Study on Estimation of Economic Value of National Protected Areas in Lao PDR*

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Abstract

The objective of this study is for estimation of Economic Value of National Protected Areas in Lao PDR. The estimation of Economic Value of National Protected Areas in Lao PDR by Benefit Transfer (BT) approach. Data were applied for analyzed came from study sites to Policy site. The results show the economic value of the national protected area in Lao PDR from the both Use Value and Non-use Value. The final result also total economic value is $ 3,942/year. The authors conclude that Total Economic Value(TEV) has a maximum Value on National Protected Area in Lao PDR. These results offer information to policy makers to decide protect on National Protected Area in Lao PDR. This finding might have significant on National Biodiversity strategy of Lao PDR. It is the first paper try to investigate the Total Economic Value of the National Protected Area in Lao PDR.

Keywords: National Protected Area (NPA); Benefit Transfer (BT); Total Economic Value (TEV).

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Introduction

Lao PDR is a rich country with forest resources, and the one of the highest rates of forestry area in South East Asia, in 1940 had a forest cover of the country's total land area of 17 million hectares and also canopy density cover about 70% (WB,2005), in recently forest area reduces or destroyed. In 1982, forestry is decline to 49% (Environmental Protection Project, 2014). In 1992, forests cover about 47% of the country's total land area. In 2002, cover about 41.5% (WB, 2005). In 2010, the forestry is cover by 40% (UNDP, 2010). Maybe it is an important reasons from the stakeholder as much as the importance of forest resources. This is an indicates to figures of timber supply are 300,000 m^3 annually and the official logging figures for 2000-2001, 2001-2002 are 260,000 m^3 and 2004-2005 is 150,000 m^3 (FS2020, 2005). Especially, the lao people in rural areas, also continued destroy of forests to through-out in the country, including burn forest and invasive wildlife, An estimated the forest was destroyed within two decades in the past about 91,200 ha (UNDP, 2010) or possibly up to 53,000 ha per year (WB, 2005). Forest quality decreased, with declines in the evergreen forest in 1992, 29% in 2005, at 8.2% (UNDP, 2010). Forest Change include decreases in quantitative timber, changes in composition of forest species and structures, loss of habitat and declining populations of wildlife and plant species in many areas.As aforementioned, the trend to decline of forestry may lead on to adverse impacts on the economy, society and the environment (Office of the Prime Minister of Laos, 2005).From the deforested, it is an impact to decline in the number of wildlife, biodiversity and so on; it is likely to lead on to extinction. In 1993, formal regulations and formalities were formulated to establish the National Biodiversity Conservation Area (NBCAs) or the National Protected Area by Decree No. 164 / ND. It covers 18 national protected areas with an area of 2.8 million hectares, or about 12% of the total area of the country (FS2020). In 1995, the National protected areas increased to 20, covering 3.3 million hectares, or about 14% of the country's total area (Ministry of Agriculture and Forestry, 2001).Now, there are 24 national protected areas covering 3.8 million hectares or 18% of land area (MONRE, 2016). However, forestry is still heavily harvested or destroyed, showing in 2007-2008, export figures accounted for 4.5% of total exports, or approximately 1.3 billion US dollars (UNDP, 2010) At the same time, the Government of Lao PDR has set a strategic goal of developing quality and increasing the coverage of forest cover by 70% by 2020 (FS2020, 2005).It has been an important challenge in the present for the Lao People's Democratic Republic. The Lao people has not yet fully understood the value and significance of forests. It is not known the true

value of the forest or lowest value estimation of the forest, So, resulted in the loss of Lao forest for the case of Lao PDR. Now it did not research yet, so the case study would like to consider "assessing the economic value of the NPA in Lao PDR". What is the treats/challenges of protection of national protected area?It is not enough to meet even the basic management needs. It is not enough funding the government has limited budget but there are number of priority activities to be undertaken. Remains very limited and being received from a single income source. People assess the environmental value of those things, and become to use those resources immensely.

Total Economics Value

The total economic value (TEV) approach is the methodology to measure the economic value of the environment and natural resources. It is the sum total of use values (UV) and non-use values (NUV) of the goods or service. Use values can further be classified into three types: direct use values (DUV), indirect use values (IUV) and option values (OV), although there are some sectors that contend that OV should be included as part of NUV rather than of UV. On the other hand, NUV are made up of existence (XV) and bequest values (BV). The total economic value may be expressed as:

$$TEV = UV + NUV$$

$$TEV = (DUV + IUV + OV) + (XV + BV)$$

Direct use values refer to values derived from actual use of the good either for direct consumption or production of other commodities. Market prices are used for goods that are traded but for goods or services with no market prices, i.e., not traded, their values are more difficult to estimate. In the case of forests, direct use values would include the value of NTFPs being extracted for livelihoods, and the value of timber being sold and traded in the market. Benefits are therefore enjoyed by community or village members that depend on NTFP extraction for their livelihoods, and by the provincial government that gets to collect tax revenues from the sale of timber.

Indirect use values are benefits derived from ecosystem functions, such as the forest's functions for watershed protection, sequestering carbon, and biodiversity conservation etc. These are values derived from resources and services that are not consumed, traded or

reflected in national income accounts. They usually accrue to society as a whole, rather than to individuals or corporate entities. In the case of watershed protection, the direct beneficiaries are those who live and/or operate within the whole watershed catchment area. On the other hand, biodiversity conservation and carbon sequestration benefits are global in nature, whereby people who may not live within the boundaries of Lao PDR as a whole still attach positive values and derive benefits from such services. Although difficult to measure, there is increasing evidence that IUVs may prove to be larger than DUVs.

Option values are those that approximate an individual's willingness to pay (WTP) in order to ensure that the good can be accessed at a later date. OVs are some sort of insurance values, in which people assign values to risk aversion in the face of uncertainty. Forests provide an option for potential discoveries of microorganisms or genetic resources that may prove beneficial in the future. Bio prospecting activities by pharmaceutical and biotechnology companies are concrete examples of benefits that would have option values. Given this, society as a whole may be willing to pay to retain the option of having future access to a certain species. Again, this type of benefit is global in terms of the beneficiaries covered. A pharmaceutical discovery from a genetic resource in Lao PDR will in most cases benefit the rest of the world, thus people in general will have a positive value attached to this service.

Existence values are defined as the WTP of people merely to ensure the continued existence of a certain species or ecosystem. It is the benefit accruing to an individual just by knowing that the resource exists. The ethical dimension is important in determining the XV, which reflects sympathy, responsibility and concern that some people may feel toward certain species and ecosystems or biodiversity in general. Like option values, existence values are global in nature. The existence of the tiger, for instance, would be important not just to the Lao population but also to people in other parts of the world in general.

Bequest values are measures of benefits people attach to resources so that future Generations may avail of the same benefits that accrue to the present generation. These values provide a strong economic justification for preserving natural lands, and they seem to dominate all other benefits of wilderness in the minds of some people. It also ensures inter-generational equity.

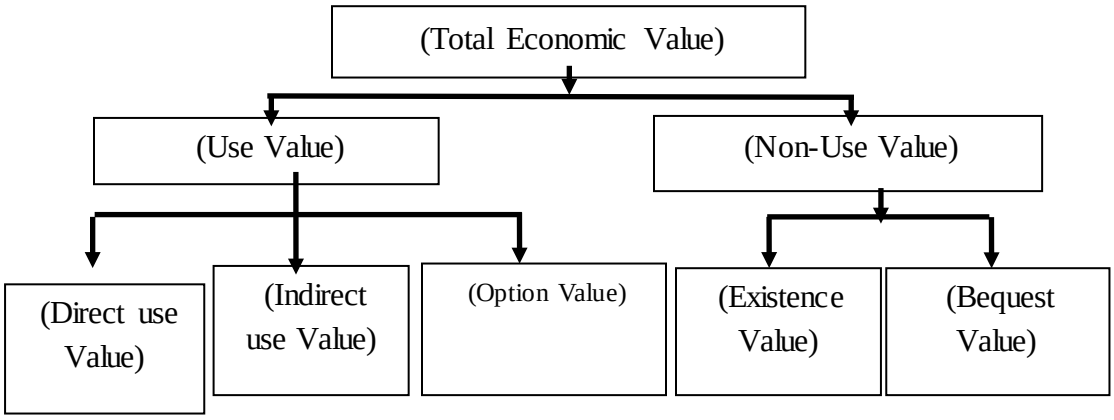


Figure 1 Total Economics Value

Source: IUCN, 1998

Benefit Transfer Approach (BT) is a method of using all types of valuation because this method is not required to conduct field surveys, but is a survey of existing and pasted environmental values from other sources to represent the value of the environmental value being studied.

Table 1 The area of National Protected Area (ha)

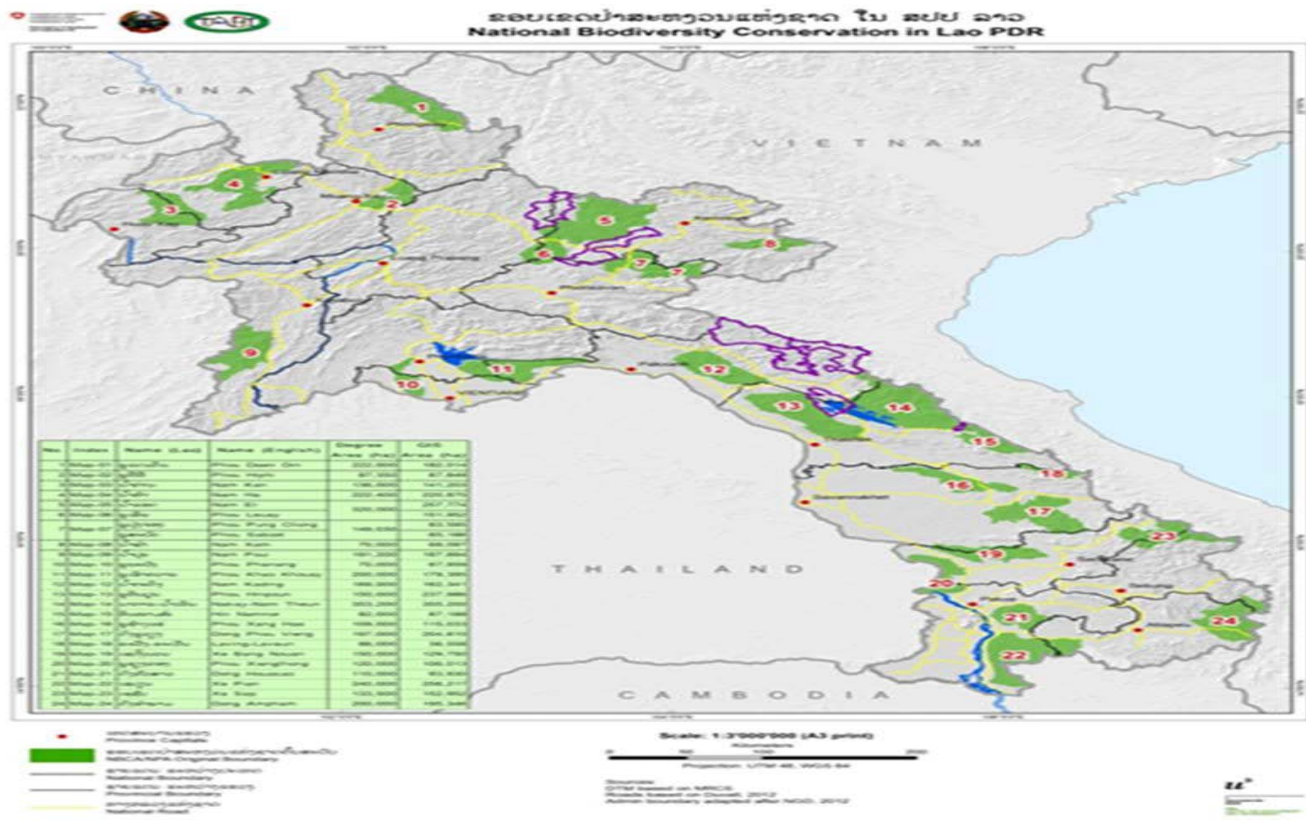
		BT
Use Value	Direct Use Value	✓
	Indirect Use Value	✓
Non Use Value	Existence Value	✓
	Bequest Value	✓
Option Value		✓

National Protected Areas in Lao PDR

There are 24 National Protected Areas and two corridors covering 3.8 million ha, or 18% of total area of the country, as of 2004 (see figure 3). In addition, local authorities have established 57 Provincial Conservation forests; 23 provincial protection forests; 144 District Conservation Forests and 52 District Protection Forests which sum up to 1.4 million hectares.

Overall, there are 5.34 million ha of conservation and protection forests, representing 22.56 % of the total land area of the country. However, in 2014 the National Assembly requested the GoL to review and recdelineate these '3 forest categories' due to the fact that, as mapped, these '3 forest categories' overlap and include significant large areas of agriculture and other land uses, and villages.

Figure 1 National Protected Areas in Lao PDR



Source: Prime Minister's Office, Environmental Protection Fund, 2014

The system of National Protected Areas in Lao PDR was legally established in 1993 and was officially termed the National Biodiversity Conservation Areas (NBCAs) through the Prime minister's Decree164, where 18 areas were declared (WREA, 2009). Later, five more areas plus 2 corridors were added making the total number of National Protected Areas in the system to 24 and 2 corridors (Table 2).

Table 2: The area of National Protected Area (ha)

No	Nam of National Protected Areas	Location	Degree Area (ha)
01	Phou Deen Din	Phongsaly	222,000
02	Nam Ha	Luangnamtha	222,400
03	Nam Kan	Borkeo	136,000
04	Nam Et	Houaphan	170,000
05	Phou Leuay	Houaphan/Louangphrang/Xiengkhoang	150,000
06	Nam Xam	Houaphan	70,000
07	Nam Poui	Sayaboury	191,200
08	Phou Phanang	Vientiane/Vientiane Capital	70,000
09	Phou Khao Khouay	Vientiane/Vientiane Capital/Borlikhamxay/Saysomboun	200,000
10	Nam Kading	Borlikhamxay	169,000
11	Phou HinPoun	Khammouane	150,000
12	Nakay-Nam Teun	Borlikhamsay/Kammouane	353,200
13	Hin Nam No	Kammouane	82,000
14	Phou XangHae	Savannakhet	109,000
15	Dong Phouvieng	Savannakhet	197,000
16	Xe Sap	Salavan/Xekong	133,500
17	Xe Bang Nouan	Savannakhet/ Salavan	150,000
18	Dong Houasao	Champasack	110,000
19	Phou Xiengthong	Salavan/Champasack	120,000
20	XePian	Champasack/Attapeu	240,000
21	Dong Ampham	Attapeu	200,000
22	Phou Sapoot-pungchong	Xekhoang	149,030
23	Phou Hiphi	Oudomsay	87,350
24	Laving-Laveun	Savannakhet	86,000
Total			3,767,680

Source: Prime Minister's Office, Environmental Protection Fund, 2014

Methodology

This study method is used to describe the use of the chart to reflect the total economic value (TEV) of the 24 National Protected Areas in Lao PDR, which will evaluate both the Use Value and the Non-Use Value. Using a method of reference or benefit transfer from research findings has taken place from other sites in the Study Site and then assessed the value of the Policy Site, which will be used to transfer Unit Transfer With Income Adjustment.

The Benefit Transfer Method (BTM) is an assessment method that focuses on assessing the economic value of the NPA system by taking value or cost from another case study and assessing the value of the National Protected Areas (James L. Boutwell and John V. Westra, 2013).Most of the numbers employed in the calculations are drawn from other studies. In addition to listing the sources for these estimates, The each Table is the presents a few details on the methodology for each. Two caveats are worth mentioning. First, many of the cited studies do not pertain to the Lao PDR nor, for that matter, to Lao PDR. They are, nevertheless, employed, absent an adequate selection of corresponding Laos case studies. Second, calculating a general per-hectare value for the National Protected Areas. Again, this simplifying assumption is made necessary by the limited available data.

Result

This section discussed about the literature on economic values of NPA in developed and developing countries. There are use value and non-use value of NPA. Then we used the average values from literature to estimate the economic values of NPA in Laos.

- **Use Value (1) Direct Use**

Most of the numbers employed in the calculations are drawn from other studies. In addition to listing the sources for these estimates, The direct use values considered in this study are composed of Timber, NTFP, Food, Non-food raw material, Recreation, Water supply and Medicines. the benefit-transfer method (BTM) was used.

Table 4 Direct Use

No	Forest service	$/ha/yr	Source	Location (Country)	GDP		WTP in Laos	CPI in Laos		Difference CPI (%)	Value in Laos
	Direct Use				Country(i)	Laos	Year (i)	Year (i)	2015		

1	Sustainable Timber	307	Torras, M (1999)	Brazil	3,469	277	25	38	126	227	80
	(Timber)	10.35	Rosales et al (2003)	Laos		362	10	66	126	90	20
	Timber	1461	Van Beukering (2009)	Indonesia	2,254	948	614	94	126	33	819
	Timber harvesting	830	Grieg-Gran (2006)	Ghana	922	590	531	84	126	50	797
Average Timber Value											429
2	NTFP	52	Van Beukering (2009)	Indonesia	2,254	948	22	94	126	33	29
	NTFP	19	Bann (1997)	Cambodia	304	345	22	9	126	1,314	305
	NTFP	8	Caldecott (1988)	Malaysia	2,071	148	1	2	126	7,434	43
Average NTFP Value											126
3	Food	131	Torras, M (1999)	Brazil	3,469	277	10	38	126	227	34
	Food	400	Peters et al. (1989)	Peru	1,052	172	65	3	126	4,560	3,047
	Food	46	Grimes et al. (1994)	Ecuador	2,028	325	7	5	126	2,324	179
Average Food Value											1,087
4	Non-food raw material	74	Torras, M (1999)	Brazil	3,469	277	6	38	126	227	19
	Building material	20.3	Bye et al. (1993)	Mexico	5,562	287	1	5	126	2,489	27
Average Non-food raw material											23
5	Recreation	37	Torras, M. (1999)	Brazil	3,469	277	3	38	126	227	10
	Recreation	50	Tobais and Mendelsohn (1991)	Costa Rica	2,257	234	5	4	126	2,924	157
	Recreation	5	Ruitenbeek (1992)	Cameroon	918	250	1	5	126	2,653	37
Average Recreation											68
6	Protection of irrigation water	15	Kumari (1996)	Malaysia	4,797	377	1	7	126	1,695	21

	Water supply	342	Van Beukering (2009)	Indonesia	2,254	948	144	94	126	33	192
Average Water supply											106
7	Medicines	51.7	Bye et al. (1993)	Mexico	5,562	287	3	5	126	2,489	69
	Total Direct Use										1,908

Indirect Use

The indirect use values considered in this study are composed of Climate regulation, Flood control, Watershed protection, Soil erosion, Soil erosion, Agriculture Production, and carbon sequestration. the benefit-transfer method (BTM) was used. BTM is an approach that involves taking the results from one or more primary economic studies with estimated values for similar impacts, and modifying and transferring them to the area being studied.

Table 5: Indirect Use

No	**Forest service**	**$/ha/ yr**	**Source**	**Location (Country)**	**GDP**		**WTP in Laos**	**CPI of Laos**		**Difference CPI (%)**	**Value in Laos**
	Indirect Use				**Country (i)**	**Laos**	**Year (i)**	**Year (i)**	**2015**		
1	Climate regulation	153	Torras, M. (1999)	Brazil	3,469	277	12	38	126	227	40
	Climate regulation	70	Fearnside (1997)	Brazil	5,271	345	5	9	126	1,314	65
	Climate regulation	336	Krutilla (1991)	Malaysia	2,652	234	30	4	126	2,924	897
Average Climate regulation											334
2	Dstrurance regulation	4	Torras, M (1999)	Brazil	3,469	277	0	38	126	227	1
	Flood protection	3	Ruitenbeck. (1992)	cameroun	918	250	1	5	126	2,653	22
	Flood control	92.3	Rosales et al (2003)	Laos		362	92	66	126	90	175
	Flood Prevention	523	Van Beukering	Indonesia	2,254	948	220	94	126	33	293

			(2009)								
Average Flood control											123
3	Water regulation	19	Fearnside (1997)	Brazil	5,271	345	1	9	126	1,307	18
	Water regulation	19	Torras, M. (1999)	Brazil	3,469	277	2	38	126	227	5
	Watershed protection	273	Emerton (1999)	Kenya	421	277	180	38	126	227	587
	Protection of irrrigation	15	Kumari (1996)	Malaysia	4,797	377	1	7	126	1,695	21
Average Watershed protection											158
4	Erosion control	238	Torras. M (1999)	Brazil	3,469	277	19	38	126	227	62
	Prevention of soil erosion	12	Kumari. (1996)	Malaysia	4,797	377	1	7	126	1,695	17
	Soil erosion	46	Bann.(1998)	Turkey	4,496	248	3	17	126	637	19
Average Soil erosion											33
5	Fisheries & aquatic	0.47	Rosales et al (2003)	Laos		362	0	66	126	90	1
	Fisheries protection from avoided loggig	268	Hodgson & Dixon (1998)	Philippines	966	248	69	17	126	637	507
	Fishery	653	Van Beukering (2009)	Indonesia	2,254	948	275	94	126	33	366
Average Fishery											291
6	Agriculture Production	2.5	Rosales et al (2003)	Laos		362	3	66	126	90	5
	Agriculture	1133	Van Beukering (2009)	Indonesia	2,254	948	477	94	126	33	635
Average Agriculture											320
7	hydro-electricity	4	Shahwahid et al. (1997)	Malaysia	4,637	345	0	9	126	1,307	4
	hydro-electricity	5	Van Beukering (2009)	Indonesia	2,254	948	2	94	126	33	3
Average hydro-electricity											3

8	Carbon	56	Adger, N., et al (1995)	Mexico	3,655	363	6	6	126	1,929	113
	Carbon Sequestration	1,284	Rosales et al (2003)	Laos		362	1,284	66	126	90	2,436
	Value of Carbon Sequestration	37	Dunkiel&Sgarman (1998)	USA	32,949	248	0	17	126	637	2
	Carbon Sequestration	6	Howard (1995)	Uganda	280	363	8	6	126	1,929	153
	Carbon Sequestration	105	Bulte et al. (2002)	Costa rica	4,062	319	8	57	126	119	18
Average Carbon Sequestration											544
	Total Indirect Use										1,806

- **Option**

Most of the numbers employed in the calculations are drawn from other studies. In addition to listing the sources for these estimates, The Option Value considered in this study are composed of Option Value. The benefit-transfer method (BTM) was used.

Table 6: Option

No	Forest service	$/ha/yr	Source	Location (Country)	GDP		WTP in Laos	CPI of Laos		Difference CPI (%)	Value in Laos
	Option Value				Country(i)	Laos	Year (i)	Year (i)	2015		
1	Unknown future medicinal benefit	18	Torras, M (1999)	Brazil	3,469	277	1	38	126	227	5
	Option Value	32	Adger et al. (1995)	Mexico	3,655	363	3	6	126	1,929	64
	Option Value	20	Fearnside (1997)	Brazil	5,271	345	1	9	126	1,307	18
	Option Value	9	Grimes et al. (1994)	Ecuador	2,028	325	1	5	126	2,324	35
Average Option Value											31

Non-use value

Most of the numbers employed in the calculations are drawn from other studies. In addition to listing the sources for these estimates, The Existence benefit considered in this study are composed of Option Value. The benefit-transfer method (BTM) was used.

Table 7 : Non-use value

No	Forest service	$/ha/yr	Source	Location (country)	GDP		WTP in Laos	CPI of Laos		Difference CPI (%)	Value in Laos
	Existence benefit and Bequest Value				Country (i)	Laos	Year (i)	Year (i)	2015		
1	Existence benefit	194	Torras, M (1999)	Brazil	3,469	277	15	38	126	227	51
	Existence benefit	238	Echeverria et al. (1995)	Costa rica	3,279	363	26	6	126	1,929	535
	Existence benefit	18	pearce(1991)	US	24,405	234	0	4	126	2,924	5
Average Existence benefit and Bequest Value											197

Sources: The authors' summary.

Average Value of the National Protected Area in Lao

The average value of each study sites, and then the average cost is used to use the value (Policy Site) of the NPA in Lao PDR, which is as follows (Table 8)

Table 8: Average Value of the National Protected Area in Lao

No	Type of Value	Value per ha / year	Total Degree Area (ha)	Value
I	USE Value			
1.1	**Direct Use**			
1	Timber Value	429	3,767,680	1,616,485,373
2	NTFP Value	126	3,767,680	473,520,764
3	Food Value	1,087	3,767,680	4,094,540,005
4	Non-food raw material	23	3,767,680	87,476,358
5	Recreation	68	3,767,680	256,101,860
6	Water supply	106	3,767,680	401,181,776
7	Medicines	69	3,767,680	260,192,251
Sub-total		1,908	3,767,680	7,189,498,388
1.2	**Indirect Use**			
1	Climate regulation	334	3,767,680	1,257,550,657
2	Flood control	123	3,767,680	463,394,746
3	Watershed protection	158	3,767,680	594,249,699
4	Soil erosion	33	3,767,680	122,764,004
5	Fishery	291	3,767,680	1,097,538,709
6	Agriculture	320	3,767,680	1,205,956,080
7	hydro-electricity	3	3,767,680	13,172,284
8	Carbon Sequestration	544	3,767,680	2,051,486,813
Sub-total		1,806	3,767,680	6,806,112,993
1.3	Option Value	31	3,767,680	115,454,830
Total USE Value		3,745	3,767,680	14,111,066,211
II	**Non-USE Value**			
2.1	Existence benefit and Bequest Value	197	3,767,680	741,620,216
Total Economic Value		3,942	3,767,680	14,852,686,427

Source: Authors' estimation.

The National Protected Area of the Lao PDR comprises of 24, including the Use value and non-Use value. Based on the assessment of the Study Sites in different locations to calculate the NPA in Lao PDR, Total Economic Value is 3,942 / ha / year, so the total are 14,852,686,427/ year.

Estimate that the direct Use Value is $ 1,908 per hectare, if all of the 24 protected areas are $ 7,189,498,388.The value of timber consumption is 429 USD /ha/year, if all of the 24 protected areas are $ 1,616,485,373, the NTFP value is $ 126 USD / ha / year. If the total value of all 24 National protected areas are $ 473,520,764, the food of $ 1,087/ha/year, if all of the 24 National protected areas are $ 4,094,540,005 /ha/year, the non-food raw material is $ 23 /ha/year, if all of the 24 National protected areas are $ 87,476,358 /ha/year, Recreation & Tourism is $ 68 /ha/ year, If the total value of all 24 National protected areas are $ 256,101,860 /ha/year, the water supply are $ 106 /ha/year, if the total value of the 24 National protected areas are $ 401,181,776 /ha/year, the medication value is $ 69/ha/year, if all of the 24 National protected areas are $ 260,192,251/ha/year.

Indirect use value is $ 1,806/ha/year, if the total values of 24 National protected areas are $ 6,806,112,993/ha/year. It includes the following: Climate regulation values are $ 334/ha/year, if all of the 24 National protected areas are $ 1,257,550,657/ha/year. Flood control is $ 123/ha/year, if 24 National protected areas are $ 463,394,746 /ha/year. The Watershed protection value is $ 158 /ha/year, if 24 National protected areas are $ 594,249,699/ha/year. Soil erosion is $ 33/ha/year, If 24 National protected areas are $ 122,764,004/ha/year. Fishery value is $ 291/ha/year, if 24 National protected areas are $ 1,097,538,709/ha/year. The value of agriculture are US $ 320/ ha/year, if 24 National protected areas are $ 1,205,956,080/ha/year. The value of hydroelectric power is $ 3/ha/year, if 24 National protected areas are $ 13,172,284/ha/year. Carbon Sequestration value are $ 544 /ha/year, if 24 National protected areas are $ 2,051,486,813/ha/year.

The value of the Option Value is $ 31/ha/year, if 24 National protected areas are $ 115,454,830/ha/year. The Average Existence benefit and Bequest Value are $ 197/ha/year, if 24 National protected areas are $ 741,620,216/ha/year.

Conclusion and Recommendation

The policy maker and some economist seem estimated under-valuation of NPA. As the result, it leads to decline the forest cover and increase the deforestation. The objective of this study is to estimate the economic values of the NPA in Lao PDR

Total Economic Value of the National Protected Areas of Lao PDR by Benefit Transfer. It is the value of each study site to assess the value of the Policy Site in Laos. In the transaction, the average value of each type of goods and services from the forest and then assessed by the Lao National Protected Area.

It is a way for policy makers to use them in planning or setting policies in the future. This study uses a cost-transfer method to reflect the average value of the National Protected Area in Lao PDR, which shows the valuable that it should be preserved. In this Case study is a reflects to overall value, but would like to see the true value of each area or place or product, the next one should study further. And it is used to benefit transfer and the next time, it is necessary to use other methods to ask local people.

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