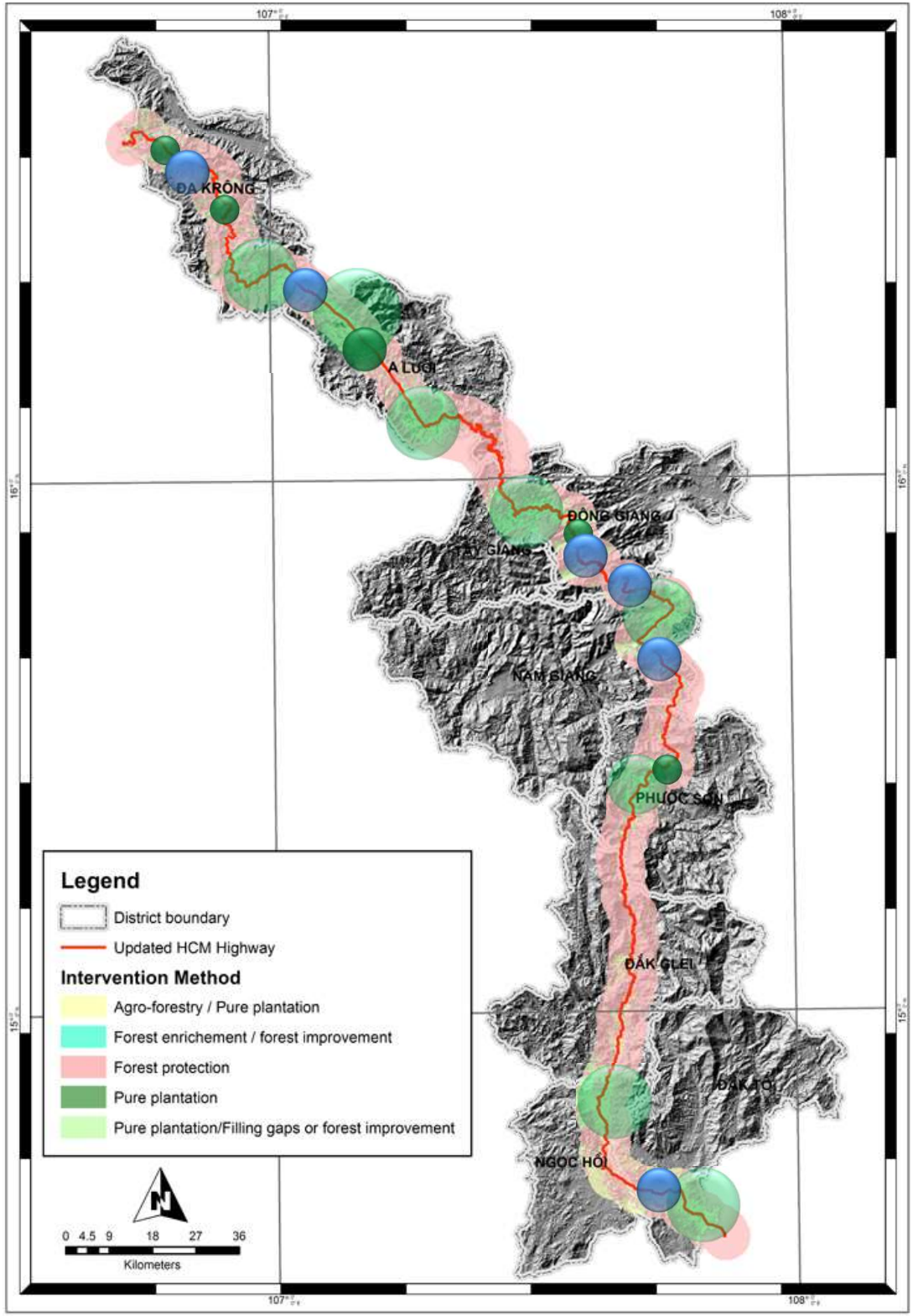
Land cover type	*Intervention method*
Dense forest	Forest protection
Medium dense forest	Forest protection/Natural growing
Open forest	Forest enrichment/Forest improvement
Shrub	Pure plantation/Filling gaps or forest improvement
Agriculture land	Agro-forestry/Pure plantation
Bare soil	Pure plantation

Intervention

Filling gaps

Pure plantation

Forest enrichment



CONCLUSION AND RECOMMENDATION

Results of calculation showed that in all the studied part of the Ho Chi Minh road, *protect* the forest should be strict compliance. The conduct in each forest is only necessary in some sector (where the road passing the Thua Thien - Hue and Quang Nam provinces).

The results of this study can be used as the initial investigation, allowing efforts to focus the investigation on a specific area - the area is *"sensitive"* in the habitat map breakage.

THANK YOU!