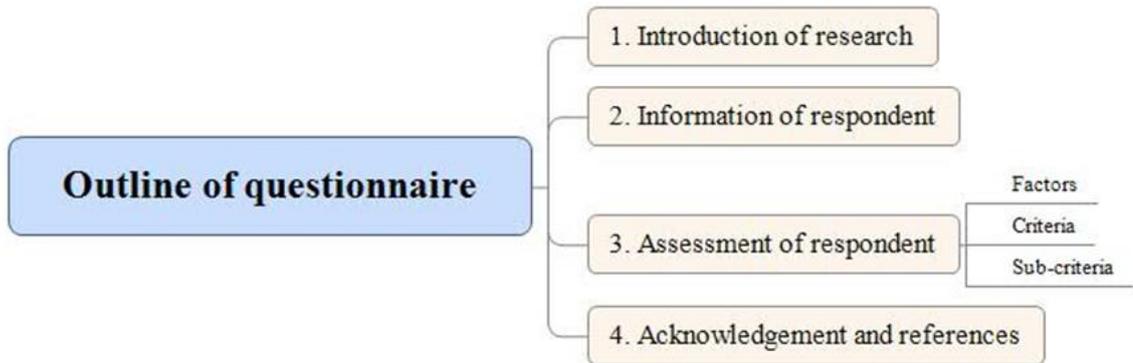


Appendix S1: Questionnaire

IDENTIFYING CRITERIA TO DEFINING PRIORITY AREAS FOR BIODIVERSITY CONSERVATION



Vu Xuan Dinh

Ph.D. Student

Institute for Photogrammetry and Remote Sensing

Faculty of Environmental Sciences

TU Dresden, 01062 Dresden, Germany

Mobile phone: +49 17695837608

Lecturer and researcher Mapping and GIS Department

Institute of Land Management and Rural Development

Vietnam National University of Forestry

Xuan Mai town, Chuong My district, Hanoi city

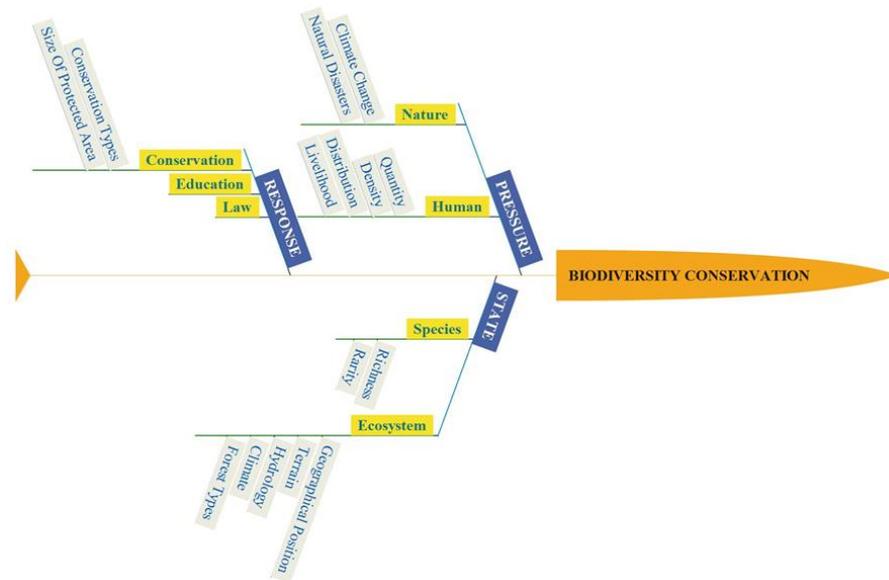
Mobile phone: +84973250982

A. Introduction of research

Vietnam has been recognized as one of the 16 countries with high biodiversity in the world and is one of the priority countries for global conservation, with about 10% species worldwide and area accounts for only 1% of the land area of the world (PARC, 2002). Natural protected areas system comprises 164 PAs, including 30 National Parks, 69 Nature Reserves, and 45 landscape protection areas, 20 areas of empirical scientific research (MARD, 2007). Thus, PAs protection and management are of vital significance for biodiversity conservation in Vietnam (Bruner et al. 2001). However, the loss of biodiversity in Vietnam has been very critical, with many species are on the brink of extinction due to human exploitation (Nghia 1999, and Primack et al. 1999).

Vietnam is one of the countries in the world to be considered as the highest proportion of threatened species (Pilgrim & Tu 2007). Vietnam has more than 300 species threaten data global level, including 49 species are considered in the case of many Endangered, Threatened, and Rare plant and animal species are at risk on the brink of extinction (World Bank, 2005). In order to identify threats influencing biodiversity conservation needs a conservation strategy based on situational analysis and a biological assessment to formulate the priority landscape (Baltzer 2000). The biodiversity assessment process was facing many limitations (Tordoff, 2003). One of the root limitations for the biodiversity assessment process in Vietnam is the incomprehensive data set on the conservation status of Vietnam's protected areas. The data of biodiversity is usually identified through personal observation, interviews, and the capacity of institutions responsible for protected areas management. Based on the previous information described before, it is necessary to carry out a study as follows "Application of Geoinformation Science (GIS) to establish a database of biodiversity conservation for regional planning and management of protected areas in the northern region of Vietnam."

The figure of the criteria tree in biodiversity conservation:



B. Information of respondent

Please provide the following general information about you. All personal information will be confidential

1. Full name: *

.....

1. Gender:

Male Female

2. Age:

.....

3. Email:

.....

4. Phone number:

.....

5. Major field: *

.....

6. Position in organization*

.....

7. Address of organization: *

Please follow the order: House number, street number, commune, district, province

.....

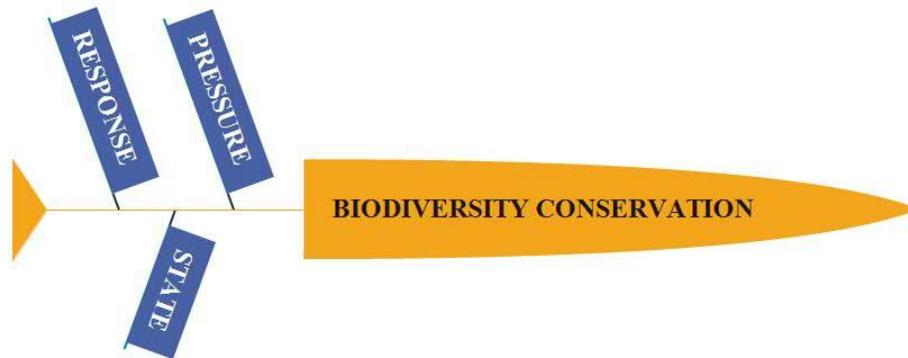
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C. Assessment of respondent

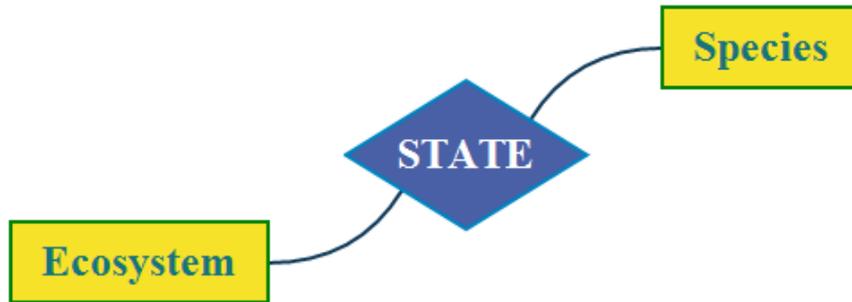
1. To assess the priority level in biodiversity conservation, we have three factors, including "State," "Pressure," and "Response." Which importance level do you think are the below factors influencing the priority areas of biodiversity conservation? * Please give us your opinion about the level of importance for each criterion following nine levels from 1 (non-influence) to 9 (extreme influence)

	1	2	3	4	5	6	7	8	9
State	<input type="radio"/>								
Pressure	<input type="radio"/>								
Response	<input type="radio"/>								



2. "State" factor includes two criteria are "species" and "ecosystem" state. Which importance level do you think is the below criteria influencing the "State" factor? *Please give us your opinion about the level of importance for each criterion following nine levels from 1 (non-influence) to 9 (extreme influence)

	1	2	3	4	5	6	7	8	9
Species	<input type="radio"/>								
Ecosystem	<input type="radio"/>								



3. "Pressure" factor includes two criteria are "Nature" and "Human" pressure. Which importance level do you think is the below criteria influencing the "pressure" factor? *Please give us your opinion about the level of importance for each criterion following nine levels from 1(non-influence) to 9 (extreme influence)

	1	2	3	4	5	6	7	8	9
Nature	<input type="radio"/>								
Human	<input type="radio"/>								



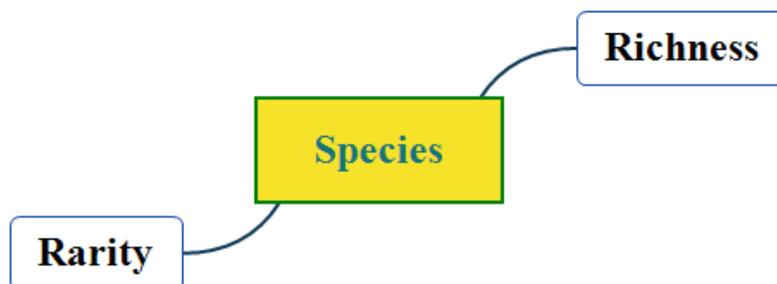
4. "Response" factor includes three criteria is "Conservation," "Education," and "Law." Which importance level do you think is the below criteria influencing the "response" factor? *Please give us your opinion about the level of importance for each criterion following nine levels from 1(non-influence) to 9 (extreme influence)

	1	2	3	4	5	6	7	8	9
Conservation	<input type="radio"/>								
Education	<input type="radio"/>								
Law	<input type="radio"/>								



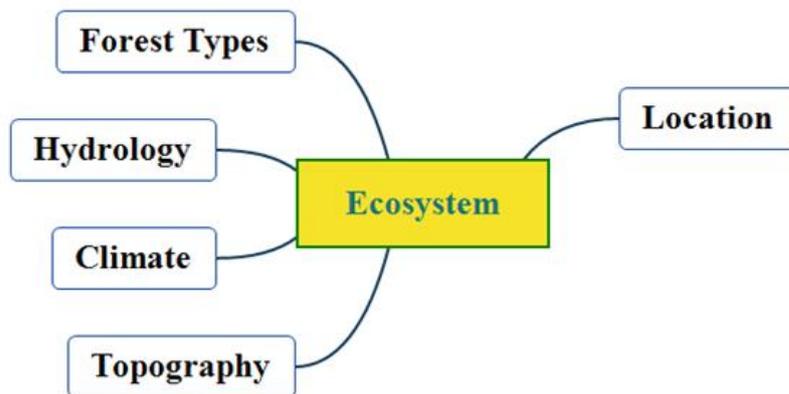
5. "Richness" and "Rarity" are two sub-criteria chosen for showing the "Species" state. Which importance level do you think is the below sub-criteria influencing the "species" criterion? *Please give us your opinion about the level of importance for each criterion following nine levels from 1(non-influence) to 9 (extreme influence)

	1	2	3	4	5	6	7	8	9
Richness	<input type="radio"/>								
Rarity	<input type="radio"/>								



6. "Location," "Forest types," "Climate," "Hydrology," and "Topography" are the sub-criteria that impact the selection of the "Ecosystem" condition for biodiversity conservation. Which importance level do you think is the below sub-criteria influencing the "ecosystem" criterion? *Please give us your opinion about the level of importance for each criterion following nine levels from 1 (non-influence) to 9 (extreme influence)

	1	2	3	4	5	6	7	8	9
Location	<input type="radio"/>								
Forest types	<input type="radio"/>								
Climate	<input type="radio"/>								
Hydrology	<input type="radio"/>								
Topography	<input type="radio"/>								



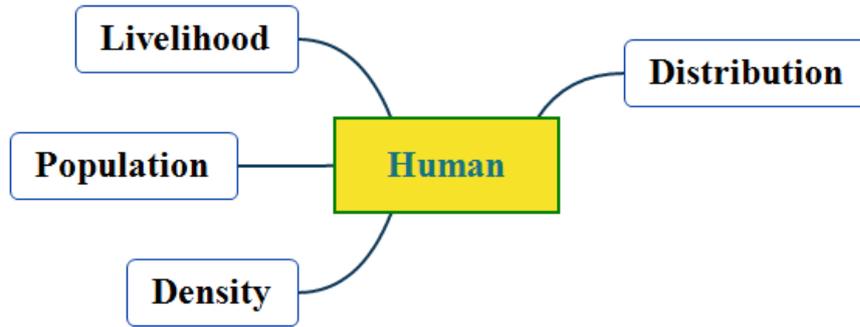
7. The pressure for biodiversity conservation caused "Nature" is built up by "Climate change" and "Natural disasters" sub-criteria. Which influence level of the sub-criteria is fit for "Nature" pressure? **Please give us your opinion about the level of importance for each criterion following nine levels from 1(non-influence) to 9 (extreme influence)*

	1	2	3	4	5	6	7	8	9
Climate change	<input type="radio"/>								
Natural disaster	<input type="radio"/>								



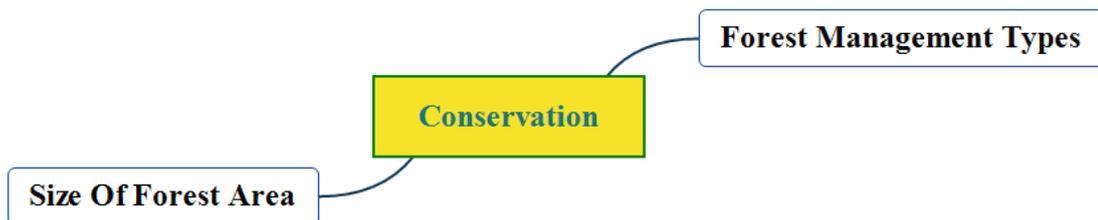
8. The pressure for biodiversity conservation caused "Human" is built up by "Distribution," "Density," "Population," and "Livelihood" sub-criteria. Which influence level of the sub-criteria is fit for "Human" pressure? **Please give us your opinion about the level of importance for each criterion following nine levels from 1(non-influence) to 9 (extreme influence)*

	1	2	3	4	5	6	7	8	9
Distribution	<input type="radio"/>								
Density	<input type="radio"/>								
Population	<input type="radio"/>								
Livelihood	<input type="radio"/>								



9. "Forest management types" and "Size of forest area" are two sub-criteria that create a protected area. Which importance level do you think is the below sub-criteria influencing the "Conservation" response? **Please give us your opinion about the level of importance for each criterion following nine levels from 1 (non-influence) to 9 (extreme influence)*

	1	2	3	4	5	6	7	8	9
Forest management types	<input type="radio"/>								
Size of forest area	<input type="radio"/>								



10. In your opinion, within biodiversity conservation, which other criteria are significant, and which influence levels do you choose for them?

If you have any opinion for this question, please give us your assessment for the following nine levels from 1 (non-influence) to 9 (extreme influence)

.....

.....

.....

.....

.....

D. Acknowledgement

My sincere thanks go to all the respondents of the survey, who supported me with your valuable opinion and knowledge of biodiversity conservation.

I promise that all personal information will be kept confidential.

Sincerely,

Vu Xuan Dinh

Appendix S2: List of interviewees

No	Sex	Age	Background	Organization
I. Protected areas group (PAs)				
1	Male	50	Silviculture	Cat Tien National Park
2	Male	50	Forestry ecology	Cat Tien National Park
3	Female	30	Environmental science	Cuc Phuong National Park
4	Male	35	Forest protection	Cuc Phuong National Park
5	Male	46	Forest protection	Cuc Phuong National Park
6	Male	41	Silviculture	Cuc Phuong National Park
7	Male	46	Forestry	Cuc Phuong National Park
8	Male	54	Silviculture	Cuc Phuong National Park
9	Male	45	Forestry	Cuc Phuong National Park
10	Male	32	Forestry	Cuc Phuong National Park
11	Male	52	Forestry	Cuc Phuong National Park
12	Male	38	Forest protection	Cuc Phuong National Park
13	Male	36	Forestry	Cuc Phuong National Park
14	Female	39	Forestry	Cuc Phuong National Park
15	Female	33	Forestry	Cuc Phuong National Park
16	Female	37	Ecology travel	Cuc Phuong National Park
17	Female	27	Ecotourism	Cuc Phuong National Park
18	Male	28	Communication of conservation	Cuc Phuong National Park
19	Female	24	Forest protection	Cuc Phuong National Park
20	Male	32	Silviculture	Cuc Phuong National Park
21	Male	37	Forestry	Cuc Phuong National Park
22	Male	41	Forestry	Cuc Phuong National Park
23	Male	38	Forestry	Hoang Lien National Park
24	Male	31	Forestry	Hoang Lien National Park
25	Male	38	Forest protection	Muong La Nature Reserve
26	Male	43	Silviculture	Ngoc Son - Ngo Luong Nature Reserve
27	Male	41	Silviculture	Ngoc Son - Ngo Luong Nature Reserve

28	Male	52	Forestry	Ngoc Son - Ngo Luong Nature Reserve
29	Male	35	Forest protection	Ngoc Son - Ngo Luong Nature Reserve
30	Male	34	Forest protection	Ngoc Son - Ngo Luong Nature Reserve
31	Male	30	Forest protection	Ngoc Son - Ngo Luong Nature Reserve
32	Male	47	Silviculture	Ngoc Son - Ngo Luong Nature Reserve
33	Male	53	Hunter	Ngoc Son - Ngo Luong Nature Reserve
34	Male	41	Forestry	Ngoc Son - Ngo Luong Nature Reserve
35	Male	45	Forestry	Ngoc Son - Ngo Luong Nature Reserve
36	Male	38	Forestry	Pu Hu Protected Area
37	Male	38	Forestry	Pu Hu Protected Area
38	Male	32	Biodiversity conservation	Pu Hu Protected Area
39	Female	23	Agriculture	Pu Luong Nature Reserve
40	Male	45	Forestry	Pu Luong Nature Reserve
41	Male	34	Forest protection	Pu Luong Nature Reserve
42	Male	34	Forestry	Pu Luong Nature Reserve
43	Male	33	Forest protection	Pu Luong Nature Reserve
44	Male	34	Biodiversity conservation	Pu Luong Nature Reserve
45	Female	28	Silviculture	Pu Luong Nature Reserve
46	Male	28	Biodiversity conservation	Pu Luong Nature Reserve
47	Male	34	Forestry	Pu Luong Nature Reserve
48	Male	35	Forestry	Pu Luong Nature Reserve
49	Male	55	Forestry	Pu Luong Nature Reserve
50	Female	33	Silviculture	Pu Luong Nature Reserve
51	Male	37	Forestry	Pu Luong Nature Reserve
52	Male	43	Forestry	Pu Luong Nature Reserve
53	Male	28	Forestry	Pu Luong Nature Reserve
54	Male	52	Forestry	Pu Luong Nature Reserve
55	Male	45	Law	Pu Luong Nature Reserve
56	Male	53	Forestry	Pu Luong Nature Reserve
57	Male	37	Forestry	Pu Mat National Park
58	Male	31	Silviculture	Pu Mat National Park

59	Male	30	Forestry	Song Thanh Nature Reserve
60	Male	38	Forestry	Tam Dao National Park
61	Female	44	Forestry	Van Long Nature Reserve
62	Male	37	Silviculture	Van Long Nature Reserve
63	Male	37	Forestry	Van Long Nature Reserve
64	Female	36	Forestry	Van Long Nature Reserve
II. Universities and Research Institutes Group (URIs)				
65	Male	29	Land management	Can Tho University
66	Female	22	Silviculture	Can Tho University
67	Male	70	Biodiversity conservation	Hanoi National University
68	Male	43	Agriculture	Hanoi University of Agriculture
69	Male	27	Geophysics	Hanoi University of Mining and Geology
70	Male	25	Land management	Hue University of Agriculture and Forestry
71	Male	28	Environmental science	Vietnam Institute of forest inventory and planning
72	Male	32	Forestry	Vietnam Institute of forest inventory and planning
73	Male	34	Forestry	Vietnam Institute of forest science
74	Male	38	Hydrology	Vietnam Institute of geography
75	Male	63	Remote sensing	Vietnam Institute of geography
76	Male	42	GIS and remote sensing	Vietnam Institute of geography
77	Female	41	Forestry	Vietnam Institute of Management for Agriculture and Rural Development
78	Female	44	Forestry	Vietnam Institute of Management for Agriculture and Rural Development
79	Male	34	Geodesy	Vietnam Institute of natural resource inventory and planning
80	Male	37	Forestry ecology	Vietnam national university of forestry
81	Male	38	Forestry inventory	Vietnam national university of forestry
82	Male	37	Forestry inventory	Vietnam national university of forestry
83	Female	34	Silviculture	Vietnam national university of forestry
84	Female	34	Silviculture	Vietnam national university of forestry
85	Male	38	Forestry ecology	Vietnam national university of forestry
86	Male	36	Forestry inventory	Vietnam national university of forestry

87	Male	42	Silviculture	Vietnam national university of forestry
88	Male	21	Silviculture	Vietnam national university of forestry
89	Female	21	Silviculture	Vietnam national university of forestry
90	Female	20	Silviculture	Vietnam national university of forestry
91	Female	21	Silviculture	Vietnam national university of forestry
92	Female	21	Silviculture	Vietnam national university of forestry
93	Female	21	Silviculture	Vietnam national university of forestry
94	Female	21	Silviculture	Vietnam national university of forestry
95	Female	21	Silviculture	Vietnam national university of forestry
96	Female	21	Silviculture	Vietnam national university of forestry
97	Female	23	Silviculture	Vietnam national university of forestry
98	Female	22	Silviculture	Vietnam national university of forestry
99	Female	22	Silviculture	Vietnam national university of forestry
100	Female	22	Silviculture	Vietnam national university of forestry
101	Female	22	Silviculture	Vietnam national university of forestry
102	Male	23	Silviculture	Vietnam national university of forestry
103	Female	21	Silviculture	Vietnam national university of forestry
104	Female	20	Silviculture	Vietnam national university of forestry
105	Female	22	Silviculture	Vietnam national university of forestry
106	Female	22	Silviculture	Vietnam national university of forestry
107	Female	21	Silviculture	Vietnam national university of forestry
108	Female	21	Silviculture	Vietnam national university of forestry
109	Female	21	Silviculture	Vietnam national university of forestry
110	Female	22	Silviculture	Vietnam national university of forestry
111	Female	22	Silviculture	Vietnam national university of forestry
112	Female	21	Silviculture	Vietnam national university of forestry
113	Male	22	Forestry	Vietnam national university of forestry
114	Male	22	Forestry	Vietnam national university of forestry
115	Male	21	Forestry	Vietnam national university of forestry
116	Male	22	Forestry	Vietnam national university of forestry
117	Male	24	Forestry	Vietnam national university of forestry

118	Male	21	Forestry	Vietnam national university of forestry
119	Male	21	Forestry	Vietnam national university of forestry
120	Male	21	Forestry	Vietnam national university of forestry
121	Male	21	Forestry	Vietnam national university of forestry
122	Male	21	Forestry	Vietnam national university of forestry
123	Male	21	Forestry	Vietnam national university of forestry
124	Female	21	Forestry	Vietnam national university of forestry
125	Female	21	Forestry	Vietnam national university of forestry
126	Male	21	Forestry	Vietnam national university of forestry
127	Male	21	Forestry	Vietnam national university of forestry
128	Male	22	Forestry	Vietnam national university of forestry
129	Male	22	Forestry	Vietnam national university of forestry
130	Male	21	Forestry	Vietnam national university of forestry
131	Female	21	Forestry	Vietnam national university of forestry
132	Female	21	Forestry	Vietnam national university of forestry
133	Female	21	Forestry	Vietnam national university of forestry
134	Female	21	Forestry	Vietnam national university of forestry
135	Female	21	Forestry	Vietnam national university of forestry
136	Female	22	Forestry	Vietnam national university of forestry
137	Female	21	Forestry	Vietnam national university of forestry
138	Female	22	Forestry	Vietnam national university of forestry
139	Female	21	Forestry	Vietnam national university of forestry
140	Male	21	Forestry	Vietnam national university of forestry
141	Female	21	Forestry	Vietnam national university of forestry
142	Female	21	Forestry	Vietnam national university of forestry
143	Male	23	Forestry	Vietnam national university of forestry
144	Female	21	Forestry	Vietnam national university of forestry
145	Male	37	Biodiversity conservation	Vietnam national university of forestry
146	Female	39	Forestry	Vietnam national university of forestry
147	Male	50	Forest protection	Vietnam national university of forestry
148	Male	34	Silviculture	Vietnam national university of forestry

149	Male	44	Silviculture	Vietnam national university of forestry
150	Male	48	Botany	Vietnam national university of forestry
151	Male	43	Forestry inventory	Vietnam national university of forestry
152	Male	49	Forestry	Vietnam national university of forestry
III. Government Organizations Group (GOs)				
153	Male	47	Forestry	Bac Giang Department of Agriculture and Rural Development
154	Male	26	Land management	Dong Nai Department of Environment and Natural Resources
155	Male	27	Environmental science	Environment and Natural Resources Department
156	Male	34	Environmental science	Environment and Natural Resources Department
157	Male	45	Soil science	Environmental Center
158	Male	25	Forestry	Forest Protection Department
159	Male	35	Forest protection	Forest Protection Department
160	Male	45	Forestry	Forest Protection Department
161	Male	37	Forest protection	Forest Protection Department
162	Female	40	Silviculture	Forest Protection Department
163	Male	28	Forestry	Forest Protection Department
164	Male	35	Forestry	Forest Protection Department
165	Male	38	Forestry	Forest Protection Station
166	Male	28	Forest protection	Forest Protection Station
167	Male	40	Forest protection	Forest Protection Station
168	Male	32	Forestry	Forest Protection Station
169	Male	35	Forest protection	Forest Protection Station
170	Male	33	Forestry inventory	Forest Protection Station
171	Male	38	Forest protection	Forest Protection Station
172	Male	47	Forestry	Ha Giang Department of Agriculture and Rural Development
173	Female	23	Land management	Land Management Center
174	Male	30	Forestry inventory	Tuyen Quang Center of Agroforestry Management and Planning
175	Male	48	Environmental science	Vietnam Center for Monitoring and Technical Resources

176	Male	25	Environmental geology	Vietnam Center for Monitoring and Technical Resources
IV. Others				
177	Male	40	Geology	Ha An Company
178	Female	28	Forestry	ICRAF Vietnam
179	Male	30	Forestry economy	ICRAF Vietnam
180	Male	23	Agriculture	ICRAF Vietnam
181	Female	28	Resource management	ICRAF Vietnam
182	Male	34	Silviculture	Kim Hoang Company
183	Male	27	Forestry	Kim Hoang Company
184	Male	27	Land management	Loc Ninh Company
185	Male	28	Geology	Thuan Phat Company

Appendix S3: Synthesizing the numbers of respondents in pairwise

Category		A	A>B									A=B	A<B									B	
			Sum	9	8	7	6	5	4	3	2		1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	Sum		
Factors	State	State	59	0	0	2	1	11	5	13	27	54	44	12	10	4	0	0	0	0	70	Pressure	
	State	State	58	0	0	2	2	9	9	19	17	71	22	13	11	7	1	0	0	0	54	Response	
	Pressure	Pressure	61	0	0	1	3	8	9	15	25	58	33	15	5	10	0	1	0	0	64	Response	
Criteria	State	Species	48	1	0	0	1	2	3	5	36	70	40	20	4	1	0	0	0	0	65	Ecosystem	
	Pressure	Nature	13	0	0	0	0	1	0	3	9	18	40	26	35	24	10	11	4	2	152	Human	
	Response	Conservation	Conservation	44	0	0	0	0	1	3	8	32	68	45	14	9	3	0	0	0	0	71	Education
Conservation		Conservation	38	0	0	0	1	4	7	8	18	80	44	9	7	5	0	0	0	0	65	Law	
Education		Education	53	0	0	2	0	2	4	14	31	87	25	14	2	2	0	0	0	0	43	Law	
Sub-criteria	Species	Richness	52	0	0	0	0	2	3	22	25	58	41	23	5	3	1	0	0	0	73	Rarity	
	Ecosystem	Location	Location	54	0	0	0	1	4	3	16	30	59	44	19	4	1	0	0	2	0	70	Topography
		Location	Location	80	0	0	0	5	4	5	24	42	56	35	6	3	1	0	1	0	1	47	Hydrology
		Location	Location	56	0	0	0	2	1	4	19	30	56	41	18	6	4	1	0	0	1	71	Climate
		Location	Location	51	0	0	0	0	2	6	8	35	46	45	26	11	2	1	0	0	1	86	Forest type
		Topography	Topography	80	0	0	0	0	1	14	23	42	73	23	4	1	2	0	0	0	0	30	Hydrology
		Topography	Topography	65	0	0	0	0	1	3	22	39	56	37	15	3	5	2	0	0	0	62	Climate
		Topography	Topography	48	0	1	0	0	1	4	8	34	56	49	17	8	5	0	0	0	0	79	Forest type
		Hydrology	Hydrology	21	0	0	0	0	0	1	4	16	84	41	26	8	3	0	0	0	0	78	Climate
		Hydrology	Hydrology	28	0	0	1	0	0	1	7	19	57	42	36	8	10	2	0	0	0	98	Forest type
	Climate	Climate	60	0	0	0	1	1	2	11	45	50	37	24	7	5	0	0	0	0	73	Forest type	
	Nature	Climate change	100	0	1	3	5	4	16	33	38	58	14	7	1	3	0	0	0	0	25	Nature disaster	
	Human	Distribution	Distribution	50	0	0	1	0	1	8	13	27	75	46	11	1	0	0	0	0	0	58	Density
Distribution		Distribution	47	0	0	1	0	2	5	17	22	68	44	17	7	0	0	0	0	0	68	Quantity	
Distribution		Distribution	19	0	0	0	0	1	4	2	12	59	40	33	21	8	2	1	0	0	105	Livelihood	
Density		Density	30	0	0	0	0	0	0	6	24	107	33	9	2	1	1	0	0	0	46	Quantity	
Density		Density	21	0	0	0	0	0	0	4	17	45	53	36	15	10	2	1	0	0	117	Livelihood	
Quantity	Quantity	21	0	0	0	0	0	0	4	17	45	53	36	15	10	2	1	0	0	117	Livelihood		

	Conservation	Conservation type	75	0	0	1	0	4	9	27	34	55	34	14	3	0	1	1	0	0	53	Size of PAs
--	--------------	-------------------	----	---	---	---	---	---	---	----	----	----	----	----	---	---	---	---	---	---	----	-------------