Annex F

Final Report
for
the Preparatory Survey
on the Project for Restoration and Sustainable Management of Protection Forests in the Socialist Republic of Vietnam

Annex F: Cost Estimation of Rural Infrastructure Construction and Improvement

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Annex F: Cost Estimation of Rural Infrastructure Construction and Improvement

1. Proposed Rural Infrastructure

The 12 provinces proposed more than 200 subprojects for rural infrastructure improvement and construction for livelihood improvement support. The proposed subprojects include roads, bridges, irrigation and water supply in the 167 Communes in 55 Districts. The JICA Study Team confirmed DARDs of 12 provinces the location, objectives, work quantity and impact to the livelihood improvement for each commune. After confirmation of outline of the sub project, the Study Team together with DARD prioritized the subprojects and compiled in the short list taking into account of the needs and equity in support in each Province. Further, the short listed subprojects were reviewed by DARDs and JICA Fact Finding mission in March 2010 and revised.

The detailed information of long listed subprojects including revised short listed subprojects are given in **Tables F-1 to F-12**.

Summary of Long List and Short List of Rural Infrastructure Construction and Improvement

Province	Long List for Improvement and/or Construction					Short List (revised) for Improvement and/or Construction			
	Road (km)	Bridge (no.)	Irrigation (ha)	Water Supply (no.)		Road (km)	Bridge (no.)	Irrigation (ha)	Water Supply (no.)
Thanh Hoa	21	-	105	-	→	16.6	-	85	-
Nghe An	20	-	45	-	→	18.0	-	45	-
Ha Tinh	11	-	120	-	→	9.0	-	90	-
Quang Binh	25	-	-	-	→	20.0	-	-	-
Quang Tri	15	-	-	-	→	15.0	-	-	-
Hue	18	-	13	3	→	12.0	-	13	4
Quang Nam	68	-	205	-	→	22.0	-	15	-
Quang Ngai	10	-	-	-	→	10.0	-	-	-
Binh Dinh	140	8	2,422	-	→	22.5	-	-	-
Phu Yen	32	-	300	3	→	18.0	-	150	-
Ninh Thuan	49	-	1,400	2	→	9.0	-	160	2
Binh Thuan	48	-	502	3	→	13.5	-	-	2
Total	457	8	5,112	11	→	186.0	0	558	8

2. Cost Components

2.1 Direct Cost of Construction

The direct cost for rural infrastructure construction and improvement are estimated by the construction unit price following the construction cost norm specified in “Degree No.99/2007ND-CP” under “Law of Construction”. According to the “Degree No.99/2007ND-CP”, the construction cost norm should be established and promulgated by the PPC or branch of the Ministry of Construction considering the particular and location of the works based on the Econo-Technical Norm and Construction Price Index issued by the Ministry of Construction. The Unit Construction Cost is composed of price of construction material, construction machinery and construction labor and the “Degree No.99/2007ND-CP” guides the way of determination of the each price. According to the “Degree No.99/2007ND-CP”, the material cost should be determined on the basis of the market price notified by the suppliers and transportation cost of the material to the work site should be added to the

price. The construction labor price is guided to be determined according to the popular labor market price in each region or Province. The machine and equipment price are determined by the guidance of the Ministry of Construction with monthly and quarterly hiring charges.

Although the way of establishment of construction unit price is varied in each Province for each type of work, the unit construction price for short listed rural infrastructure construction and improvement for each province is calculated in the simple manner on the following premises.

(a) Construction Labor Unit Price

The minimum wage level of all of target Districts and Communes are in the Range-IV level according to promulgation issued by the State Agency. It is therefore that same unit labor price is applied to all the Provinces for unit construction price calculation. Since most of the Provinces estimate the additional charge if working site is far away from the main road, additional 4% of the unit labor price for the coastal protection area and additional 20% of the unit labor price to the watershed area are added to the unit labor price.

(b) Construction Machine and Equipment Unit Price

Although the hiring charge of the construction machine and equipment are varied in each Province, the variation of the machine and equipment cost would not give a big impact for the unit construction cost. It is therefore that the uniformed machinery cost is applied to all the Provinces. The additional transportation cost is estimated 1.2% only for the watershed area uniformly to all the Provinces.

(c) Construction Material Unit Price

It is observed the difference of the construction material cost in the Region-wise namely North Central Coast, South Central Coast and South East, the average of the major material cost such as cement, sand, coarse aggregate and reinforcement is employed for each region for the calculation of unit construction cost. The additional transportation cost for the major material also calculated VND 140,000 per 1 m^3 for watershed area and VND 70,000 per 1 m^3 for the coastal protection area assuming the necessary transport of the material.

2.2 Administrative Charges and Miscellaneous

In addition to the direct cost estimated based on the construction unit price, 1.5% of total direct cost is included as a miscellaneous to the estimation. Also the following administrative charges of the Contractor and their profit are estimated and included in the cost. Any price and physical contingencies are not included in the cost estimation.

Administration Charge :	5.3 % of Direct Cost for all type of work
Profit :	6.0 % for rural road and culvert construction and improvement work and 5.5% for irrigation and water supply construction and improvement work in the estimation

2.3 Unit Cost of Construction

The work quantities of each subcomponents are tentatively estimated considering the similar type of work carried out in SLP-III or other Government projects in the target provinces and based on the typical design.

Based on the above assumption, the unit construction and improvement cost of rural road, irrigation and domestic water supply are estimated and summarized below:

Summary of Estimated Unit Cost for Rural Infrastructure

Region	Province	Location	Estimated Cost (Million VND)		
			Road (per km)	Irrigation (per location for 15ha)	Water Supply (per system for 100 HH)
North Central Coast	Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Hue	Watershed	1,030.6	759.9	399.3
		Coastal	929.4	-	-
South Central Coast	Quang Nam, Quang Ngai Binh Dinh, Phu Yen	Watershed	1,148.9	810.1	408.8
		Coastal	1,046.3	-	-
South East	Ninh Thuan, Binh Thuan	Watershed	1,063.6	774.2	402.5
		Coastal	962.0	-	-

Tables F-13~F-15 provide the estimated unit cost of rural infrastructure. **Figures F-1~F-9** give typical design of the rural infrastructure.

3. Estimated Cost of the Component by Province

Based on the work quantity and unit cost for rural infrastructure construction and improvement, the total cost for each Province is estimated as shown below.

Summary of Estimated Cost for Rural Infrastructure

Province	Quantity of Work Total Qt'y (*Qt'y in Coastal Area*)			Estimated Cost (Million VND)			
	Road (km)	Irrigation (ha)	Water Supply (Location.)	Road	Irrigation	Water Supply	Total
Thanh Hoa	16.6 (*0*)	85 (*0*)	-	17,108	4,306	0	21,414
Nghe An	18.0 (*0*)	45 (*0*)	-	18,551	2,280	0	20,831
Ha Tinh	9.0 (*0*)	90 (*0*)	-	9,275	4,560	0	13,835
Quang Binh	10.0 (*10*)	-	-	19,600	0	0	19,600
Quang Tri	15.0 (*0*)	-	-	15,459	0	0	15,459
Hue	12.0 (*0*)	13 (*0*)	4 (*0*)	12,367	659	1,597	14,623
Quang Nam	22.0 (*0*)	15 (*0*)	-	25,276	810	0	26,086
Quang Ngai	10.0 (*0*)	-	-	11,489	0	0	11,489
Binh Dinh	22.5 (*0*)	-	-	25,851	0	0	25,851
Phu Yen	18.0 (*0*)	150 (*0*)	-	20,681	8,101	0	28,782
Ninh Thuan	9 (*0*)	160 (*0*)	2 (*0*)	9,572	8,258	805	18,635
Binh Thuan	7.5 (*6*)	-	2 (*0*)	13,749	0	805	14,554
Total	170 (*16*)	558 (*0*)	8 (*0*)	198,978	28,973	3,207	231,158

Tables & Figures

Table F-1 List of the Proposed Rural Infrastructure Development

Thanh Hoa

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity		Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
TH-001	BQL Song Dan	Thuong Xuan	Luan Khe	Improvement of Luan Khe Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	0.8	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	140	800	A	6.0
TH-002	BQL Song Dan	Thuong Xuan	Luan Khe	Construction of Check Dam and Canal System in Luan Khe	Irrigation	Construction of concrete check dam and irrigation canal of 1.0 km including related structure	15.0	ha	Increment of paddy production by providing the irrigation water	75	1,500	B	6.0
TH-003	BQL Song Dan	Thuong Xuan	Luan Thanh	Improvement of Luan Thanh Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	0.8	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	115	800	A	3.0
TH-004	BQL Song Dan	Thuong Xuan	Xuan Cao	Improvement of Xuan Cao Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	0.8	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	120	800	A	3.0
TH-005	BQL Song Dan	Thuong Xuan	Xuan Thang	Improvement of Xuan Thang Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	0.8	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	90	800	A	3.0
TH-006	BQL Song Chang	Tho Xuan	Thanh Hoa	Improvement of Thanh Hoa Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	3.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	110	3,000	A	4.0
TH-007	BQL Song Chang	Tho Xuan	Thanh Hoa	Improvement of Thanh Hoa Irrigation Canal	Irrigation	Improvement of existing earth canal of 0.5km by providing the concrete lining.	15.0	ha	Increment of paddy production by providing the irrigation water	75	15,000	B	6.0
TH-008	BQLRPH Sim	Nhu Thanh	Phuong Nghi	Improvement of Phuong Nghi Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	2.5	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	90	2,500	A	4.0
TH-009	BQLRPH Sim	Nhu Thanh	Phuong Nghi	Construction of Check Dam and Canal System in Phuong Nghi	Irrigation	Construction of concrete check dam and irrigation canal of 0.5 km including related structure	15.0	ha	Increment of paddy production by providing the irrigation water	75	1,500	B	6.0
TH-010	BQLRPH Nhu Xuan	Nhu Thanh	Xuan Thai	Improvement of Xuan Thai Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	270	1,000	A	3.0
TH-011	BQLRPH Nhu Xuan	Nhu Thanh	Xuan Thai	Construction of Check Dam and Canal System in Xuan Thai	Irrigation	Construction of concrete check dam and irrigation canal of 0.5 km including related structure	15.0	ha	Increment of paddy production by providing the irrigation water	75	1,500	B	6.0
TH-012	Nhu Xuan District PC	Nhu Xuan	Cat Van	Improvement of Cat Van Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	3.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	60	3,000	A	4.0
TH-013	Nhu Xuan District PC	Nhu Xuan	Cat Van	Construction of Check Dam and Canal System in Cat Van	Irrigation	Construction of concrete check dam and irrigation canal of 0.5 km including related structure	15.0	ha	Increment of paddy production by providing the irrigation water	75	1,500	B	6.0
TH-014	Nhu Xuan District PC	Nhu Xuan	Thanh Quan	Improvement of Thanh Quan Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	3.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	100	3,000	A	4.0

Table F-1 List of the Proposed Rural Infrastructure Development

Thanh Hoa

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity		Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
TH-015	Nhu Xuan District PC	Nhu Xuan	Thanh Quan	Construction of Check Dam and Canal System in Thanh Quan	Irrigation	Construction of concrete check dam and irrigation canal of 0.5 km including related structure	15.0	ha	Increment of paddy production by providing the irrigation water	75	1,500	B	6.0
TH-016	BQLRPH Thach Thanh	Thach Thanh	Ngoc Trao	Improvement of Ngoc Trao Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.5	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	80	1,500	A	3.0
TH-017	BQLRPH Thach Thanh	Thach Thanh	Ngoc Trao	Construction of Check Dam in Thanh Quan	Irrigation	Construction of check dam and inlet structure	15.0	ha	Increment of paddy production by providing the irrigation water	75	1,000	B	6.0
TH-018	BQLRPH Thach Thanh	Thach Thanh	Thach Tuong	Improvement of Thach Tuong Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.5	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	70	1,500	A	3.0
TH-019	BQLRPH Thach Thanh	Thach Thanh	Thach Lam	Improvement of Thach Lam Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.5	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	50	1,500	A	3.0
TH-020	Ha Trung	Ha Trung	Ha Linh	Improvement of Ha Linh Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	0.6	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	220	600	A	3.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	20.8 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	7 Location	105ha
(4)	Water Supply System Construction	0 Location	

SHORT LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	16.6 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	4 Location	85ha
(4)	Water Supply System Construction	0 Location	

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010. There was addition of new sites (Ting Gia PFMB) and infrastructure during the discussion with Thanh Hoa DARD.

Table F-2 List of the Proposed Rural Infrastructure Development

Nghe An

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
NA-001	Yen Thanh Forestry Company	Yen Thanh	Dong Thanh	Improvement of Dong Thanh Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	170	1,050	A	2.0
NA-002	Yen Thanh Forestry Company	Yen Thanh	Hau Thanh	Improvement of Hau Thanh Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	120	1,050	A	2.0
NA-003	Yen Thanh Forestry Company	Yen Thanh	Ma Thanh	Improvement of Ma Thanh Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	120	1,050	A	2.0
NA-004	Tuong Duong	Tuong Duong	Tam Thai	Improvement of Tam Thai Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	90	1,050	A	2.0
NA-005	Tuong Duong	Tuong Duong	Tam Thai	Construction of Tam Thai Check Dam and Irrigation Canal	Irrigation	New construction of check dam and inlet sluice of 0.5km	15.0 ha	Ensure the irrigation water for inreasement of paddy production	75	3,750	A	6.0
NA-006	Tuong Duong	Tuong Duong	Tam Hop	Improvement of Tam Hop Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	40	1,050	A	2.0
NA-007	Tuong Duong	Tuong Duong	Thach Giam	Improvement of Thach Giam Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	100	1,050	A	2.0
NA-008	Tan Ky	Tan Ky	Nghia Dung	Improvement of Nghia Dung Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	3.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	140	3,150	A	5.0
NA-009	Quynh Luu	Quynh Luu	Quynh Thang	Improvement of Quynh Thang Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.5 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	190	1,575	A	3.0
NA-010	Quynh Luu	Quynh Luu	Tan Thang	Improvement of Tan Thang Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.5 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	90	1,575	A	3.0
NA-011	Quynh Luu	Quynh Luu	Tan Thang	Construction of Tan Thang Check Dam and Irrigation Canal	Irrigation	New construction of check dam and inlet sluice of 0.5km	15.0 ha	Ensure the irrigation water for inreasement of paddy production	75	3,750	A	6.0
NA-012	Nam Dan	Nam Dan	Nam Giang	Construction of Nam Giang Check Dam and Irrigation Canal	Irrigation	New construction of check dam and inlet sluice of 0.5km	15.0 ha	Ensure the irrigation water for inreasement of paddy production	75	3,750	A	6.0
NA-013	Nam Dan	Nam Dan	Nam Giang Nam Nghia Nam Thai Nam Hung Nam Thanh	Improvement of Commune Road in Nam Dan District	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	3.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	125	3,150	A	5.0
NA-014	Nghi Loc	Nghi Loc	Nghi Dong Nghi Cong Bac Nghi Quang Nghi Thiet Phuc Tho Nghi Cong Nam Nghi Yen Nghi Lam	Improvement of Commune Road in Nghi Loc District	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	3.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	140	3,750	A	5.0

Table F-2 List of the Proposed Rural Infrastructure Development

Nghe An

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
NA-015	Dien Chau	Dien Chau	Dien Hai Dien Hung Dien Kim Dien Thanh Dien Thinh Dien Trung	Improvement of Commune Road in Dien Chau District	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	200	2,100	A	4.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	20.0 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	3 Location	45ha
(4)	Water Supply System Construction	0 Location	

SHORT LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	18.0 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	3 Location	45ha
(4)	Water Supply System Construction	0 Location	

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-3 List of the Proposed Rural Infrastructure Development

Ha Tinh

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
HT-001	Hong Linh	Huyen Nghi Xuan	Xuan Vien	New Construction of Xuan Vien Irrigation Dam and Canal System	Irrigation	Construction of concrete check dam with 15 m long and 3 m height. Construction of necessay concrete lining canal	15.0 ha	Increase paddy production and productivity	75	2,160	A	6.0
HT-002	Hong Linh	Huyen Nghi Xuan	Xuan Hong	New Construction of Xuan Hong Irrigation Dam and Canal System	Irrigation	Construction of concrete check dam with 15 m long and 3 m height. Construction of necessay concrete lining canal	15.0 ha	Increase paddy production and productivity	75	2,160	A	6.0
HT-003	Hong Linh	Huyen Can Loc	Thien Loc	New Construction of Thien Loc Irrigation Dam and Canal System	Irrigation	Construction of concrete check dam with 15 m long and 3 m height. Construction of necessay concrete lining canal	15.0 ha	Increase paddy production and productivity	75	2,160	A	6.0
HT-004	Hong Linh	Huyen Can Loc	Thuan Thien	New Construction of Thuan Thien Irrigation Dam and Canal System	Irrigation	Construction of concrete check dam with 15 m long and 3 m height. Construction of necessay concrete lining canal	15.0 ha	Increase paddy production and productivity	75	2,160	A	6.0
HT-005	Ngan Pho	Huyen Huong Son	Son Le	New Construction of Son Le Irrigation Dam and Canal System	Irrigation	Construction of concrete check dam with 15 m long and 3 m height. Construction of necessay concrete lining canal	15.0 ha	Increase paddy production and productivity	75	2,160	A	6.0
HT-006	Cam Xuyen	Huyen Cam Xuyen	Cam Thach	Improvement of Cam Thach Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	3.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	140	3,150	A	4.0
HT-007	Cam Xuyen	Huyen Cam Xuyen	Cam Lac	Improvement of Cam Lac Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	170	1,050	A	3.0
HT-008	Cam Xuyen	Huyen Cam Xuyen	Cam Quan	Improvement of Cam Quan Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	210	2,100	A	4.0
HT-009	Cam Xuyen	Huyen Cam Xuyen	Cam Quan	New Construction of Cam Quan Irrigation Dam and Canal System	Irrigation	Construction of concrete check dam with 15 m long and 3 m height. Construction of necessay concrete lining canal	15.0 ha	Increase paddy production and productivity	75	2,160	B	6.0
HT-010	Thach Ha	Huyen Thach Ha	Bac Son	Improvement of Bac Son Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.8 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	160	1,890	A	3.0
HT-011	Thach Ha	Huyen Thach Ha	Thach Xuan	New Construction of Irrigation Dam and Canal System	Irrigation	Construction of concrete check dam with 15 m long and 3 m height. Construction of necessay concrete lining canal	15.0 ha	Increase paddy production and productivity	75	2,160	A	6.0
HT-012	Thach Ha	Huyen Thach Ha	Thach Xuan	Improvement of Thach Xuan Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.3 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	160	1,365	B	3.0
HT-013	Thach Ha	Huyen Thach Ha	Nam Huong	New Construction of Irrigation Dam and Canal System	Irrigation	Construction of concrete check dam with 15 m long and 3 m height. Construction of necessay concrete lining canal	15.0 ha	Increase paddy production and productivity	75	2,160	A	6.0
HT-014	Thach Ha	Huyen Thach Ha	Nam Huong	New Construction of Nam Huong Irrigation Dam and Canal System	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	160	2,100	B	4.0

Table F-3 List of the Proposed Rural Infrastructure Development

Ha Tinh

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)

SUMMAY

LONG LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	11.1 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	8 Location	120ha
(4)	Water Supply System Construction	0 Location	

SHORT LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	9.0 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	6 Location	90ha
(4)	Water Supply System Construction	0 Location	

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-4 List of the Proposed Rural Infrastructure Development

Quang Binh

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
QB-001	Quang Trach	Quang Trach	Quang Hop Quang Kim Quang Phu Quang Trach	Improvement of Commune Road in Quang Trach District	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	10.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	315	10,000	A	6.0
QB-002	Ba Ren	Quang Ninh	Vo Ninh Hai Ninh Gia Ninh Truong Xuan Truong Son	Improvement of Commune Road in Quang Ninh District	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	5.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	650	5,000	A	6.0
QB-003	Ven Bien Nam	Le Thuy	Hong Thuy Thanh Thuy Ngu Hoa Cam Thuy Hung Thuy Hai Thuy Ngu Thuy Sen thuy	Improvement of Commune Road in Le Thuy District	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	10.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	660	10,000	A	6.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity
(1)	Road Construction and Improvement	25.0 km
(2)	Bridge Construction	0 Location
(3)	Irrigation Dam & Canal Improvement or Development	0 Location
(4)	Water Supply System Construction	0 Location

SHORT LISTED SUB PROJECT		Quantity
(1)	Road Construction and Improvement	20.0 km
(2)	Bridge Construction	0 Location
(3)	Irrigation Dam & Canal Improvement or Development	0 Location
(4)	Water Supply System Construction	0 Location

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-5 List of the Proposed Rural Infrastructure Development

Quang Tri

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
QT-001	Hướng Hoá-Đakrông	Hướng Hoá	Hướng Phung, Hướng Tân Hướng Linh, Tân Thanh Huong Son, Tan Hop	Improvement of Huong Hoa District Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	4.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	70	4,200	A	6.0
QT-002	Hướng Hoá-Đakrông	Đakrông	Hướng Hiệp, Đăkrông Mò Ó	Improvement of Communes Road in Dakrong District	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	70	2,100	A	4.0
QT-003	Ben Hai River	Vĩnh Linh	Vinh Ha Vinh O	Improvement of Vinh Ha and Vinh O commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	50	2,100	A	4.0
QT-004	Ben Hai River	Gio Linh	Linh Thuong	Improvement of Linh Thuong Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	4.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	40	4,200	A	6.0
QT-005	Thach Han River	Hải Lăng	Hải Lâm Hai Son	Improvement of Hai Lam and Hai Son Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	110	2,100	A	4.0
QT-006	Thach Han River	Thị xã Quảng Trị (Xa Hai Le)	Hai Le	Improvement of Hai Le Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with related structures	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	100	1,050	A	2.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity
(1)	Road Construction and Improvement	15.0 km
(2)	Bridge Construction	0 Location
(3)	Irrigation Dam & Canal Improvement or Development	0 Location
(4)	Water Supply System Construction	0 Location

SHORT LISTED SUB PROJECT		Quantity
(1)	Road Construction and Improvement	15.0 km
(2)	Bridge Construction	0 Location
(3)	Irrigation Dam & Canal Improvement or Development	0 Location
(4)	Water Supply System Construction	0 Location

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-6 List of the Proposed Rural Infrastructure Development

T. T. Hue

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity		Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
HE-001	Song Bo	Phong Dien	Phong Xuan	Improvement of Phong Xuan Commune Road	Road	Apply 3.0 m width of concrete pavement to the existing village road and new construction of 4 culverts	2.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	110	2,100	A	4.0
HE-002	Song Bo	Phong Dien	Phong Son Phong Xuan	Construction of water supply system for Phong Son	Water Supply	Newly construct of weir on the river and install the pipe water supply system length of the system is 2 km (Concrete and PVC pipe)	100.0	HH	To reduce the time and cost to get safe water	100	800	A	5.0
HE-003	Song Huong	Huong Tra	Huong Van	Improvement of Huong Van Commune Road	Road	Apply 3.0 m width of concrete pavement to the existing village road with 2 culverts	1.0	km	Improvement of access to the clinic, school and market to uplift the living standard	135	1,050	A	3.0
HE-004	Song Huong	Huong Tra	Binh Dien	Improvement of School Road in Binh Dien Commune	Road	Apply 3.0 m width of concrete pavement to the existing village road (extension of SPL-III road)	4.0	km	Improvement of access to the clinic, school and market to uplift the living standard	140	4,200	A	4.0
HE-005	Song Huong	Huong Tra	Huong Van Hong Tien Binh Thanh Huong Tho	Construction of water supply system	Water Supply	Newly construct of weir on the river and install the pipe water supply system length of the system is 2 km (Concrete and PVC pipe)	100.0	HH	To reduce the time and cost to get safe water	100	800	A	6.0
HE-006	Huong Thuy	Huong Thuy	Duong Hoa	Improvement of Village road	Road	Apply 3.0 m width of concrete pavement to the existing village road (extension of SPL-III road)	1.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	40	1,050	A	3.0
HE-007	Huong Thuy	Huong Thuy	Duong Hoa	New construction of irrigation dam and canal system in Ha village	Irrigation	New construction of earth dam (height 5 m x Width 80m) and concrete lining canal of 500 m for 13 ha of paddy land.	13.0	ha	Mitigate flood damage in the rainy season and ensure irrigation water to 13 (ha) to increase paddy production	170	3,000	A	6.0
HE-008	Huong Thuy	Huong Thuy	Duong Hoa	Construction of Duong Hoa water supply system	Water Supply	Newly construct of weir on the river and install the pipe water supply system length of the system is 2 km (Concrete and PVC pipe)	200.0	HH	To reduce the time and cost to get safe water	200	1,600	A	5.0
HE-009	Huong Thuy	Huong Thuy	Duong Hoa	Improvement of Duong Hoa Commune Road	Road	Apply 3.0 m width of concrete pavement to the existing village road	5.0	km	Improvement of access to the clinic, school and market to uplift the living standard	40	5,250	A	6.0
HE-010	Phu Loc	Phu Loc	Vinh My Vinh Hien Vinh Hai	Improvement of Vinh My, Vinh Hien, Vinh Hai Commune Road	Road	Apply 3.0 m width of concrete pavement to the existing village road	5.0	km	Improvement of access to the clinic, school and market to uplift the living standard	150	5,250	A	6.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity		
(1)	Road Construction and Improvement	18.0	km	
(2)	Bridge Construction	0	Location	
(3)	Irrigation Dam & Canal Improvement or Development	1	Location	13ha
(4)	Water Supply System Construction	3	Location	

SHORT LISTED SUB PROJECT		Quantity		
(1)	Road Construction and Improvement	12.0	km	
(2)	Bridge Construction	0	Location	
(3)	Irrigation Dam & Canal Improvement or Development	1	Location	13ha
(4)	Water Supply System Construction	4	Location	

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-7 List of the Proposed Rural Infrastructure Development

Quang Nam

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity		Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
QN-001	Phu Ninh	Phu Ninh	Tam Lanh	Improvement of Phuoc Loi Village Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	130	2,400	A	4.0
QN-002	Phu Ninh	Nui Thanh	Tam Son	Improvement of Danh Son Village Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	215	2,400	B	4.0
QN-003	Phu Ninh	Nui Thanh	Tam Tra	Improvement of No.1 Village Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	120	2,400	B	4.0
QN-004	Phu Ninh	Nui Thanh	Tam Tra	Improvement of No.3 Village Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 30 culverts	12.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	70	14,400	B	6.0
QN-005	Phu Ninh	Nui Thanh	Tam Tra	Improvement of No.6 Village Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	100	2,400	B	4.0
QN-006	Phu Ninh	Nui Thanh	Tam Thanh	Improvement of No.3 Village Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	99	2,400	B	4.0
QN-007	Phu Ninh	Nui Thanh	Tam Xuan 2	Improvement of Tieu Khu 592 Village Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	150	2,400	B	4.0
QN-008	Phu Ninh	Phu Ninh	Tam Dai	Improvement of Tam Dai Village Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	90	2,400	B	4.0
QN-009	Duy Xuyen	Duy Xuyen	Duy Trung	New construction of check dam	Irrigation	Construction of new concrete weir on the stream in Duy trung 8m (L) x 4m (H) x 0.5m (W) and concrete lining canal for 1.0 km	15.0	ha	To ensure the irrigation water for 15 ha of land for paddy production	75	1,500	A	6.0
QN-010	Duy Xuyen	Duy Xuyen	Duy Trung	New construction of concrete anicut	Irrigation	Construction of new concrete weir on the stream in Duy trung 8m (L) x 4m (H) x 0.5m (W) and concrete lining canal for 0.5 km	10.0	ha	To ensure the irrigation water for 10 ha of land for paddy production	40	1,000	B	6.0
QN-011	Duy Xuyen	Duy Xuyen	Duy Hoa	New construction of concrete anicut	Irrigation	Construction of new concrete weir on the stream in Duy Hoa 8m (L) x 4m (H) x 0.5m (W) and concrete lining canal for 0.5 km	15.0	ha	To ensure the irrigation water for 15 ha of land for paddy production	45	1,500	B	6.0
QN-012	Duy Xuyen	Duy Xuyen	Duy Hoa	New construction of concrete anicut	Irrigation	Construction of new concrete weir on the stream in Duy Hoa 8m (L) x 4m (H) x 0.5m (W) and concrete lining canal for 0.5 km	12.0	ha	To ensure the irrigation water for 12 ha of land for paddy production	55	1,200	B	6.0

Table F-7 List of the Proposed Rural Infrastructure Development

Quang Nam

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity		Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
QN-009	Duy Xuyen	Duy Xuyen	Duy Son	Upgrading of Dap Dong Vuon Weir and Canal System	Irrigation	Augment the existing weir for 1 m for 40 m long located in the downstream side of Duy Xuyen Hydro power station. Improvement of 2 km of concrete lining canal	40.0	ha	To ensure the irrigation water for existing 40 ha of paddy land	200	3,200	B	6.0
QN-010	Duy Xuyen	Duy Xuyen	Duy Son	Rehabilitation of Dong Eo Anicut	Irrigation	To install the 3 number of gate (1.8 X 1.8 m) to regulate the irrigation water properly	45.0	ha	To ensure the irrigation water for existing 20 ha of paddy land and mitigate the flood damage by controlling the water properly	60	270	B	2.0
QN-013	Duy Xuyen	Duy Xuyen	Dyu Phu	New construction of earth dam No.1 and canal system	Irrigation	Construction of earth fill dam in the down stream side of Ho Thank Ban Dam and develop the canal system	5.0	ha	To irrigate unstable 5 ha for paddy production.	40	4,000	B	8.0
QN-014	Duy Xuyen	Duy Xuyen	Duy Son	Rehabilitation of Duy Son canal system	Irrigation	Applying the concrete lining to the exiting earth canal for 2.0 km and related structure. The dimension of the canal is 0.5m (B) x 0.8 m (H).	40.0	ha	To irrigate the paddy land located in the No.5 village in Dyu Phi commune	200	4,000	B	6.0
QN-011	Duy Xuyen	Duy Xuyen	Duy Son	Improvement of Dong Eo Village Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	1.2	km	Improvement of access to the clinic, school and market to uplift the living standard	150	1,440	B	3.0
QN-012	Duy Xuyen	Duy Xuyen	Dyu Phu	Improvement of Dyu Phi Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts (extension of SPL-III road)	3.0	km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	220	3,600	B	4.0
QN-015	Duy Xuyen	Duy Xuyen	Duy Trung	Improvement of Dyu Trung Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 4 culverts and 1 bridge	5.0	km	Improvement of access to the clinic, school and market to uplift the living standard	500	6,000	B	4.0
QN-016	Duy Xuyen	Duy Xuyen	Duy Hoa	Improvement of Dyu Hoa Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 8 culverts	5.0	km	Improvement of access to the clinic, school and market to uplift the living standard	525	6,000	B	4.0
QN-022	Song Tranh	Tra My	Tro Bui	Improvement of Tro Bui Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 5 culverts	5.0	km	Facilitate the villagers for forest protection activity and improvement of livelihood of the community	240	6,000	A	4.0
QN-025	Dak Mi	Phuoc Son	Phuoc Hiep	Improvement of Phuoc Hiep Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 8 culverts	6.5	km	Improvement of access to the clinic, school and market to uplift the living standard	300	7,800	A	4.0
QN-026	Dak Mi	Phuoc Son	Phuoc Hoa	New construction of Phouc Hoa weir and water supply system	Irrigation	Construction of concrete weir on the stream of Phuoc Hoa. Dimension of the weir is 20m (L) x 5m (H) x 2m (W) and pipeline system for 1 km	5.0	ha	Providing domestic water supply to the Phuoc Hoa commune people to improve the livelihood and ensure the paddy production for 5 ha by providing the necessary irrigation water	40	500	B	6.0
QN-028	A Vuong	Dong Giang	Ma Cooi	Improvement of Na Cooih Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 3 culverts	1.0	km	Improvement of the mobility of the village for local economy	340	1,200	A	3.0
QN-029	Song Kon	Dong Giang	Song Kon	Improvement of Son Kon Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 15 culverts	7.0	km	Improvement of the mobility of the village for local economy	162	8,400	A	6.0

Table F-7 List of the Proposed Rural Infrastructure Development

Quang Nam

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
QN-030	Song Kon	Dong Giang	Jo Ngay	Improvement of Zo Ngay Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 9 culverts	3.0 km	Improvement of the mobility of the village for local economy	173	3,600	B	4.0
QN-031	Song Kon	Dong Giang	A Ting	Improvement of Ating Commune Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 5 culverts and 1 bridge	5.0 km	Improvement of the mobility of the village for local economy	200	6,000	B	4.0
QN-032	Song Kon	Dong Giang	Song Kon	New construction of Song Kon headworks and canal system	Irrigation	New construction of 7m long concrete weir and 0.5 km of closed canal	5.0 ha	To ensure the irrigation water for 5 ha of land for paddy production	120	910	B	6.0
QN-033	Song Kon	Dong Giang	A Ting	New construction of Ating headworks and canal system	Irrigation	New construction of 7m long concrete weir and 0.5 km of closed canal	5.0 ha	To ensure the irrigation water for 5 ha of land for paddy production	120	910	B	6.0
QN-034	Song Kon	Dong Giang	Jo Ngay	New construction of Zo Ngay headworks and canal system	Irrigation	New construction of 7m long concrete weir and 0.5 km of closed canal	5.0 ha	To ensure the irrigation water for 5 ha of land for paddy production	120	910	B	6.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	67.7 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	12 Location	205ha
(4)	Water Supply System Construction	0 Location	

SHORT LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	22.0 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	1 Location	15ha
(4)	Water Supply System Construction	0 Location	

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-8 List of the Proposed Rural Infrastructure Development

Quang Ngai

Code	PFMB	District	Commune	Name of Sub Project	Type	Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
QG-001	BQLRPH Khu dong	Huyen Ba To	Xa Ba Trang	Improvement of Xa Ba Trang 429 Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	50	2,400	A	4.0
QG-002	BQLRPH Khu tay	Huyen Ba To	Xa Ba Dinh	Improvement of Xa Ba Dinh 377 Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	125	2,400	A	4.0
QG-003	BQLRPHD N Thach Nham	Huyen Son Ha	Xa Son Ba	Improvement of Xa Son Ba 254 Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	85	2,400	A	4.0
QG-004	BQLRPHD N Thach Nham	Huyen Son Ha	Xa Son Ky	Improvement of Xa Son Ky 249 Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 6 culverts	2.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	130	2,400	A	4.0
QG-005	BQLRPHD N Thach Nham	Huyen Son Ha	Xa Son Linh	Improvement of Xa Son Linh 201 Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 3 culverts	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	100	1,200	A	3.0
QG-006	BQLRPHD N Thach Nham	Huyen Son Ha	Xa Son Linh	Improvement of Xa Son Linh 216 Road	Road	Apply the 3.0 m width of concrete pavement to the existing village road with 3 culverts	1.0 km	Improvement of access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	100	1,200	A	3.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity
(1)	Road Construction and Improvement	10.0 km
(2)	Bridge Construction	0 Location
(3)	Irrigation Dam & Canal Improvement or Development	0 Location
(4)	Water Supply System Construction	0 Location

SHORT LISTED SUB PROJECT		Quantity
(1)	Road Construction and Improvement	10.0 km
(2)	Bridge Construction	0 Location
(3)	Irrigation Dam & Canal Improvement or Development	0 Location
(4)	Water Supply System Construction	0 Location

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-9 List of the Proposed Rural Infrastructure Development

Binh Dinh

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
BD-001	Vinh Thanh MBFP	Vinh Thanh	Vinh Kim	Construction of East of Commune's River Road	Road	Construction of 6.0 m width of stone pavement road with related structures	10.0 km	To improve the mobility in the commune/To support for plantation, management and take care 300 ha protection forest	250	3,000	B	6.0
BD-002	Vinh Thanh MBFP	Vinh Thanh	Vinh Kim	Construction of link road O2 Village to O3 Village	Road	Construction of 6.0 m width of stone pavement road with related structures	5.0 km	To improve the mobility in the commune	85	1,500	B	4.0
BD-003	Vinh Thanh MBFP	Vinh Thanh	Vinh Kim	Construction of O5 Village Road to Upstream of the Trinh River	Road	Construction of 6.0 m width of stone pavement road with related structures	3.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	50	900	A	4.0
BD-004	Vinh Thanh MBFP	Vinh Thanh	Vinh Kim	Improvement of O5 Village Road to Con Tru Village	Road	Apply 6.0 m width of concrete pavement to the existing village road and rehabilitation of existing related	6.0 km	To improve the access to the clinic, school and market to uplift the living standard	50	6,000	B	4.0
BD-005	Vinh Thanh MBFP	Vinh Thanh	Vinh Kim	Construction of Irrigation Canal System in Nuoc Nhoc Stream to Na Area	Irrigation	New construction of closed canal with PVC for 3 km (D=0.50m)	15.0 ha	To ensure the 2 times cultivation of paddy for 15 ha by providing irrigation water	50	300	B	6.0
BD-006	Vinh Thanh MBFP	Vinh Thanh	Vinh Kim	Improvement of Dac Lam Dam	Irrigation	Rehabilitation and augmentation of existing concrete weir for 3m(H) x 30m(L)	5.0 ha	To increase the irrigable paddy land of 5 ha	30	300	B	6.0
BD-007	Vinh Thanh MBFP	Vinh Thanh	Vinh Kim	Construction of Seed Garden Vinh Kim	Building	Land preparation for 2500m2, fence and sprinkler system	2500.0 m2	Providing the necessary seed for agriculture in the village for their livelihood improvement	200	0	B	3.0
BD-008	Tay Son	Tay Son	Tay Phu	Improvement of Phu Lam Village Road	Road	Apply 5 m width of concrete pavement to the existing village road and rehabilitation of existing related structure	10.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	220	10,000	A	6.0
BD-009	Tay Son	Tay Son	Tay Phu	Rehabilitation of Dong Do Pumping Station	Irrigation	Replacement of horizontal pump for 500 m3/h	60.0 ha	To increase irrigable paddy land of 60 ha	300	200	B	3.0
BD-010	Tay Son	Tay Son	Tay Phu	Improvement of Irrigation Canal from Ham Mo to Loc Dong and Kien Giang canals	Irrigation	Improvement of concrete canal 2m (B) x 1m (H) for 17 km and related structure	60.0 ha	To supply water to Loc Dong and Kien Giang canals for paddy production	300	600	B	6.0
BD-011	Tay Son	Tay Son	Tay Phu	Construction of Dong Do Bridge	Bridge	New construction of 20 m bridge with 4m width	20.0 m	To improve the access to the village from the town and encourage the economic activities in the village	220	500	B	6.0
BD-012	Tay Son	Tay Son	Tay Phu	Construction of Dong Do Pumping Station Dam	Irrigation	New construction of concrete check dam for 50 m	5.0 ha	To irrigate the paddy land of 5 ha	25	300	B	6.0
BD-013	Tay Son	Tay Son	Vinh An	Improvement of Vinh An Village Road to Sa Tang	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of existing related	2.0 km	To improve the mobility in the commune/To support for plantation, management and take care the protection forest	30	2,000	A	4.0
BD-014	Tay Son	Tay Son	Vinh An	Improvement of Vinh An Village Road to Kon Giang	Road	Apply 3.5 m width of concrete pavement to the existing village road and construction of 5 culverts	2.0 km	To improve the mobility in the commune/To support for plantation, management and take care the protection forest	30	2,000	B	4.0
BD-015	Tay Son	Tay Son	Vinh An	Improvement of Kon Mon Village Road	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of existing related	3.0 km	To improve the mobility in the commune/To support for plantation, management and take care the protection forest	30	3,000	B	4.0

Table F-9 List of the Proposed Rural Infrastructure Development

Binh Dinh

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
BD-016	Tay Son	Tay Son	Vinh An	Improvement of Sa Tang Village Dam	Irrigation	Improvement of concrete weir height 2m x 20m long	40.0 ha	To ensure the paddy production	200	250	B	4.0
BD-017	Phu My MBFP	Phu My	My Hiep	Improvement of Dai Son Lake Road to Protection Forest	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of existing related structure (10 culverts)	2.0 km	To improve the mobility in the commune/To support for plantation, management and take care the protection forest	390	2,000	A	4.0
BD-018	Phu My MBFP	Phu My	My Hiep	Improvement of Tri Hoa No.2 Lake Road to Protection Forest	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of existing related structure (10 culverts)	2.0 km	To improve the mobility in the commune/To support for plantation, management and take care the protection forest	390	2,000	B	4.0
BD-019	Phu My MBFP	Phu My	My Hiep	Improvement of 1A Road to Protection Forest	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of existing related structure	1.5 km	To improve the mobility in the commune/To support for plantation, management and take care 700 ha protection forest	390	1,500	B	4.0
BD-020	Phu My MBFP	Phu My	My Hiep	Construction of Tri Hoa No.1 Lake Dam and Irrigation System	Irrigation	Construction of new concrete canal 0.9m (B) x 1.0m (H) for 6 km and related structure	400.0 ha	To increate 400 ha and 3 crop/year more to be irrigated	2,000	500	B	6.0
BD-021	Phu My MBFP	Phu My	My Hiep	Construction of Dai Thuan Lake Canal System	Irrigation	Construction of new concrete canal for 2 km and related structures. The dimension of canal is 0.8m (B) x 0.8m (H)	200.0 ha	To increate 200 ha rice and vegetables more to be irrigated	1,000	300	B	4.0
BD-022	Phu My MBFP	Phu My	My Hiep	Construction of 3 Causeway	Bridge	New construction of 3m (width) x 20m (length) causeway for 3 nos.	60.0 m	To improve the mobility in the commune/To support for plantation, management and take care the protection forest	390	500	B	6.0
BD-023	Phu My MBFP	Phu My	My Hoa	Improvement of My Hoa Commune Road (CPC) to Protection Forest	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of existing related structure	4.0 km	To improve the mobility in the commune/To support for plantation, management and take care 1000 ha protection forest	200	4,000	A	4.0
BD-024	Phu My MBFP	Phu My	My Hoa	Rehabilitation of My Hoa Commune Canal System	Irrigation	Rehabilitation of new concrete canal for 11 km and related structures. The dimension of canal is 0.9m(B) x 0.9m(H)	790.0 ha	To irrigate all of paddy land in My Hoa Communes To increase the paddy yield from 5.0 ton/ha to 6.5 ton/ha	4,000	400	B	6.0
BD-025	Phu My MBFP	Phu My	My An	Improvement of My An Commune Road (CPC) to Protection Forest	Road	Apply 5 m width of stone pavement to the existing village road and rehabilitation of related structure	5.0 km	To improve the mobility in the commune/To support for plantation, management and take care 200 ha protection forest	250	500	A	3.0
BD-026	Phu My MBFP	Phu My	My An	Dredging of Da Bang Lake	Irrigation	Desilting of 500 m^3	100.0 ha	To increase capacity of lake to ensure the irrigation in the downstream paddy	500	0.05	B	2.0
BD-027	Phu My MBFP	Phu My	My An	Construction of Hoa Ninh Canal	Irrigation	Construction of new concrete canal for 3 km and related structures. The dimension of canal is 1.0m (B) x 0.8m (H)	25.0 ha	To increase irrigable paddy land of 25 ha for 2 time cultivations per year	125	300	B	4.0
BD-028	Phu My MBFP	Phu My	My An	Construction of Da Bang and Go Bong Canal	Irrigation	Construction of new concrete canal for 3 km and related structures. The dimension of canal is 1.0m (B) x 0.8m (H)	100.0 ha	To increase irrigable paddy land of 100 ha for 2 time cultivations per year	500	300	B	4.0
BD-029	Phu My MBFP	Phu My	My Phong	Improvement of My Phong Commune Road from National Road to Protection Forest	Road	Apply 5 m width of concrete pavement to existing village road and rehabilitation of related structure	1.5 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	180	1,500	A	3.0

Table F-9 List of the Proposed Rural Infrastructure Development

Binh Dinh

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
BD-030	Phu My MBFP	Phu My	My Phong	Improvement of Deo Nhong Village Road to Northern Area	Road	Apply 2 m width of stone pavement to the existing village road and rehabilitation of related structure	4.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	180	160	B	2.0
BD-031	Phu My MBFP	Phu My	My Phong	Dredging of the Hoc Sinh Lake	Irrigation	Dredge of 1,000 m3 for Hoc Sinh Lake	40.0 ha	To increase irrigable paddy land of 40 ha (At present, only 15-20 ha are irrigated)	200	0.03	B	2.0
BD-032	Phu My MBFP	Phu My	My Phong	Construction of Canal System Hoc Sinh Lake to Phuoc Chanh	Irrigation	Construction of new concrete canal for 1.5 km and related structures. The dimension of canal is	100.0 ha	To increase irrigable paddy land of 100 ha	500	300	B	6.0
BD-033	Phu My MBFP	Phu My	My Phong	Construction of Canal System Suoi So Lake to Gia Hoi	Irrigation	Construction of new concrete canal for 2 km and related structures. The dimension of canal is 0.8m (B) x 0.9m (H)	150.0 ha	To increase irrigable paddy land of 150 ha	750	300	B	4.0
BD-034	Hoai Nhon MBPF	Hoai Nhon	Hoai Son	Improvement of An Do Village Road to Protection Forest	Road	Apply 5 m width of stone pavement to the existing village road and rehabilitation of related structure (2 culverts)	5.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	260	500	A	3.0
BD-035	Hoai Nhon MBPF	Hoai Nhon	Hoai Son	Improvement of La Vuong Village Road to Protection Forest	Road	Apply 5 m width of stone pavement to the existing village road and rehabilitation of related structure (2 culverts)	5.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	260	500	B	3.0
BD-036	Hoai Nhon MBPF	Hoai Nhon	Hoai Son	Improvement of Tu Son Village Road to Protection Forest	Road	Apply 5 m width of stone pavement to the existing village road and rehabilitation of related structure (2 culverts)	7.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	260	700	B	3.0
BD-037	Hoai Nhon MBPF	Hoai Nhon	Hoai Son	Improvement of Can Hoi Village Road to Suoi Vang Protection Forest	Road	Apply 5 m width of stone pavement to the existing village road and rehabilitation of related structure (2 culverts)	5.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	260	500	B	3.0
BD-038	Hoai Nhon MBPF	Hoai Nhon	Hoai Son	Improvement of Tuy Son Village Road to Phu Nong Protection Forest	Road	Apply 5 m width of stone pavement to the existing village road and rehabilitation of related structure (2 culverts)	6.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	260	600	B	3.0
BD-039	Hoai Nhon MBPF	Hoai Nhon	Hoai Son	Construction of Canal System Hoc Quan Lake to An Do, An Han	Irrigation	Construction of new concrete canal for 2 km and related structures. The dimension of canal is 0.8m (B) x 0.8m (H)	12.0 ha	To increase of irrigable paddy land of 12 ha To irrigate 5 ponds for aquaculture	60	300	B	4.0
BD-040	Hoai Nhon MBPF	Hoai Nhon	Hoai Son	Two concrete bridge in An Dovilage	Bridge	New construction of 2 number of concrete bridge for 5 m with 4m width	10.0 m	Improvement of the mobility in the commune especially in the rainy season	260	250	B	6.0
BD-041	Hoai An MBFP	Hoai An	An Nghia	Improvement of Kim Son Village Road to Phu Tai Protection Forest	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of related structure	6.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	210	6,000	A/B	4.0
BD-042	Hoai An MBFP	Hoai An	An Nghia	Improvement of Dong Lan Village Road to Nghia Dien Protection Forest	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of related structure (2	7.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	210	7,000	B	6.0
BD-043	Hoai An MBFP	Hoai An	An Nghia	Improvement of An Nghia Commune Road (CPC) to Huong Quang	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of related structure (2	0.5 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	210	500	A	2.0

Table F-9 List of the Proposed Rural Infrastructure Development

Binh Dinh

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
BD-044	Hoai An MBFP	Hoai An	An Nghia	Construction of Kim Son Lake Canal	Irrigation	Construction of new concrete canal for 4 km and related structures. The dimension of canal is 0.8m (B) x 0.8m (H)	150.0 ha	To increase irrigable paddy land of 150 ha for 3 time cultivations per year	750	300	B	4.0
BD-045	Hoai An MBFP	Hoai An	An Nghia	Construction of Canal Dong Quan Lake to Phu Tri	Irrigation	Construction of new concrete canal for 0.5 km and related structures. The dimension of canal is	40.0 ha	To increase irrigable paddy land and upland of 40 ha	200	300	B	2.0
BD-046	Hoai An MBFP	Hoai An	An Nghia	Construction of Canal Be Ne Lake to Binh Son	Irrigation	Construction of new concrete canal for 4 km and related structures. The dimension of canal is 0.8m (B) x 0.8m (H)	30.0 ha	To increase irrigable paddy land of 30 ha	150	300	B	4.0
BD-047	Hoai An MBFP	Hoai An	An Nghia	Construction of Dam in Kim Son to Phu Tri	Bridge	Construction of causeway for 30m long and 3m width and 5m height	30.0 m	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	210	400	B	6.0
BD-048	Hoai An MBFP	Hoai An	Bok Toi	Improvement of Bok Toi Commune Road (CPC) to Doc Ba Boi Protection	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of related structure	8.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	40	8,000	B	6.0
BD-049	Hoai An MBFP	Hoai An	Bok Toi	Improvement of From Nghia Dien Village Road to Doc Ba Boi Protection Forest	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of related structure	14.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	40	14,000	B	6.0
BD-050	Hoai An MBFP	Hoai An	Bok Toi	Improvement of T4 Village Road to Nuoc Ba Lu Protection Forest	Road	Construction of 3 m width of stone paved road and related structure	2.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	40	600	A	3.0
BD-051	Hoai An MBFP	Hoai An	Bok Toi	Improvement of T1 Village Road to Doc Let Protection Forest	Road	Construction of 3 m width of stone paved road and related structure	3.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	40	900	B	3.0
BD-052	Hoai An MBFP	Hoai An	Bok Toi	Construction Vuon Gop Canal	Irrigation	Construction of new concrete canal for 0.5 km and related structures. The dimension of canal is	40.0 ha	To increase irrigable paddy land and upland of 40 ha	100	300	B	3.0
BD-053	Hoai An MBFP	Hoai An	Bok Toi	Construction of Cay Tung Canal	Irrigation	Construction of new concrete canal for 0.5 km and related structures. The dimension of canal is	35.0 ha	To increase irrigable paddy land and upland of 35 ha	88	300	B	3.0
BD-054	Hoai An MBFP	Hoai An	Bok Toi	Construction of Bo Nach Lake Canal	Irrigation	Construction of new concrete canal for 1 km and related structures. The dimension of canal is 0.8m (B) x 0.8m (H)	25.0 ha	To increase irrigable paddy land and upland of 25 ha	63	300	B	3.0
BD-055	Hoai An MBFP	Hoai An	Bok Toi	Construction of Five Dams (T4, T5, T1, T2)	Bridge	Construction of 5 causeway for 100m long and 2m height and 3m width	500.0 m	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	120	800	B	12.0
BD-056	Hoai An MBFP	Hoai An	Bok Toi	Bridge on the way from to Nghia Dien to Doc Ba Boi protection Forest	Bridge	New construction of bridge for 200m with 4m width	200.0 m	Improvement of the mobility in the commune especially in the rainy season	120	1,000	B	12.0
BD-057	Hoai An MBFP	Hoai An	Bok Toi	Construction of 2 bridges An Dovilage	Bridge	New construction of concrete bridge for 5 m with 4m width	5.0 m	Improvement of the mobility in the commune especially in the rainy season	40	250	B	6.0
BD-058	Hoai An MBFP	Hoai An	An Son	Improvement of Trai Dau Moi Lake Road to Nui Chua Protection Forest	Road	Construction of 3 m width of stone paved road and related structure	6.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	20	1,800	B	3.0

Table F-9 List of the Proposed Rural Infrastructure Development

Binh Dinh

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
BD-059	Hoai An MBFP	Hoai An	An Son	Improvement of An Tin Village Road to Nha Muoi Farm	Road	Apply 3.5 m width of concrete pavement to the existing village road and rehabilitation of related structure	4.5 km	To improve the access to the farm area and reduction of transportation cost	20	4,500	A	4.0
BD-060	Hoai An MBFP	Hoai An	An Son	Improvement of Van Hoi 1 Village Road to CPC An Son	Road	Construction of 5m width of concrete paved road and related structure	0.1 km	To reduce the transportation cost and improvement of access to the clinic, school and market to uplift the living standard	20	50	B	1.0
BD-061	Hoai An MBFP	Hoai An	An Son	Construction of Bridge from An Son to Van Hoi	Bridge	New construction of concrete bridge for 50 m with 5m width	50.0 m	To improve the mobility in the commune especially in the rainy season	20	2,000	B	6.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	140.1 km	
(2)	Bridge Construction	8 Location	
(3)	Irrigation Dam & Canal Improvement or Development	22 Location	2422ha
(4)	Water Supply System Construction	0 Location	

SHORT LISTED SUB PROJECT		Quantity
(1)	Road Construction and Improvement	22.5 km
(2)	Bridge Construction	0 Location
(3)	Irrigation Dam & Canal Improvement or Development	0 Location
(4)	Water Supply System Construction	0 Location

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-10 List of the Proposed Rural Infrastructure Development

Phu Yen

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
PY-001	Dong Xuan	Dong Xuan	Phu Mo	Improvement of Phu Mo Commune Road to protection forest	Road	Apply 6.0 m width of concrete pavement to the existing village road and rehabilitation of existing structures	15.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	70	15,000	A	6.0
PY-002	Dong Xuan	Dong Xuan	Phu Mo	Improvement of Suoi Cat Irrigation Dam	Irrigation	Improvement of earth dam (15m(H) x 30m(W))	50.0 ha	To increate the irrigable paddy land of 50 ha	180	8,000	B	6.0
PY-003	Dong Xuan	Dong Xuan	Phu Mo	Improvement of Irrigation Canal of Suoi Cat Dams to Phu Hai Farm	Irrigation	Improvement of concrete lining canal for 2km. The dimension of the canal is 0.8m(B) x 0.8m(H)	50.0 ha	To ensure the irrigation water for 50 ha of paddy land for 2crop cultivation/year	150	600	B	4.0
PY-004	Dong Xuan	Dong Xuan	Phu Mo	Improvement of Irrigation Canal under Phu Loi Pump Station	Irrigation	Improvement of concrete lining irrigation canal for 2 km. The dimension of the canal is 0.6m(B) x 0.4m(H)	10.0 ha	To increate 10 ha and 3 crop/year more to be irrigated	30	400	B	4.0
PY-005	Dong Xuan	Dong Xuan	Phu Mo	Improvement of Phu Loi Pumping Station	Irrigation	Replacement of horizontal pump with capacity of 500 m3/h	10.0 ha	To irrigate paddy field of 10ha	150	200	B	4.0
PY-006	Dong Xuan	Dong Xuan	Phu Mo	Construction of Water Supply System to Phu Dong Village	Water Supply	Construction of small weir on Gam Stream and 4 km pipeline system made of Polymer pipe φ20 cm	110.0 HH	To reduce the time and cost to get safe water for 110 households	110	1,000	B	6.0
PY-007	Song Hing	Song Hing	Song Hing	Improvement of Song Hing Commune Road	Road	Apply 5.0 m width of stone pavement to the existing village road and rehabilitation of existing structures	4.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	60	1,200	A	4.0
PY-008	Song Hing	Song Hing	Song Hinh	Construction of New Pump Station at Hoa Son and Yen Son	Irrigation	New installation of 2 nos. of pump stations with capacity of 500 m3/h and related structures	60.0 ha	To irrigate paddy field of 60ha	300	600	B	4.0
PY-009	Song Hing	Song Hing	Song Hinh	Improvement of Eangao Irrigation Dam	Irrigation	Improvement of earth dam (15m(H) x 30m(W))	60.0 ha	To irrigate paddy field of 60ha and other crop land of 40 ha and to support for transportation of 300 households	300	8,000	B	6.0
PY-010	Song Hing	Song Hing	Song Hinh	Improvement of Eangao Irrigation Canal System	Irrigation	Improvement of concrete lining canal for 2 km. The dimension is 0.8m(B) x 0.8m(H)	60.0 ha	To ensure the irrigation water for 60 ha paddy land for 2 crop/year	300	600	B	4.0
PY-011	Song Hing	Song Hing	Song Hinh	Construction of Water Supply System for Suoi Dua Village	Water Supply	Construction of small scale weir on the Hinh River and water tank with capacity of 20,000litters and pipeline water supply system by Polymer pipe	300.0 HH	To reduce the time and cost to get safe water for 300 households	300	2,300	B	6.0
PY-012	Song Hoa	Song Hoa	Phuoc Tan	Improvement of Phuoc Tan Commune Road to Gia Tru	Road	Apply 6.0 m width of concrete pavement to the existing village road and rehabilitation of existing structures	7.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	50	7,000	A	6.0
PY-013	Song Hoa	Song Hoa	Phuoc Tan	Improvement of Phuoc Tan Commune Road to Suoi Da	Road	Apply 6.0 m width of concrete pavement to the existing village road and rehabilitation of existing structures	2.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	50	2,000	B	6.0

Table F-10 List of the Proposed Rural Infrastructure Development

Phu Yen

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
PY-014	Song Hoa	Song Hoa	Phuoc Tan	Improvement of Phuoc Tan Commune Road to Mai Giay	Road	Apply 6.0 m width of concrete pavement to the existing village road and rehabilitation of existing structures	4.0 km	To improve the access to the forest area and reduction of transportation cost and improvement of access to the clinic, school and market to uplift the living standard	50	4,000	B	6.0
PY-015	Song Hoa	Song Hoa	Phuoc Tan	Construction of Open Dug Well	Water Supply	Construction of 10 shallow wells with φ1m and 15 - 20 m depth	37.0 HH	To reduce the time and cost to get safe water for 37 households	37	200	B	6.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	32.0 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	7 Location	300ha
(4)	Water Supply System Construction	3 Location	

SHORT LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	18.0 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	7 Location	150ha
(4)	Water Supply System Construction	0 Location	

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010. There was addition of new sites (Ting Gia PFMB) and infrastructure during the discussion with Thanh Hoa DARD.

Table F-11 List of the Proposed Rural Infrastructure Development

Ninh Thuan

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
NT-001	Ninh Phuoc	Ninh Phuoc	Phuoc Ha	Improvememt of Irrigation Canal from Tan Giang Lake to Lang Dau Farm	Irrigation	To apply the concrete lining to the existing canal with dimension of 0.8m(B) x 0.8m(H) for 3km and construction of	50.0 ha	To ensure the 50 ha of paddy land for 2 time crop per year	250	1,000	A	4.0
NT-002	Ninh Phuoc	Ninh Phuoc	Phuoc Ha	Improvement of Suoi Cat Dam	Irrigation	Improvement of concrete check dam of 15m(H) x 30m(L)	50.0 ha	To increate irrigable paddy land of 50 ha	250	8,000	B	6.0
NT-003	Ninh Phuoc	Ninh Phuoc	Phuoc Ha	Improvement of Irrigation Canal from Tan Ha to Suoi Nhuc Farm	Irrigation	Rehabilitation of concrete lining canal of 0.6m(B) x 0.4(H)m, 1km	10.0 ha	to increate 10 ha and 3 crop/year more to be irrigated	50	8,000	B	3.0
NT-004	Ninh Phuoc	Ninh Phuoc	Phuoc Ha	Construction of Tan Giang Pumping Station	Irrigation	Installation of new horizontal pump with capacity of 500 m3/h and construction of related structure	300.0 ha	to increate 300 ha and 3 crop/year more to be irrigated	1500	300	B	3.0
NT-005	Ninh Phuoc	Ninh Phuoc	Phuoc Ha	Improvement of Irrigation Cannel form Da Tang Ha to Lo Ren	Irrigation	Apply the concrete lining to the existing earth canal for 0.8 km with dimension of 0.6m(B) x 0.4m(H)	20.0 ha	to increate 20 ha and 3 crop/year more to be irrigated and increase rice production to 4 tons/ha/crop	100	8,000	B	3.0
NT-006	Ninh Phuoc	Ninh Phuoc	Phuoc Ha	Improvement of Tan Ha Village Road to Doc 3 Tang protection Forest (6000 ha)	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	5.0 km	To improve the mobility in the commune/To support for plantation, management and take care 6000 ha protection forest	60	5,000	B	4.0
NT-007	Ninh Phuoc	Ninh Phuoc	Phuoc Ha	Improvement of Gia Village Road to Da Mang Protection Forest (5000 ha)	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	4.0 km	To improve the mobility in the commune/To support for plantation, management and take care 5000 ha protection forest	60	4,000	B	4.0
NT-008	Ninh Phuoc	Ninh Phuoc	Phuoc Dinh	Improvement of Phuoc Nam Commune Road to Son Hai Village	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	8.0 km	To improve the mobility in the commune	160	8,000	A	6.0
NT-009	Ninh Phuoc	Ninh Phuoc	Phuoc Dinh	Improvement of Son Hai Village Road to Nui Mot Lake	Road	Apply 4.0 m width of stone pavement to the existing village road and construction of related structure	5.0 km	To improve the mobility in the commune	160	1,500	B	3.0
NT-010	Ninh Phuoc	Ninh Phuoc	Phuoc Nam	Improvement of Muong Mieu Irrigation Canal	Irrigation	To apply the concrete lining to the existing earth canal for 0.8 km with dimension of 0.8m(B) x 0.8m(H)	90.0 ha	To ensure the irrigation water to the paddy land of 90 ha for 2 time crop cultivation	450	800	A	3.0
NT-011	Ninh Phuoc	Ninh Phuoc	Phuoc Nam	Improvement of Pan Nhu Irrigation Canal	Irrigation	To apply the concrete lining to the existing earth canal for 0.8 km with dimension of 0.6m(B) x 0.7m(H)	60.0 ha	To ensure the irrigation water to the paddy land of 60 ha for 3 time crop cultivation	300	800	B	3.0
NT-012	Ninh Phuoc	Ninh Phuoc	Phuoc Nam	Improvement of Hang Ty Village Road to Hang Moi (Protection forest 5000 ha	Road	Apply 4.0 m width of stone pavement to the existing village road and construction of related structure	4.0 km	To improve the mobility in the commune/To support for plantation, management and take care 5000 ha protection forest	300	1,200	B	3.0
NT-013	Thuan Bac	Thuan Bac	Phuoc Chien	Improvement of Irrigation Cannel in Suoi A Village	Irrigation	To apply the concrete lining to the existing earth canal for 1.5 km with dimension of 0.4m(B) x 0.6m(H)	20.0 ha	to increate 20 ha and 2 crop/year more to be irrigated	100	1,000	A	3.0
NT-014	Thuan Bac	Thuan Bac	Phuoc Chien	Construction of U Go Irrigation Dam	Irrigation	Construction of new concrete check dam with dimension of 1.5m(H) x 0.8m(W) x 30m(L) To apply the concrete lining to the existing	15.0 ha	To ensure the irrigation water to 15 ha of paddy land for 3 crop cultivation per year	75	2,000	B	6.0
NT-015	Thuan Bac	Thuan Bac	Phuoc Chien	Construction of Suoi Muong Irrigation Dam	Irrigation	Construction of new concrete check dam with dimension of 1.5m(H) x 0.8m(W) x 30m(L) To apply the concrete lining to the existing two	25.0 ha	To ensure the irrigation water to 10 ha of paddy land for 3 crop cultivation per year	125	3,000	B	6.0
NT-016	Thuan Bac	Thuan Bac	Phuoc Chien	Construction of Dau Suoi Irrigation Dam	Irrigation	Construction of new concrete check dam with dimension of 1.5m(H) x 0.8m(W) x 30m(L)	40.0 ha	To ensure the irrigation water to 40 ha of paddy land for 3 crop cultivation per year	200	1,000	B	4.0

Table F-11 List of the Proposed Rural Infrastructure Development

Ninh Thuan

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
NT-017	Thuan Bac	Thuan Bac	Phuoc Chien	Construction of Bo Hy Irrigation Dam	Irrigation	Construction of new concrete check dam with dimension of 1.5m(H) x 0.8m(W) x 30m(L) To apply the concrete lining to the existing	30.0 ha	To ensure the irrigation water to 30 ha of paddy land for 3 crop cultivation per year	150	2,000	B	6.0
NT-018	Thuan Bac	Thuan Bac	Phuoc Chien	Improvement of Dong Thong Village Road to Protection Forest	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	0.7 km	To improve the mobility in the commune/To support for plantation, management and take care the protection forest	90	700	B	2.0
NT-019	Thuan Bac	Thuan Bac	Phuoc Chien	Improvement of Dau Suoi A Village Road to Tap La	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	1.0 km	To improve the mobility in the commune	90	1,000	B	3.0
NT-020	Thuan Bac	Thuan Bac	Phuoc Chien	Improvement of Tap La Village Road to Dau Suoi A Protection Forest	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	1.5 km	To improve the mobility in the commune/To support for plantation, management and take care the protection forest	90	1,500	B	3.0
NT-021	Thuan Bac	Thuan Bac	Phuoc Chien	Improvement of Ma Trai Lake Road to Cam Thinh Tay	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	1.0 km	To improve the mobility in the commune	90	1,000	B	3.0
NT-022	Thuan Bac	Thuan Bac	Phuoc Khang	Construction of Water Supply System to Suoi Le Village	Water Supply	Construction of inlet structure with water tank of 20,000 liter capacity. Construction of pipeline water supply system	59.0 HH	To reduce the time and cost to get safe water	59	700	A	6.0
NT-023	Thuan Bac	Thuan Bac	Phuoc Khang	Construction of Da Tren Irrigation Dam	Irrigation	New construction of earth fill dam for 6m(W) x 30m(H) x 400m(L)	120.0 ha	To ensure the irrigation water to 120 ha of paddy land for 3 time crop cultivation per year	600	2,000	B	18.0
NT-024	Thuan Bac	Thuan Bac	Phuoc Khang	Construction of Da Duoi Irrigation Dam	Irrigation	New construction of earth fill dam for 6m(W) x 30m(H) x 400m(L)	150.0 ha	To ensure the irrigation water to 150 ha of paddy land for 3 time crop cultivation per year	750	2,000	B	18.0
NT-025	Thuan Bac	Thuan Bac	Phuoc Khang	Improvement of Irrigation Cannel from Da Duoi Dams to Da Mai Tren Dams	Irrigation	Apply concrete lining to the existing earth canal for 2.0 km with dimension of 0.4m(B)x0.6m(H) and	150.0 ha	To ensure the irrigation water to 150 ha of paddy land for 2 time crop cultivation per year	750	1,000	B	4.0
NT-026	Thuan Bac	Thuan Bac	Phuoc Khang	Improvement of Da Mai Duoi Village Road to Health Care Centre	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	0.3 km	To improve the mobility in the commune	50	300	B	2.0
NT-027	Thuan Bac	Thuan Bac	Phuoc Khang	Improvement of In Mai Da Village Road	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	0.7 km	To improve the mobility in the commune	50	700	B	2.0
NT-028	Thuan Bac	Thuan Bac	Phuoc Khang	Improvement of Da Liet Village Road to Da Liet Protection Forest	Road	New construction of 6m width of concrete pavement road with related structure	1.5 km	To improve the mobility in the commune/To support for plantation, management and take care the protection forest	50	1,500	B	3.0
NT-029	Ninh Son	Ninh Son	Lam Son	Construction of Sakai Water Supply System	Water Supply	Construction of inlet structure with water tank of 20,000 liter capacity. Construction of pipeline water supply system	300.0 HH	To reduce the time and cost to get safe water	300	1,000	A	6.0
NT-030	Ninh Son	Ninh Son	Lam Son	Construction of Binh Phu Irrigation Dam	Irrigation	New construction of earth fill dam with dimension of 3m(W) x 6m(H) x 30m(L)	120.0 ha	To ensure the irrigation water to 120 ha of paddy land for 3 time crop cultivation per year	600	2,000	B	4.0
NT-031	Ninh Son	Ninh Son	Lam Son	Construction of New Irrigation Canal 19/5 to Tay	Irrigation	New construction of concrete lining canal for 5.0km with dimension of 0.8m(H) x 0.8m(B)	50.0 ha	To ensure the irrigation water to 50 ha of paddy land for 2 time crop cultivation per year	250	1,000	B	4.0
NT-032	Ninh Son	Ninh Son	Lam Son	Construction of New Irrigation Canal from Gon I to Gon II	Irrigation	New construction of concrete lining canal of 0.8(B)x0.8(H)m, 3.0km	70.0 ha	To ensure the irrigation water to 70 ha of paddy land for 2 time crop cultivation per year	350	1,000	B	5.0

Table F-11 List of the Proposed Rural Infrastructure Development

Ninh Thuan

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
NT-033	Ninh Son	Ninh Son	Lam Son	Construction of New Irrigation Canal from 45 Dams to Be De Canal	Irrigation	New, concrete 0.8x0.8 m, 2.0km	30.0 ha	To ensure the irrigation water to 30 ha of paddy land for 2 time crop cultivation per year	150	1,000	B	6.0
NT-034	Ninh Son	Ninh Son	Lam Son	Improvement of Lap La Village Road to Gon II Village	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	3.0 km	To improve the mobility in the commune	310	3,000	B	4.0
NT-035	Ninh Son	Ninh Son	Lam Son	Improvement of Ya Chieu Village Road to Cha Banh	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	8.0 km	To improve the mobility in the commune	310	8,000	B	6.0
NT-036	Ninh Son	Ninh Son	Lam Son	Improvement of Ya Chieu Village Road to Le Stream	Road	Apply 6.0 m width of concrete pavement to the existing village road and construction of related structure	5.0 km	To improve the mobility in the commune	310	5,000	B	5.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	48.7 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	19 Location	1400ha
(4)	Water Supply System Construction	359 Location	

SHORT LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	9.0 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	3 Location	160ha
(4)	Water Supply System Construction	2 Location	

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-12 List of the Proposed Rural Infrastructure Development

Binh Thuan

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
BT-001	Bac Binh	Bac Binh	Hoa Thang	Improvement of 176 road to Centre of Hoa Thang Commune	Road	Apply 3.5 m width of concrete pavement to the existing village road and construction of related structure	6.0 km	To improve the mobility in the commune	1,632	3,900	A	6.0
BT-002	Tuy Phong	Tuy Phong	Binh Thanh	Construction of Water Supply System in Binh Thanh	Water Supply	Construction of water inlet structure and pipe water system (with PVC) for 2km	100.0 HH	To reduce the time and cost to get safe water	110	200	A	6.0
BT-003	Tuy Phong	Tuy Phong	Binh Thanh	Construction of Tube Wells for Domestic Water Supply in Binh Thanh	Irrigation	Construction of tube wells	10.0 No	To reduce the time and cost to get safe water	50	200	B	6.0
BT-004	Tuy Phong	Tuy Phong	Binh Thanh	Construction of Aquaculture and Agriculture Ponds in Binh Thanh	Irrigation	Construction of New Ponds (500 m2)	10.0 No	To ensure the irrigation water for 10ha and to encourage aquaculture activities	100	200	B	6.0
BT-005	Tuy Phong	Tuy Phong	Binh Thanh	Improvement of Binh Thanh Road to Hien Luong	Road	Apply 6.0 m width of stone pavement to the existing village road and rehabilitation of related structure	2.0 km	To improve the mobility in the commune/To support for plantation, management and take care 300 ha protection forest	350	900	B	4.0
BT-006	Tuy Phong	Tuy Phong	Binh Thanh	Improvement of Binh Thanh & Chi Cong Road to Trung Phong Protection Forest	Road	Apply 6.0 m width of stone pavement to the existing village road and rehabilitation of related structure	2.0 km	To improve the mobility in the commune/To support for plantation, management and take care 200 ha protection forest	500	900	B	4.0
BT-007	Tuy Phong	Tuy Phong	Phan Dung	Construction of Ta Hoang Dam	Irrigation	Construction of concrete check dam with dimension of 30m(L) x 3m(H) Rehabilitation of existing Ta Hoang canal system with concrete lining of	70.0 ha	To increase the irrigated paddy land of 70 ha	300	8,800	B	6.0
BT-008	Tuy Phong	Tuy Phong	Phan Dung	Construction of Tan Le Dam	Irrigation	Construction of concrete check dam with dimension of 30m(L) x 3m(H) Rehabilitation of existing Tan Le canal system with concrete lining of	70.0 ha	To increase the irrigated paddy land of 70 ha	350	8,480	B	6.0
BT-009	Tuy Phong	Tuy Phong	Phan Dung	Construction of Tan Thu Dam	Irrigation	Construction of concrete check dam with dimension of 30m(L) x 3m(H) Rehabilitation of existing Tan Thu canal system with concrete lining of	70.0 ha	To increase the irrigated paddy land of 70 ha	300	8,300	B	6.0
BT-010	Tuy Phong	Tuy Phong	Phan Dung	Construction of Cho Tay Dam	Irrigation	Construction of concrete check dam with dimension of 30m(L) x 3m(H) Rehabilitation of existing Cho Tan Thu canal system with concrete	270.0 ha	To increase the irrigated paddy land of 270 ha	500	8,300	B	6.0
BT-011	Tuy Phong	Tuy Phong	Phan Dung	Improvement of Phan Dung Dam Road to Ta Hoang	Road	Apply 6.0 m width of stone pavement to the existing village road and rehabilitation of related structure	3.0 km	To improve the mobility in the commune/To support for plantation, management and take care 200 ha protection forest	20	5,850	A	4.0
BT-012	Tuy Phong	Tuy Phong	Phan Dung	Improvement of Ba Phum Road to Phum Dam (Protection forest)	Road	Apply 6.0 m width of stone pavement to the existing village road and rehabilitation of related structure	6.0 km	To improve the mobility in the commune/To support for plantation, management and take care 200 ha protection forest	15	2,700	B	4.0
BT-013	Ham Thuan Bac	Ham Thuan Bac	Thuan Minh	Improvement of Kuke Road to Da Ban (Suoi Da protection Forest, 350 ha)	Road	Apply 5.0 m width of concrete pavement to the existing village road and rehabilitation of related structure	2.0 km	To improve the mobility in the commune/To support for plantation, management and take care 350 ha protection forest	40	1,300	A	4.0
BT-014	Ham Thuan Bac	Ham Thuan Bac	Thuan Minh	Improvement of Kuke Road to Da Cau (Da Cau protection forest, 900 ha)	Road	Apply 4.0 m width of concrete pavement to the existing village road and rehabilitation of related structure	10.0 km	To improve the mobility in the commune/To support for plantation, management and take care 900 ha protection forest	40	6,500	B	6.0
BT-015	Ham Thuan Bac	Ham Thuan Bac	Thuan Minh	Improvement of Kuke Road to Chieu Lieu (Da Den protection forest, 400 ha)	Road	Apply 4.0 m width of concrete pavement to the existing village road and rehabilitation of related structure	6.0 km	To improve the mobility in the commune/To support for plantation, management and take care 400 ha protection forest	40	3,900	B	4.0

Table F-12 List of the Proposed Rural Infrastructure Development

Binh Thuan

Code	PFMB	District	Commune	Name of Sub Project	Type	Main Component of Work	Quantity	Objectives	Number of Beneficiaries (HH)	Proposed Investment Cost (by DARD) (million VTD)	Needs	Period of Construction (months)
BT-016	Ham Thuan Bac	Ham Thuan Bac	Hong Son	Construction of Water Supply System from Gieng Chanh Streams to Village	Water Supply	Construction of inlet structure with 50,000 liter concrete tank with pipeline water supply system with 9km (PVC)	1033 HH	To reduce the time and cost to get safe water	1,033	1,500	A	6.0
BT-017	Ham Thuan Bac	Ham Thuan Bac	Hong Son	Improvement of 1A Road to Village 1 and 2 (Hong Phu protection Forest,	Road	Apply 5.0 m width of concrete pavement to the existing village road and rehabilitation of related structure	2.0 km	To improve the mobility in the commune/To support for plantation, management and take care 1000 ha protection forest	1,033	1,300	B	4.0
BT-018	Ham Thuan Bac	Ham Thuan Bac	Hong Son	Improvement of Village Road From 1A (Health Care Center) to Village 2 (Hong	Road	Apply 5.0 m width of concrete pavement to the existing village road and rehabilitation of related structure	1.4 km	To improve the mobility in the commune/To support for plantation, management and take care 1000 ha protection forest	457	910	B	3.0
BT-019	Ham Thuan Bac	Ham Thuan Bac	Hong Son	Improvement of Hong Son Village No.3 Road to Hong Phu protection Forest	Road	Apply 5.0 m width of concrete pavement to the existing village road and rehabilitation of related structure	4.0 km	To improve the mobility in the commune/To support for plantation, management and take care 1000 ha protection forest	250	2,600	B	4.0
BT-020	Ham Thuan Bac	Ham Thuan Bac	Dong Tien	Improvement of Dong Tien Commune Road to Trung Bi protection Forest	Road	Apply 4.0 m width of concrete pavement to the existing village road and rehabilitation of related structure	2.3 km	To improve the mobility in the commune/To support for plantation, management and take care 10759 ha protection forest	217	1,265	A	4.0
BT-021	Ham Thuan Bac	Ham Thuan Bac	Dong Tien	Improvement of Dong Tien Commune Road to Village 2	Road	Apply 4.0 m width of concrete pavement to the existing village road and rehabilitation of related structure	1.0 km	To improve the mobility in the commune/To support for plantation, management and take care 150 ha protection forest	217	650	B	3.0
BT-022	Ham Thuan Bac	Ham Thuan Bac	Dong Tien	Improvement of Cau Seo Village Road to Ban Da (Agriculture area, 80 ha)	Road	Apply 4.0 m width of stone pavement to the existing village road and rehabilitation of related structure	0.7 km	To improve the mobility in the commune/To support for plantation, management and take care 80 ha protection forest	100	315	B	4.0
BT-023	Long Son Da Bac	Tuy Phong	Phong Phu	Construction of Water Supply System from Phan Dung to La ha Village	Water Supply	Construction of inlet structure with pipeline water supply system with 8km (PVC)	100.0 HH	To reduce the time and cost to get safe water	100	1,000	A	6.0
BT-024	Long Son Da Bac	Tuy Phong	Phong Phu	Improvement of Irrigation Canal from Cam to Tuy Tinh Farm 2	Irrigation	Apply concrete lining to the existing canal with dimension of 0.6m(B) x 0.6m(H) for 1.5km	50.0 ha	To ensure the irrigation for 50 ha for 2 crop paddy cultivation per year	250	750	B	4.0
BT-025	Long Son Da Bac	Tuy Phong	Phong Phu	Improvement of Irrigation Canal from Cay Tao Dams to La Ba Farm	Irrigation	Apply concrete lining to the existing canal with dimension of 0.6m(B) x 0.6m(H) for 1.0 km	40.0 ha	To ensure the irrigation for 40 ha for 3 crop paddy cultivation per year	200	500	B	4.0

SUMMAY

LONG LISTED SUB PROJECT		Quantity	
(1)	Road Construction and Improvement	48.4 km	
(2)	Bridge Construction	0 Location	
(3)	Irrigation Dam & Canal Improvement or Development	8 Location	502ha
(4)	Water Supply System Construction	3 Location	

SHORT LISTED SUB PROJECT		Quantity
(1)	Road Construction and Improvement	13.5 km
(2)	Bridge Construction	0 Location
(3)	Irrigation Dam & Canal Improvement or Development	0 Location
(4)	Water Supply System Construction	2 Location

Note Quantity of short listed projects indicated here is the result of discussion between JICA Fact Finding mission and MARD/DARD in the middle of March 2010.

Table F-13 Typical Cost Estimation for Construction of Rural Infrastructure

Type of Infrastructure: **Rural Road**

Specification
- Length: 1.0 km
- Width: 4.0 m
- Pavement: 3.0m width, Concrete, 18cm thickness
- Related Structure: Concrete Pipe Culvert D=0.75m 1 lane x 2 nos.

No.	Code	Description	Unit	Work Quantity	NCC Unit Cost (VND)	SCC Unit Cost (VND)	SE Unit Cost (VND)	NCC Total (VND)	SCC Total (VND)	SE Total (VND)
1	Formation of Road									
1	AF.15414	Placing Concrete 250kg/cm2 Aggrigate 1~2 cm	1 m3	552.0	793,938	934,726	840,389	438,253,776	515,968,752	463,894,728
2	AF.81211	Form work of above	100 m2	3.7	3,671,489	4,107,905	4,107,905	13,437,650	15,034,932	15,034,932
3	AL.24111	Expansion Joint (2cm)	1m	597.0	95,646	95,646	95,646	57,100,662	57,100,662	57,100,662
4	AD.11212	Coarse gravel for bed	1 m3	303.0	279,053	369,933	297,513	84,553,059	112,089,699	90,146,439
5	AB.11722	Excavation and form of side drain for class II soil by Manual	1 m3	52.0	39,321	39,321	39,321	2,044,692	2,044,692	2,044,692
6	AB.31122	Excavation and form of side drain for class II soil	1 m3	35.0	10,577	10,577	10,577	370,195	370,195	370,195
7	AB.11822	Excavation and form of road base for class II soil	1 m3	31.0	63,350	63,350	63,350	1,963,850	1,963,850	1,963,850
8	AB.32122	Excavation and form of road base for class II soil	1 m3	603.0	9,862	9,862	9,862	5,946,786	5,946,786	5,946,786
11	AB.65130	Earthfilling and compaction by rammer	1 m3	75.0	14,892	14,892	14,892	1,116,900	1,116,900	1,116,900
12	AB.64113	Earthfilling and compaction by 9 ton road roller	1 m3	1,409.0	7,590	7,590	7,590	10,694,310	10,694,310	10,694,310
15	AB.24123	Excavation and dumping up for the earth material for class III soil	1 m3	1,675.0	7,115	7,115	7,115	11,917,625	11,917,625	11,917,625
16	AB.41423	Hauling the material (<=1.0 km)	1 m3	1,675.0	11,691	11,691	11,691	19,582,425	19,582,425	19,582,425
17	AB.42323	Hauling the material (<=6.0 km)	1 m3	1,675.0	23,383	23,383	23,383	39,166,525	39,166,525	39,166,525
18	AB.42423	Hauling the material (<=13.0 km)	1 m3	1,675.0	31,664	31,664	31,664	53,037,200	53,037,200	53,037,200
Sub Total								739,185,655	846,034,553	772,017,269
2	Construction of Pipe Culvert									
37	AG.11513	Production of Concrete Pipe (1~2cm) 200kg/cm2	1 m3	2.1	737,653	867,212	777,350	1,549,071	1,821,145	1,632,435
38	AG.32211	Form work for above	1 m2	0.5	34,236	34,236	34,236	17,837	17,837	17,837
39	AG.13311	Furnishing, cutting, bending and placing mild steel reinforcement D<=10m	ton	0.2	13,539,188	14,443,688	3,474,113	2,707,838	2,888,738	694,823
40	AG.42211	Transportation and installation of above	unit	10.0	224,344	224,344	224,344	2,243,440	2,243,440	2,243,440
41	AK.95111	Painting for above	unit	10.0	207,972	207,972	207,972	2,079,720	2,079,720	2,079,720
42	AK.98120	Placing course aggregate for bed	1 m3	3.6	317,834	317,834	317,834	1,144,202	1,144,202	1,144,202
43	AF.12152	Placing Concrete 150kg/cm2 (2~4 cm) for Structure for RC	1 m3	5.2	870,818	958,286	922,394	4,528,254	4,983,087	4,796,449
44	AF.81311	Form work for above	100 m2	0.3	3,753,490	4,198,235	4,198,235	1,141,061	1,276,263	1,276,263
45	AF.11252	Placing Concrete 150kg/cm2 (4~6 cm) for Structure for RC	1 m3	11.0	538,522	639,005	575,986	5,923,742	7,029,055	6,335,846
46	AF.81521	Form work for above	100 m2	0.7	3,684,461	4,120,877	4,120,877	2,575,438	2,880,493	2,880,493
47	AK.98120	Placing coarse aggregate for bed	1 m3	2.5	317,834	317,834	317,834	794,585	794,585	794,585
48	AB.11312	Excavation for Class-II Soil for structure by manual	1 m3	4.1	59,708	59,708	59,708	244,803	244,803	244,803
49	AB.25112	Excavation for Class-II Soil for structure by machine	1 m3	77.3	11,020	11,020	11,020	851,846	851,846	851,846
50	AB.65130	Backfilling around structure	1 m3	57.0	14,892	14,892	14,892	848,844	848,844	848,844
51	BB.11108	Removal of existing structure	1 m	8.0	46,771	46,771	46,771	374,168	374,168	374,168
Sub Total								27,024,849	29,478,227	26,215,754

Location	Watershed	Total of Estimated Cost before Adjustment		793,235,352	904,991,007	824,448,777
		Adjustment for Labor	20.0%	23,354,547	23,354,547	23,354,547
		Adjustment for Material	123,144,000.0	123,144,000	123,144,000	123,144,000
		Adjustment for Machine	1.2%	9,518,824	10,859,892	9,893,385
		Total		949,252,723	1,062,349,446	980,840,710
		Miscellaneous	1.5%	14,238,791	15,935,242	14,712,611
		Total Direct Cost		963,491,514	1,078,284,687	995,553,320
		Administration Charge	5.3%	51,065,050	57,149,088	52,764,326
		Profit Charge	6.0%	60,873,394	68,126,027	62,899,059
		Total before Tax		1,075,429,958	1,203,559,802	1,111,216,705
		(VAT included in Material)		(44,832,101)	(54,638,650)	(47,644,806)
		Total w/o VAT		1,030,597,857	1,148,921,152	1,063,571,899

Location	Coastal	Total of Estimated Cost before Adjustment		793,235,352	904,991,007	824,448,777
		Adjustment for Labor	4.0%	4,670,909	4,670,909	4,670,909
		Adjustment for Material	61,572,000.0	61,572,000	61,572,000	61,572,000
		Adjustment for Machine				
		Total		859,478,262	971,233,916	890,691,687
		Miscellaneous	1.5%	12,892,174	14,568,509	13,360,375
		Total Direct Cost		872,370,435	985,802,425	904,052,062
		Administration Charge	5.3%	46,235,633	52,247,529	47,914,759
		Profit Charge	6.0%	55,116,364	62,282,997	57,118,009
		Total before Tax		973,722,433	1,100,332,950	1,009,084,831
		(VAT included in Material)		(44,300,495)	(53,990,762)	(47,079,848)
		Total w/o VAT		929,421,937	1,046,342,189	962,004,982

Table F-14 Typical Cost Estimation for Construction of Rural Infrastructure

Type of Infrastructure: **Dam & Irrigation**

Specification		
	Irrigation Area	15 (ha)
	Intake Structure	Concrete Fixed Wier — Lendth=21m (actual crest length 15m), Crest Width=1.5 m, Height=1.0 m, with scoring sluice, 0.4m(B) x 0.8m(H)
	Main Canal	Closed Type (Steel pipe) — D=0.2m, Length=110 m
	Tertiary Canal	Open Type (Concrete lining) — 2 nos. 0.3m(B) x 0.4m(H), Length=650m
	Related Structure	Drop Structure x 5 nos., Drainage Culvert x 1no.

No.	Code	Description	Unit	Work Quantity	NCC Unit Cost (VND)	SCC Unit Cost (VND)	SE Unit Cost (VND)	NCC Total (VND)	SCC Total (VND)	SE Total (VND)
1	Construction of Dam									
1	AF.11243	Placing concrete for dam body, M200, stone 2x4	m3	54.4	682,521	805,181	717,079	37,122,317	43,793,795	39,001,927
2	AF.81111	Formwork of above	100m2	0.6	4,804,218	5,248,963	5,248,963	2,809,506	3,069,594	3,069,594
3	AB.12110	Rock excavation for dam foundation, 1st class rock	m3	30.5	457,845	457,845	457,845	13,982,586	13,982,586	13,982,586
4	AB.25111	Excavation for foundation by machine (0.8m3), 4th class soil	100m3	0.7	904,086	904,086	904,086	650,671	650,671	650,671
5	AB.22124	Excavation and spreading the soil	100m3	0.7	886,279	886,279	886,279	637,855	637,855	637,855
6	AI.11911	Manufacturing steel frame for scouring sluice	ton	0.0	15,448,162	15,448,162	15,448,162	486,617	486,617	486,617
7	BB.14113	Installing the pipe, length of pipe 6m, d = 200m, thickness 3mm	100m	0.0	63,576,347	65,976,347	60,711,347	1,843,714	1,913,314	1,760,629
8	AB.13211	Backfilling around structure for dam upstream, 2nd class soil	m3	10.0	41,505	41,505	41,505	415,050	415,050	415,050
Sub Total								57,948,317	64,949,481	60,004,929
2	Main & Branch Canal (Pipeline)									
9	BB.14113	Installation of pipe, length of pipe 6m, d=200m, thickness 3mm	100m	1.1	63,576,347	65,976,347	60,711,347	72,540,612	75,279,012	69,271,647
10	AF.11213	Placing concrete for fundation, M200, stone 1x2	m3	23.1	670,333	797,070	707,428	15,471,286	18,396,376	16,327,438
11	AF.81111	Formwork of above	100m2	1.1	4,804,218	5,248,963	5,248,963	5,373,517	5,870,965	5,870,965
12	AB.12110	Rock excavation for dam foundation, 1st class rock	m3	6.7	457,845	457,845	457,845	3,058,405	3,058,405	3,058,405
13	AB.11314	Excavation of the road foundation, width≤3m, depth≤1m, 4th class soil	m3	152.7	140,534	140,534	140,534	21,456,731	21,456,731	21,456,731
14	AE.12110	Placing stone into foundation of pipeline	m3	85.6	214,907	283,184	240,676	18,387,443	24,229,223	20,592,239
15	AF.61110	Furnishing, cutting, bending and placing mild steel reinforcement D<=10mm	ton	0.3	12,409,991	13,314,491	12,249,191	4,205,746	4,512,281	4,151,251
16	AL.41410	Manufacturing the joint connector with PVC KN 92	m	6.6	271,403	271,403	271,403	1,791,260	1,791,260	1,791,260
Sub Total								142,284,999	154,594,252	142,519,935
3	Outlet Structure for Main Canal									
17	AF.11213	Placing concrete for fundation, M200, stone 1x2	m3	0.7	670,333	797,070	707,428	442,420	526,066	466,902
18	AF.12113	Placing concrete for straight wall, M200, stone 1x2	m3	0.7	971,897	1,098,430	1,009,133	719,204	812,838	746,758
19	AF.11111	Leveling concrete M100, stone 4x6	m3	0.4	468,031	557,255	497,563	205,934	245,192	218,928
20	AF.12613	Placing concrete slab, M200, stone 1x2	m3	0.3	801,852	928,385	839,088	208,482	241,380	218,163
21	AF.61521	Furnishing, cutting, bending and placing mild steel reinforcement D<=18mm	ton	0.0	12,426,983	13,344,983	12,365,783	321,859	345,635	320,274
22	BB.36107	Installing flange valve, diameter≤ 200mm	no	2.0	3,498,195	3,698,195	3,398,195	6,996,390	7,396,390	6,796,390
23	BB.31405	Installing flange Tees, diameter≤ 200mm	no	1.0	388,006	388,006	388,006	388,006	388,006	388,006
24	AB.11314	Excavation of foundation, 4th class soil	m3	5.3	140,534	140,534	140,534	743,425	743,425	743,425
Sub Total								10,025,718	10,698,933	9,898,846
4	Sand Settling Basin for West & East canal									
25	AF.11111	Leveling concrete M100, stone 4x6	m3	1.7	468,031	557,255	497,563	786,292	936,188	835,906
26	AF.11213	Placing concrete for fundation, M200, stone 1x2	m3	5.0	670,333	797,070	707,428	3,378,478	4,017,233	3,565,437
27	AF.12113	Placing concrete for straight wall, M200, stone 1x2	m3	8.2	971,897	1,098,430	1,009,133	7,930,680	8,963,189	8,234,525
28	AF.12613	Placing concrete slab, M200, stone 1x2	m3	1.2	801,852	928,385	839,088	930,148	1,076,927	973,342
29	AF.61521	Furnishing, cutting, bending and placing mild steel reinforcement D<=18mm	ton	0.1	12,426,983	13,344,983	12,365,783	1,728,593	1,856,287	1,720,080
30	AB.11314	Excavation of foundation, 4th class soil	m3	86.5	140,534	140,534	140,534	12,160,407	12,160,407	12,160,407
Sub Total								26,914,599	29,010,231	27,489,698
5	West & East tertiary canal									
31	AF.11111	Leveling concrete M100, stone 4x6	m3	18.7	468,031	557,255	497,563	8,752,180	10,420,669	9,304,428
32	AF.11213	Placing concrete for fundation, M200, stone 1x2	m3	56.1	670,333	797,070	707,428	37,612,385	44,723,598	39,693,785
33	AF.12113	Placing concrete for straight wall, M200, stone 1x2	m3	70.5	971,897	1,098,430	1,009,133	68,489,582	77,406,362	71,113,603
34	AF.12313	Placing concrete for beam, M200, stone 1x2	m3	0.5	861,391	987,924	898,627	413,468	474,204	431,341
35	AF.81311	Formwork of above	100m2	12.5	6,092,896	6,537,641	6,537,641	75,966,221	81,511,308	81,511,308
36	AF.61511	Furnishing, cutting, bending and placing mild steel reinforcement D<=10mm	ton	0.0	12,795,212	13,699,712	12,634,412	276,377	295,914	272,903
37	AF.61521	Furnishing, cutting, bending and placing mild steel reinforcement D<=18mm	ton	0.2	12,426,983	13,344,983	12,365,783	2,120,043	2,276,654	2,109,603
38	AB.11513	Canal Excavation, 3rd class soil	m3	1,079.1	98,300	98,300	98,300	106,078,479	106,078,479	106,078,479
39	AB.13211	Backfilling around structure, 2nd class soil	m3	670.7	41,505	41,505	41,505	27,836,988	27,836,988	27,836,988
Sub Total								327,545,722	351,024,175	338,352,438
6	Drop Structure at three positions: at five locations									
40	AF.11111	Leveling concrete M100, stone 4x6	m3	0.9	468,031	557,255	497,563	435,269	518,247	462,734
41	AF.11213	Placing concrete for fundation, M200, stone 1x2	m3	4.5	670,333	797,070	707,428	3,003,092	3,570,874	3,169,277
42	AF.12113	Placing concrete for straight wall, M200, stone 1x2	m3	7.6	971,897	1,098,430	1,009,133	7,366,979	8,326,099	7,649,228
43	AF.81311	Formwork of above	100m2	0.9	6,092,896	6,537,641	6,537,641	5,178,961	5,556,995	5,556,995
44	AB.11513	Excavation of foundation, 3rd class soil	m3	36.3	98,300	98,300	98,300	3,570,256	3,570,256	3,570,256
45	AB.13211	Backfilling around structure, 2nd class soil	m3	12.1	41,505	41,505	41,505	502,211	502,211	502,211
Sub Total								20,056,768	22,044,682	20,910,701
7	Drainage Culvert									
46	AF.11111	Leveling concrete M100, stone 4x6	m3	0.3	468,031	557,255	497,563	126,368	150,459	134,342
47	AF.11213	Placing concrete for fundation, M200, stone 1x2	m3	1.9	670,333	797,070	707,428	1,266,929	1,506,462	1,337,039
48	AF.12113	Placing concrete for straight wall, M200, stone 1x2	m3	1.8	971,897	1,098,430	1,009,133	1,749,415	1,977,174	1,816,439
49	AF.12613	Placing concrete slab, M200, stone 1x2	m3	0.6	801,852	928,385	839,088	505,167	584,883	528,625
50	AF.81311	Formwork of above	100m2	0.2	6,092,896	6,537,641	6,537,641	1,274,024	1,367,021	1,367,021
51	AB.11513	Excavation of foundation, 3rd class soil	m3	8.2	98,300	98,300	98,300	805,077	805,077	805,077
52	AB.13214	Backfilling around structure, 3rd class soil	m3	2.7	58,981	58,981	58,981	161,018	161,018	161,018
53	AF.61611	Furnishing, cutting, bending and placing mild steel reinforcement D<=10mm	ton	0.1	13,230,955	14,135,455	13,070,155	1,038,630	1,109,633	1,026,007
Sub Total								6,926,629	7,661,727	7,175,569

Table F-14 Typical Cost Estimation for Construction of Rural Infrastructure

Type of Infrastructure: Dam & Irrigation

Specification:

Irrigation Area	15 (ha)	
Intake Structure	Concrete Fixed Wier	Lendth=21m (actual crest length 15m), Crest Width=1.5 m, Height=1.0 m, with scoring sluice, 0.4m(B) x 0.8m(H)
Main Canal	Closed Type (Steel pipe)	D=0.2m, Length=110 m
Tertiary Canal	Open Type (Concrete lining)	2 nos. 0.3m(B) x 0.4m(H), Length=650m
Related Structure		Drop Structure x 5 nos., Drainage Culvert x 1no.

No.	Code	Description	Unit	Work Quantity	NCC Unit Cost (VND)	SCC Unit Cost (VND)	SE Unit Cost (VND)	NCC Total (VND)	SCC Total (VND)	SE Total (VND)
	Location	Watershed		Total of Estimated Cost before Adjustment				591,702,751	639,983,480	606,352,115
				Adjustment for Labor		20.0%		58,081,932	58,081,932	58,081,932
				Adjustment for Material			34,000,000	34,000,000	34,000,000	34,000,000
				Adjustment for Machine		1.2%		7,100,433	7,679,802	7,276,225
				Total				690,885,116	739,745,214	705,710,272
				Miscellaneous		1.5%		10,363,277	11,096,178	10,585,654
				Total Direct Cost				701,248,393	750,841,392	716,295,926
				Administration Charge		5.3%		37,166,165	39,794,594	37,963,684
				Profit Charge		6.0%		44,304,873	47,438,159	45,255,577
				Total before Tax				782,719,431	838,074,145	799,515,187
				(VAT included in Material)				(22,803,006)	(27,953,201)	(25,344,946)
				Total w/o VAT				759,916,425	810,120,944	774,170,241
	Location	Coastal		Total of Estimated Cost before Adjustment				591,702,751	639,983,480	606,352,115
				Adjustment for Labor		4.0%		11,616,386	11,616,386	11,616,386
				Adjustment for Material			17,000,000	17,000,000	17,000,000	17,000,000
				Adjustment for Machine						
				Total				591,702,751	639,983,480	606,352,115
				Miscellaneous		1.5%		8,875,541	9,599,752	9,095,282
				Total Direct Cost				600,578,293	649,583,233	615,447,397
				Administration Charge		5.3%		31,830,650	34,427,911	32,618,712
				Profit Charge		6.0%		37,944,537	41,040,669	38,883,967
				Total before Tax				670,353,479	725,051,812	686,950,075
				(VAT included in Material)				(23,520,757)	(27,621,741)	(25,044,413)
				Total w/o VAT				646,832,722	697,430,072	661,905,662

Table F-15 Typical Cost Estimation for Construction of Rural Infrastructure

Type of Infrastructure: **Domestic Water Supply**

Specification			
	Intake Structure	Concrete Fixed Wier	Lendth=6.5 m, Crest Width=1.5 m, Height=1.0 m
	Head race channel	Galvanized pipe + PVC	200 m
	Water Treatment Tank	Concrete tank	14,700 lit.
	Water supply channel	PVC	400 m
	Tap Base		16 nos. for 100 Household

No.	Code	Description	Unit	Work Quantity	NCC Unit Cost (VND)	SCC Unit Cost (VND)	SE Unit Cost (VND)	NCC Total (VND)	SCC Total (VND)	SE Total (VND)
1	Intake Structure (Dam)									
1	AB.11323	Excavation of foundation, 3rd class soil	m3	19.7	95,388	95,388	95,388	1,880,288	1,880,288	1,880,288
2	AB.13213	Embankment filling for cofferdam	m3	15.0	53,883	53,883	53,883	808,245	808,245	808,245
3	AB.11713	Demolishment of cofferdam	m3	15.0	77,913	77,913	77,913	1,168,695	1,168,695	1,168,695
4	AB.12112	Rock excavation for dam foundation, 2nd class rock	m3	4.7	355,225	355,225	355,225	1,653,928	1,653,928	1,653,928
5	AF.12153	Placing concrete for dam, M200, stone 1x2	m3	9.5	827,536	950,196	862,094	7,844,214	9,006,908	8,171,789
6	AF.12152	Placing concrete for dam, M150, stone 1x2	m3	21.0	870,818	958,286	922,394	18,247,991	20,080,883	19,328,766
7	AF.81111	Formwork for above	100m2	0.9	1,074,358	1,074,358	1,074,358	986,261	986,261	986,261
8	AL.51413	Drilling of rock for anchoring	100m	0.3	3,061,899	3,061,899	3,061,899	924,693	924,693	924,693
9	AF.61120	Furnishing, cutting, bending and placing mild steel reinforcement D<=18mm	ton	0.2	12,290,846	13,208,846	12,229,646	1,929,663	2,073,789	1,920,054
10	AF.61110	Furnishing, cutting, bending and placing mild steel reinforcement D<=10mm	ton	0.5	12,409,991	13,314,491	12,249,191	6,118,126	6,564,044	6,038,851
11	AH.13111	manufacturing and installation of wood	m3	0.3	8,675,387	8,864,097	8,864,097	2,602,616	2,659,229	2,659,229
12	BB.14306	Installing galvanized pipe, D=75mm	100m	0.1	18,576,828	19,376,828	17,976,828	1,486,146	1,550,146	1,438,146
13	TT	Dealing with water	no.	3.0	314,000	314,000	314,000	942,000	942,000	942,000
14	AL.76120	Clearing of waste rock	m3	10.0	72,000	72,000	72,000	720,000	720,000	720,000
Sub Total								47,312,866	51,019,109	48,640,946
2	Regulator									
1	AB.11313	Excavation of foundation, 3rd class soil	m3	12.6	90,291	90,291	90,291	1,141,278	1,141,278	1,141,278
2	AB.13113	Backfilling around structure K=0.95	m3	6.8	50,970	50,970	50,970	346,596	346,596	346,596
3	AF.12113	Placing concrete for straight wall, M200, stone 1x2	m3	3.8	971,897	1,098,430	1,009,133	3,644,614	4,119,113	3,784,249
4	AF.11111	Leveling concrete M100, stone 4x6	m3	0.6	450,724	450,724	450,724	261,420	261,420	261,420
5	AF.61321	Furnishing, cutting, bending and placing mild steel reinforcement D<=18mm	ton	0.0	12,514,242	13,432,242	12,453,042	250,285	268,645	249,061
6	AF.81121	Formwork for above	100m2	0.2	7,578,129	8,022,874	8,022,874	1,515,626	1,604,575	1,604,575
7	BB.36013	Installation of valve, D=75mm	no.	2.0	209,761	209,761	209,761	419,522	419,522	419,522
8	BB.37103	Setting of steel pipe D=75mm	piece	6.0			132,101	792,606	792,606	792,606
9	BB.14306	Installing zinc coated pipe, D=75mm	100m	0.1	18,576,828	19,376,828	17,976,828	1,300,378	1,356,378	1,258,378
Sub Total								9,672,324	10,310,132	9,857,685
3	Settling Basin Tank x 1no.									
1	AB.11313	Excavation of foundation, 3rd class soil	m3	5.3	90,291	90,291	90,291	475,834	475,834	475,834
2	AB.13113	Backfilling around structure K=0.95	m3	3.8	50,970	50,970	50,970	192,667	192,667	192,667
3	AF.12113	Placing concrete for straight wall, M200, stone 1x2	m3	1.2	971,897	1,098,430	1,009,133	1,117,682	1,263,195	1,160,503
4	AF.11111	Leveling concrete M100, stone 4x6	m3	0.2	468,031	557,255	497,563	93,606	111,451	99,513
5	AF.81121	Formwork for above	100m2	0.1	7,578,129	8,022,874	8,022,874	833,594	882,516	882,516
6	BB.36103	Installation of valve, D=75mm	no.	1.0	201,043	210,043	284,043	201,043	210,043	284,043
7	AF.61321	Furnishing, cutting, bending and placing mild steel reinforcement D<=18mm	ton	0.1	12,514,242	13,432,242	12,453,042	725,826	779,070	722,276
8	AL.11131	Steel strap 5mm thickness	ton	0.0	13,870,520	13,870,520	13,870,520	249,669	249,669	249,669
Sub Total								3,889,920	4,164,444	4,067,021
4	Tap base x 14 positions									
1	AB.11313	Excavation of foundation, 3rd class soil	m3	32.2	90,291	90,291	90,291	2,907,370	2,907,370	2,907,370
2	AB.13113	Backfilling around structure K=0.95	m3	12.6	50,970	50,970	50,970	642,222	642,222	642,222
3	AE.21114	M75 cement mortar brick masonry	m3	6.3	697,781	676,123	653,802	4,396,020	4,259,575	4,118,953
4	AF.12113	Placing concrete for straight wall, M200, stone 1x2	m3	9.8	971,897	1,098,430	1,009,133	9,524,591	10,764,614	9,889,503
5	AF.61321	Furnishing, cutting, bending and placing mild steel reinforcement D<=18mm	ton	0.2	12,514,242	13,432,242	12,453,042	2,452,791	2,632,719	2,440,796
6	AF.81121	Formwork for above	100m2	0.6	7,578,129	8,022,874	8,022,874	4,243,752	4,492,809	4,492,809
7	BB.14301	Instalation of zinc coated steel pipe D≤27mm	100m	1.4	6,723,626	6,973,626	6,523,626	9,413,076	9,763,076	9,133,076
8	BB.26203	Instalation of zinc coated Tees, D≤27mm	no.	28.0	16,854	16,854	16,854	471,912	471,912	471,912
9	BB.26203	Instalation of zinc coated pipe D≤27mm	no.	28.0	16,854	16,854	16,854	471,912	471,912	471,912
10	BB.36601	Instalation of thread valve, D≤27mm	no.	42.0	54,009	56,009	77,009	2,268,378	2,352,378	3,234,378
11	BB.24104	Installation of cone, diameter D≤27mm	no.	42.0	20,642	20,642	20,642	866,964	866,964	866,964
12	BB.30324	Installation of joint enclosure	no.	56.0	16,596	16,596	16,596	929,376	929,376	929,376
Sub Total								38,588,365	40,554,928	39,599,272
5	Supply Pipe of untreated water									
1	AB.11313	Excavation of foundation, 3rd class soil	m3	92.0	90,291	90,291	90,291	8,306,772	8,306,772	8,306,772
2	AB.13113	Backfilling around structure K=0.95	m3	80.3	50,970	50,970	50,970	4,092,891	4,092,891	4,092,891
3	BB.19307	Instalation of PVC pipe, D=75mm	100m	1.9	6,305,344	6,105,344	6,105,344	11,980,154	11,600,154	11,600,154
4	BB.14306	Installation of galvanized steel pipe, D=75mm	100m	0.1	18,576,828	19,376,828	17,976,828	1,486,146	1,550,146	1,438,146
5	BB.24208	Installation of pipe fitter, D=75mm	no.	4.0	52,741	52,741	52,741	210,964	210,964	210,964
6	AA.21221	Demolishment of existing structure	m3	1.2	281,022	281,022	281,022	323,175	323,175	323,175
7	AF.17222	Placing concrete for gutter, M150, stone 2x4	m3	1.2	653,357	653,357	653,357	751,361	751,361	751,361
Sub Total								27,151,463	26,835,463	26,723,463

Table F-15 Typical Cost Estimation for Construction of Rural Infrastructure

Type of Infrastructure: **Domestic Water Supply**

Specification	Intake Structure	Concrete Fixed Wier	Lendth=6.5 m, Crest Width=1.5 m, Height=1.0 m
	Head race channel	Galvanized pipe + PVC	200 m
	Water Treatment Tank	Concrete tank	14,700 lit.
	Water supply channel	PVC	400 m
	Tap Base		16 nos. for 100 Household

No.	Code	Description	Unit	Work Quantity	NCC Unit Cost (VND)	SCC Unit Cost (VND)	SE Unit Cost (VND)	NCC Total (VND)	SCC Total (VND)	SE Total (VND)
6	Domestic water supply system									
1	AB.11613	Excavation of pipeline, 3rd class soil	m3	195.0	183,927	183,927	183,927	35,865,765	35,865,765	35,865,765
2	AB.13113	Backfilling around structure K=0.95	m3	165.0	50,970	50,970	50,970	8,410,050	8,410,050	8,410,050
3	BB.19105	Installation of plastic pipe, D=50mm	100m	3.9	2,906,217	2,706,217	2,706,217	11,334,246	10,554,246	10,554,246
4	BB.14304	Installing zinc coated steel pipe, D=50mm	100m	0.1	11,498,564	11,998,564	11,198,564	1,494,813	1,559,813	1,455,813
5	BB.29105	Installation of plastic cones	no.	15.0	15,964	15,964	15,964	239,460	239,460	239,460
6	BB.29125	Installation of plastic tees	no.	14.0	33,366	33,366	33,366	467,124	467,124	467,124
Sub Total								57,811,459	57,096,459	56,992,459
7	Treatment tank (Km0+162.10)									
1	AB.11313	Excavation of foundation, 3rd class soil	m3	23.8	90,291	90,291	90,291	2,148,926	2,148,926	2,148,926
2	AB.13113	Backfilling around structure K=0.95	m3	3.8	50,970	50,970	50,970	194,196	194,196	194,196
3	AF.61120	Furnishing, cutting, bending and placing mild steel reinforcement D<=18mm	ton	1.1	12,290,846	13,208,846	12,229,646	13,151,205	14,133,465	13,085,721
4	AF.81122	Formwork	100m2	0.9	6,074,344	6,519,089	6,519,089	5,734,180	6,154,020	6,154,020
5	AF.11222	Placing concrete for fundation, M150, stone1x2	m3	0.5	647,508	647,508	647,508	291,379	291,379	291,379
6	AF.11313	Placing concrete around structure, M200, stone1x2	m3	3.0	653,882	776,542	688,440	1,948,568	2,314,095	2,051,551
7	AF.16123	Placing concrete for water tank, M200, stone1x2	m3	5.1	1,283,192	1,409,725	1,320,428	6,505,783	7,147,306	6,694,570
8	AF.12513	Placing concrete slab, M200, stone 1x2	m3	1.7	850,392	850,392	850,392	1,454,170	1,454,170	1,454,170
9	AF.12313	Placing concrete beam, M200, stone 1x3	m3	0.4	861,391	987,924	898,627	327,329	375,411	341,478
10	AF.17222	Placing concrete for gutter, M150, stone 2x4	m3	0.9	653,357	653,357	653,357	555,353	555,353	555,353
11	AF.11111	Leveling concrete M100, stone 4x6	m3	1.5	468,031	557,255	497,563	688,006	819,165	731,418
12	BB.14306	instalation of zinc coated steel pipe, D=75mm	100m	0.1	18,576,828	19,376,828	17,976,828	1,486,146	1,550,146	1,438,146
13	BB.19105	Installation of plastic pipe, D=50mm	100m	0.1	2,906,217	2,706,217	2,706,217	145,311	135,311	135,311
14	BB.14304	Installation zinc coated steel pipe, D=50mm	100m	0.0	11,498,564	11,998,564	11,198,564	114,986	119,986	111,986
15	BB.24208	Installation steel pipe fitter, D=75mm	no.	11.0	52,741	52,741	52,741	580,151	580,151	580,151
16	BB.24108	Installation steel tee, D=75mm	no.	3.0	55,781	55,781	55,781	167,343	167,343	167,343
17	BB.24106	Installation steel tee, D=50mm	no.	1.0	31,033	31,033	31,033	31,033	31,033	31,033
18	BB.36103	Installation flange valve, D=75mm	no.	5.0	201,043	210,043	284,043	1,005,215	1,050,215	1,420,215
19	BB.36102	Installation flange valve, D=50mm	no.	2.0	171,061	171,061	171,061	342,122	342,122	342,122
Sub Total								36,871,402	39,563,793	37,929,089
8	Valve Box 2 nos.									
1	AB.11313	Excavation of foundation, 3rd class soil	m3	10.5	90,291	90,291	90,291	951,667	951,667	951,667
2	AB.13113	Backfilling around structure K=0.95	m3	7.6	50,970	50,970	50,970	385,333	385,333	385,333
3	AF.12113	Placing concrete for straight wall, M200, stone 1x2	m3	2.3	971,897	1,098,430	1,009,133	2,235,363	2,526,389	2,321,006
4	AF.11111	Leveling concrete M100, stone 4x6	m3	0.4	468,031	557,255	497,563	187,212	222,902	199,025
5	AF.81121	Formwork for above	100m2	0.2	7,578,129	8,022,874	8,022,874	1,667,188	1,765,032	1,765,032
6	BB.36103	Installation flange valve, D=75mm	no.	3.0	201,043	210,043	284,043	603,129	630,129	852,129
7	BB.19307	Installation of PVC pipe, D=75mm	100m	0.0	6,305,344	6,105,344	6,105,344	252,214	244,214	244,214
8	BB.29207	Installation of plastic tees, D=75mm	no.	2.0	35,407	35,407	35,407	70,814	70,814	70,814
9	AF.61321	Furnishing, cutting, bending and placing mild steel reinforcement D<=18mm	ton	0.1	12,514,242	13,432,242	12,453,042	1,451,652	1,558,140	1,444,553
10	AL.11131	5 cm thick strap steel	ton	0.0	13,870,520	13,870,520	13,870,520	499,339	499,339	499,339
Sub Total								8,303,912	8,853,959	8,733,112

Location: Watershed

Total of Estimated Cost before Adjustment			229,601,710	238,398,287	232,543,046
Adjustment for Labor	20.0%		22,821,081	22,821,081	22,821,081
Adjustment for Material		105,000,000	105,000,000	105,000,000	105,000,000
Adjustment for Machine	1.2%		2,755,221	2,860,779	2,790,517
Total			360,178,012	369,080,147	363,154,643
Miscellaneous	1.5%		5,402,670	5,536,202	5,447,320
Total Direct Cost			365,580,682	374,616,350	368,601,963
Administration Charge	5.3%		19,375,776	19,854,667	19,535,904
Profit Charge	6.0%		23,097,387	23,668,261	23,288,272
Total before Tax			408,053,845	418,139,277	411,426,139
(VAT included in Material)			(8,769,799)	(9,391,202)	(8,970,546)
Total w/o VAT			399,284,046	408,748,075	402,455,593

Location: Coastal

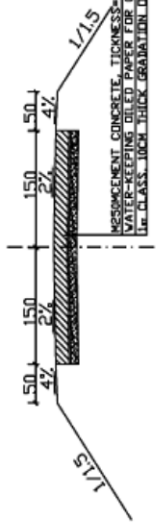
Total of Estimated Cost before Adjustment			229,601,710	238,398,287	232,543,046
Adjustment for Labor	4.0%		4,564,216	4,564,216	4,564,216
Adjustment for Material		53,000,000	53,000,000	53,000,000	53,000,000
Adjustment for Machine					
Total			287,165,927	295,962,503	290,107,262
Miscellaneous	1.5%		4,307,489	4,439,438	4,351,609
Total Direct Cost			291,473,415	300,401,941	294,458,871
Administration Charge	5.3%		15,448,091	15,921,303	15,606,320
Profit Charge	6.0%		18,415,290	18,979,395	18,603,911
Total before Tax			325,336,797	335,302,638	328,669,103
(VAT included in Material)			(8,665,810)	(9,279,843)	(8,864,177)
Total w/o VAT			316,670,987	326,022,795	319,804,926

Figure F-1 Typical Design of Rural Infrastructure

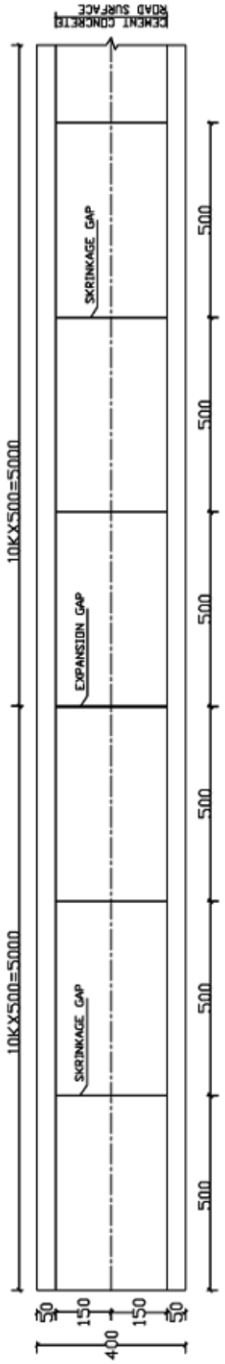
Type of Infrastructure		Rural Road
Specification	Length	1.0 km
	Width	4.0 m
	Pavement	3.0m width, Concrete, 18cm thickness
	Related Structure	Concrete Pipe Culvert D=0.75m 1 lane x 2 nos.

Typical Drawing

Typical Cross Section of Rural Road



Typical Plan of Rural Road



Expamsion Joint

Figure F-2 Typical Design of Rural Infrastructure

Type of Infrastructure		Rural Road
Specification	Length	1.0 km
	Width	4.0 m
	Pavement	3.0m width, Concrete, 18cm thickness
	Related Structure	Concrete Pipe Culvert D=0.75m 1 lane x 2 nos.

Typical Drawing

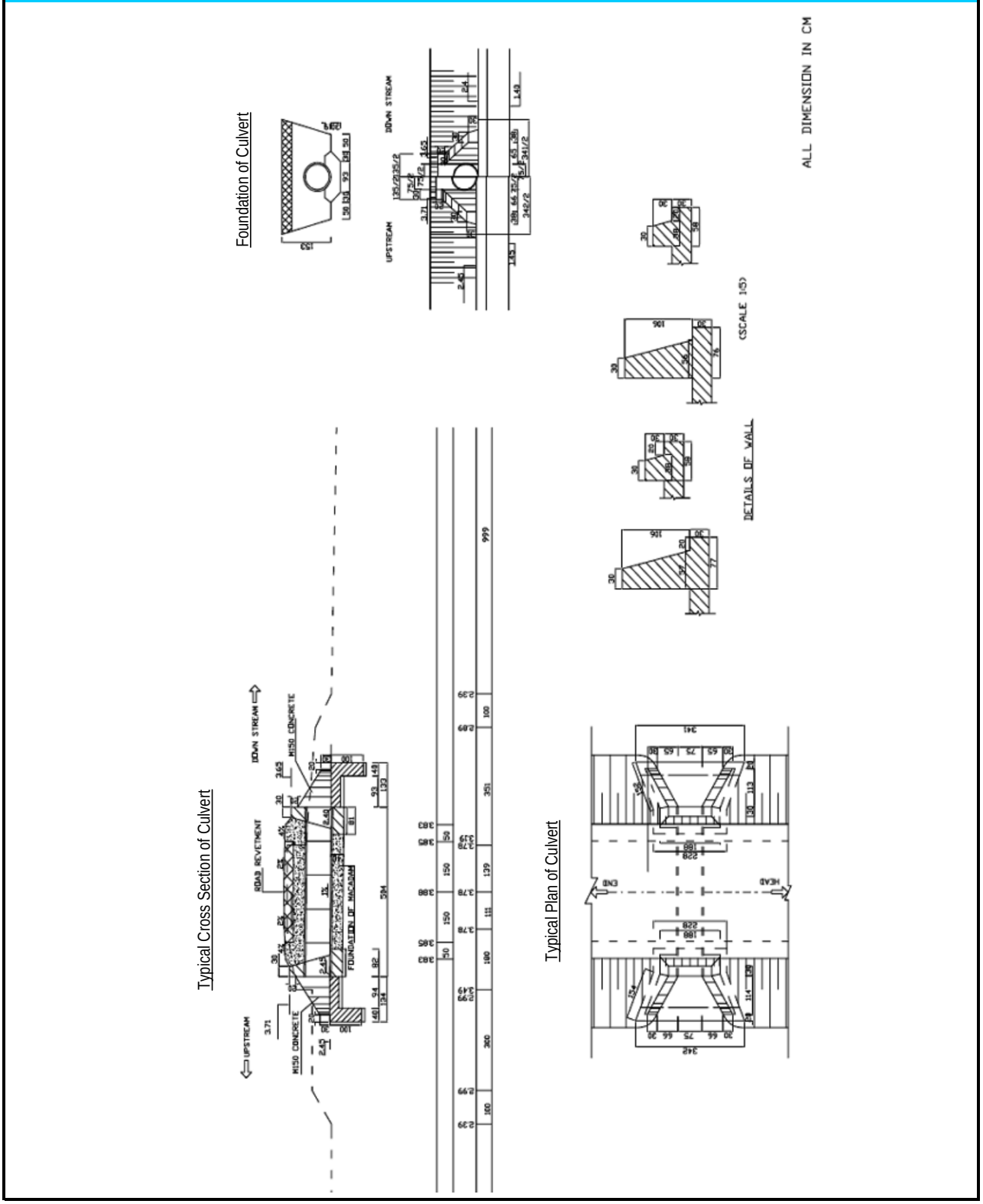


Figure F-3 Typical Design of Rural Infrastructure

Type of Infrastructure		Dam & Irrigation	
Specification	Irrigation Area	15 (ha)	
	Intake Structure	Concrete Fixed Wier	Length=21m (actual crest length 15m), Crest Width=1.5 m, Height=1.0 m, with scoring sluice, 0.4m(B) x 0.8m(H)
	Main Canal	Closed Type (Steel pipe)	D=0.2m, Length=110 m
	Tertiary Canal	Open Type (Concrete lining)	2 nos. 0.3m(B) x 0.4m(H), Length=650m
		Related Structure	Drop Structure x 5 nos., Drainage Culvert x 1no.

Typical Drawing

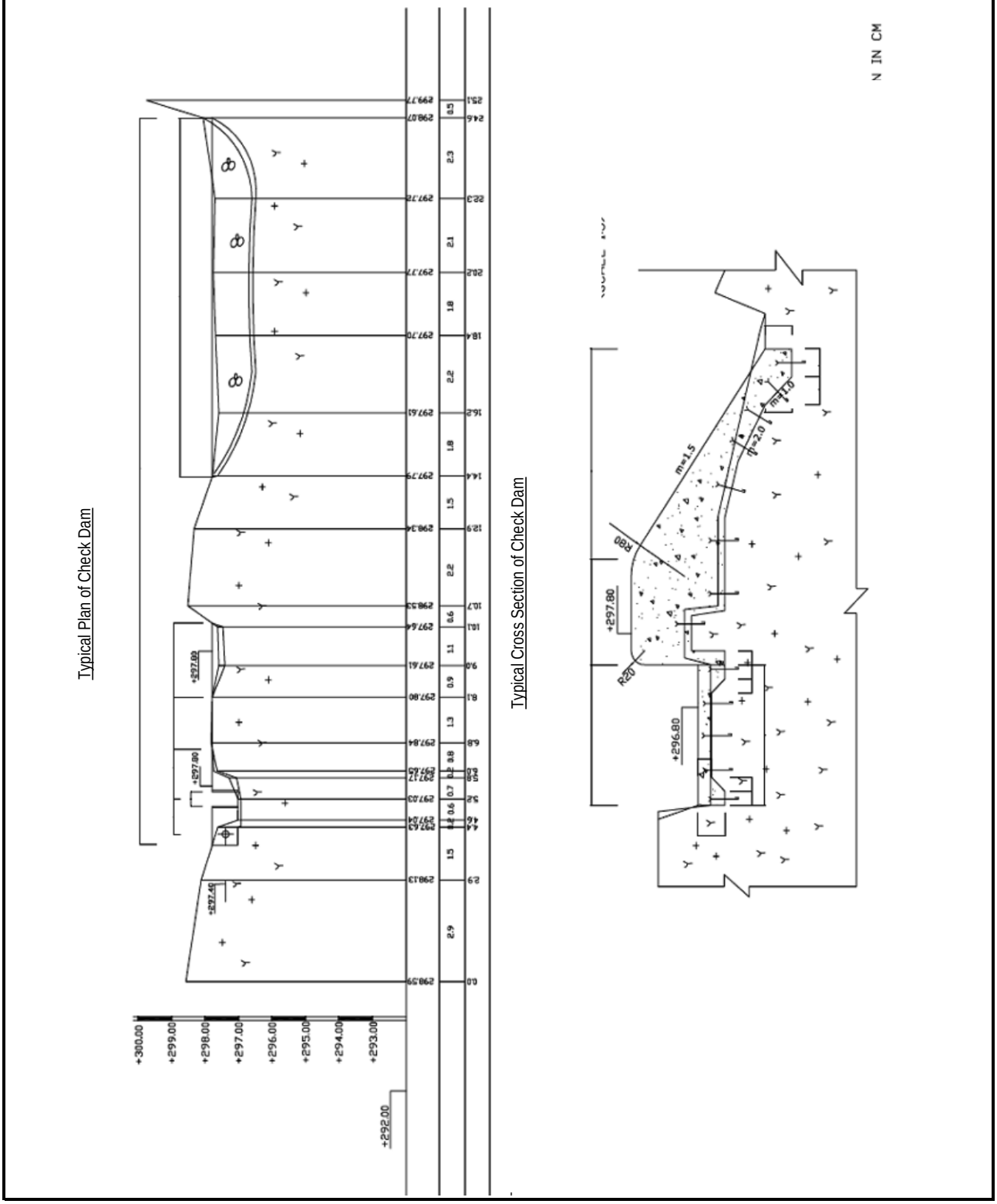


Figure F-4 Typical Design of Rural Infrastructure

Type of Infrastructure		Dam & Irrigation	
Specification	Irrigation Area	15 (ha)	
	Intake Structure	Concrete Fixed Wier	Lendth=21m (actual crest length 15m), Crest Width=1.5 m, Height=1.0 m, with scoring sluice, 0.4m(B) x 0.8m(H)
	Main Canal	Closed Type (Steel pipe)	D=0.2m, Length=110 m
	Tertiary Canal	Open Type (Concrete lining)	2 nos. 0.3m(B) x 0.4m(H), Length=650m
		Related Structure	Drop Structure x 5 nos., Drainage Culvert x 1no.

Typical Drawing

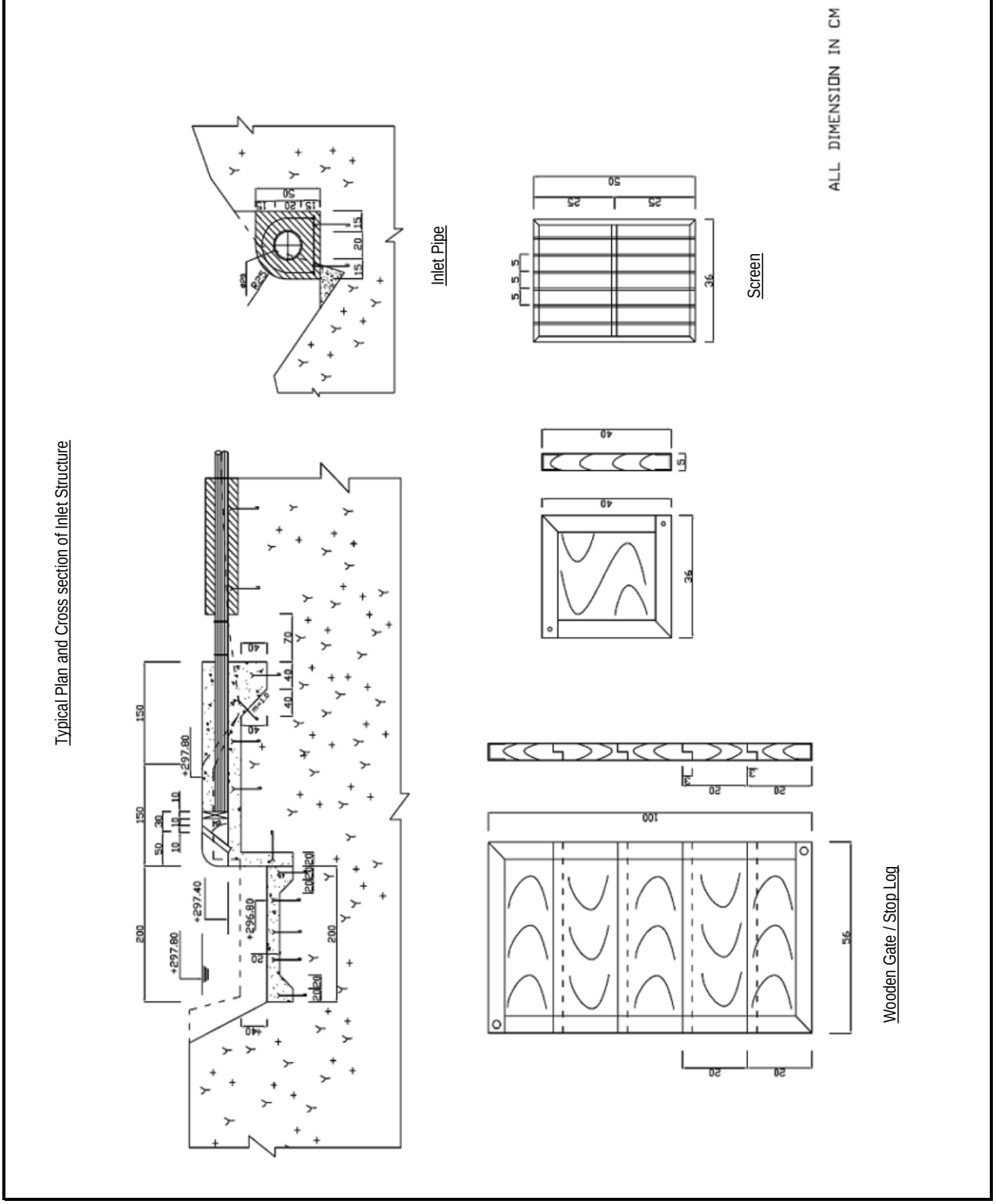


Figure F-5 Typical Design of Rural Infrastructure

Type of Infrastructure		Dam & Irrigation	
Specification	Irrigation Area	15 (ha)	
	Intake Structure	Concrete Fixed Wier	Lendth=21m (actual crest length 15m), Crest Width=1.5 m, Height=1.0 m, with scoring sluice, 0.4m(B) x 0.8m(H)
	Main Canal	Closed Type (Steel pipe)	D=0.2m, Length=110 m
	Tertiary Canal	Open Type (Concrete lining)	2 nos. 0.3m(B) x 0.4m(H), Length=650m
		Related Structure	Drop Structure x 5 nos., Drainage Culvert x 1no.

Typical Drawing

Typical Plan and Cross Section of Irrigation Canal

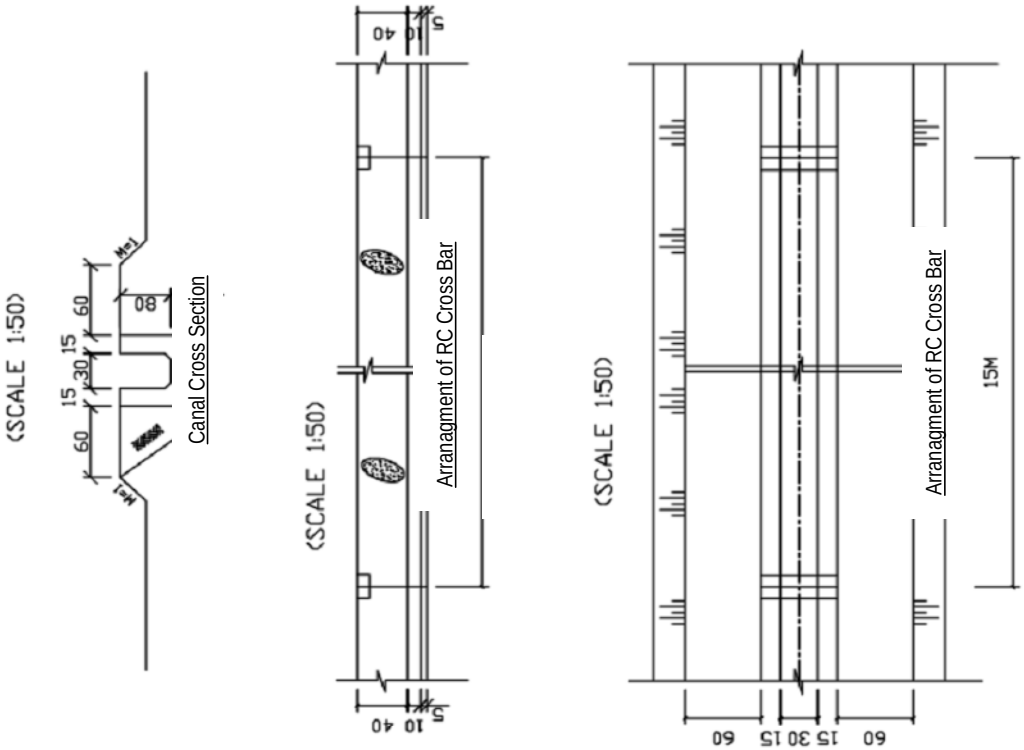
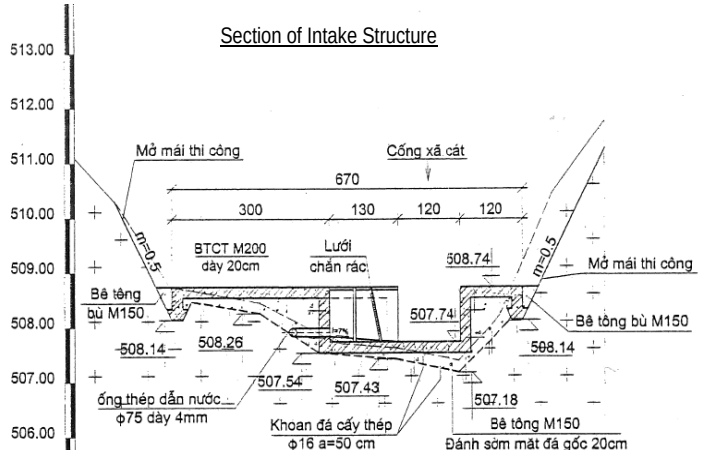


Figure F-6 Typical Design of Rural Infrastructure

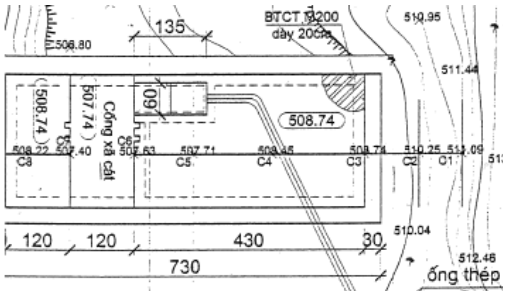
Type of Infrastructure		Domestic Water Supply	
Specification	Intake Structure	Concrete Fixed Wier	Lendth=6.7 m, Crest Width=1.5 m, Height=1.0 m
	Head race channel	Galvanized pipe + PVC	200 m
	Water Treatment Tank	Concrete tank	14,700 lit.
	Water supply channel	PVC	400 m
	Tap Base		16 nos. for 100 Household

Typical Drawing

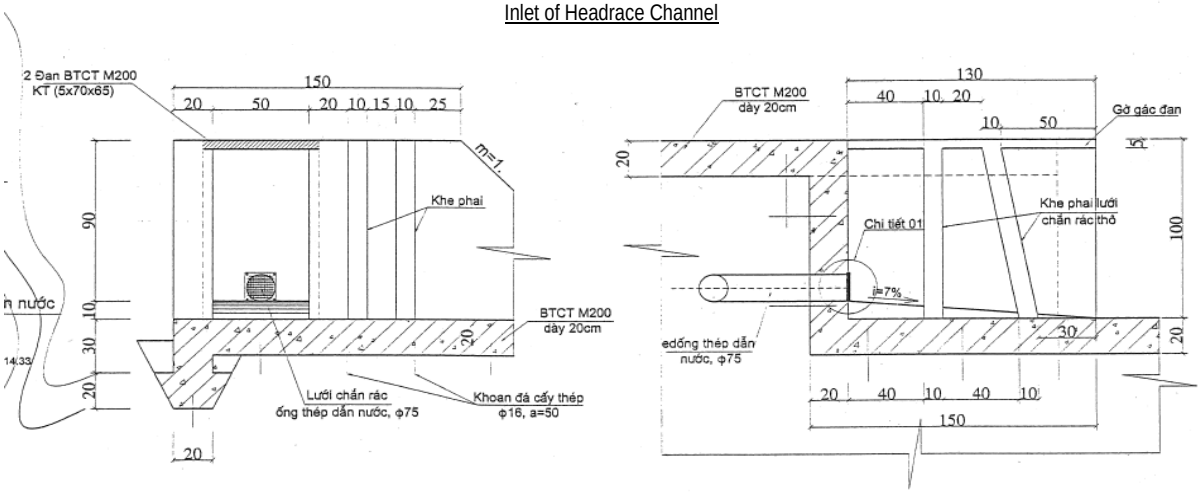
Section of Intake Structure



Plan of Intake Structure



Inlet of Headrace Channel



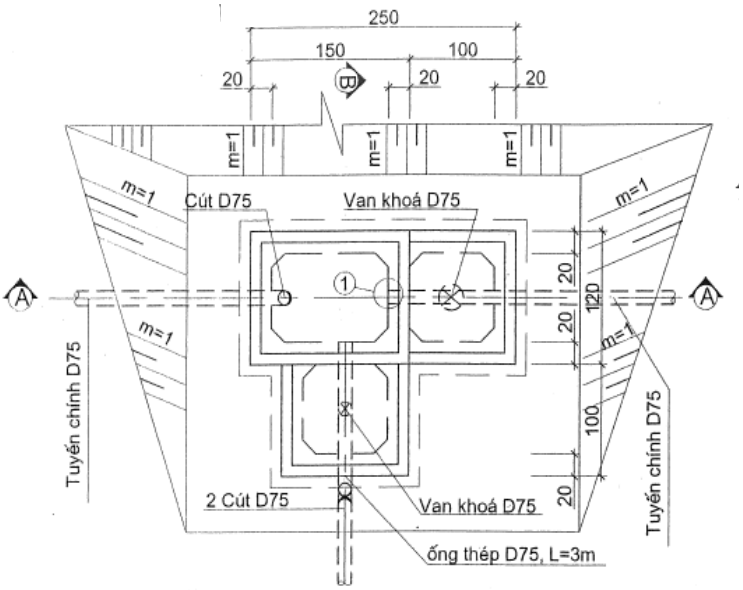
All Dimensions in CM

Figure F-7 Typical Design of Rural Infrastructure

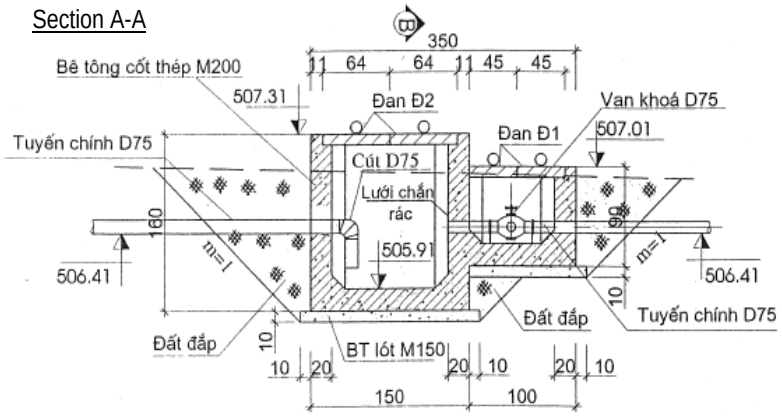
Type of Infrastructure		Domestic Water Supply	
Specification	Intake Structure	Concrete Fixed Wier	Lendth=6.7 m, Crest Width=1.5 m, Height=1.0 m
	Head race channel	Galvanized pipe + PVC	200 m
	Water Treatment Tank	Concrete tank	14,700 lit.
	Water supply channel	PVC	400 m
	Tap Base		16 nos. for 100 Household

Typical Drawing

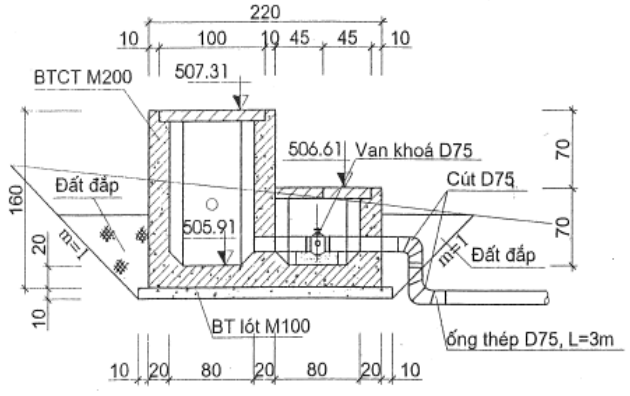
Plan of Regulator



Section A-A



Section B-B



All Dimensions in CM

Figure F-8 Typical Design of Rural Infrastructure

Type of Infrastructure		Domestic Water Supply	
Specification	Intake Structure	Concrete Fixed Wier	Lendth=6.5 m, Crest Width=1.5 m, Height=1.0 m
	Head race channel	Galvanized pipe + PVC	200 m
	Water Treatment Tank	Concrete tank	14,700 lit.
	Water supply channel	PVC	400 m
	Tap Base		16 nos. for 100 Household

Typical Drawing

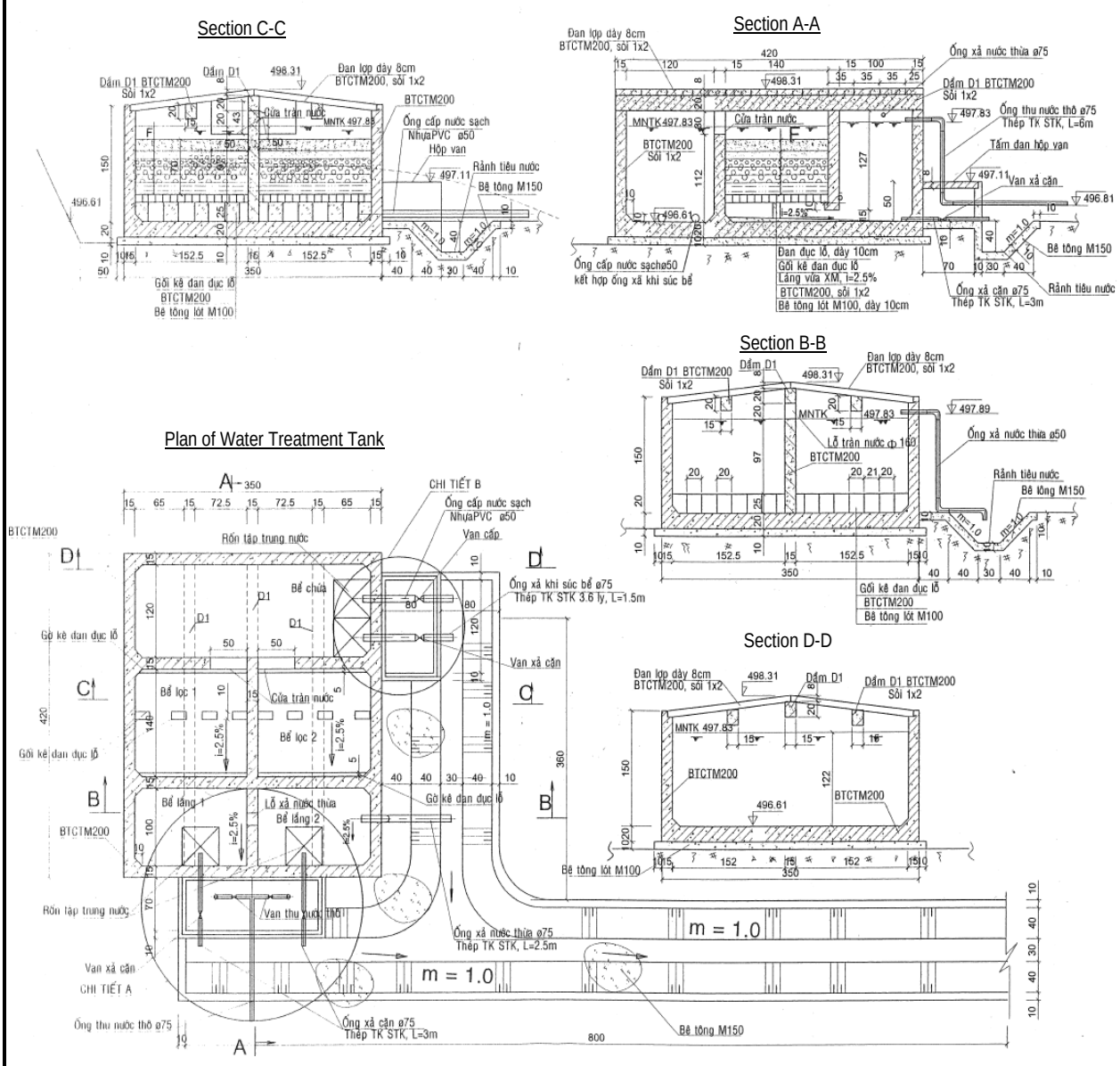
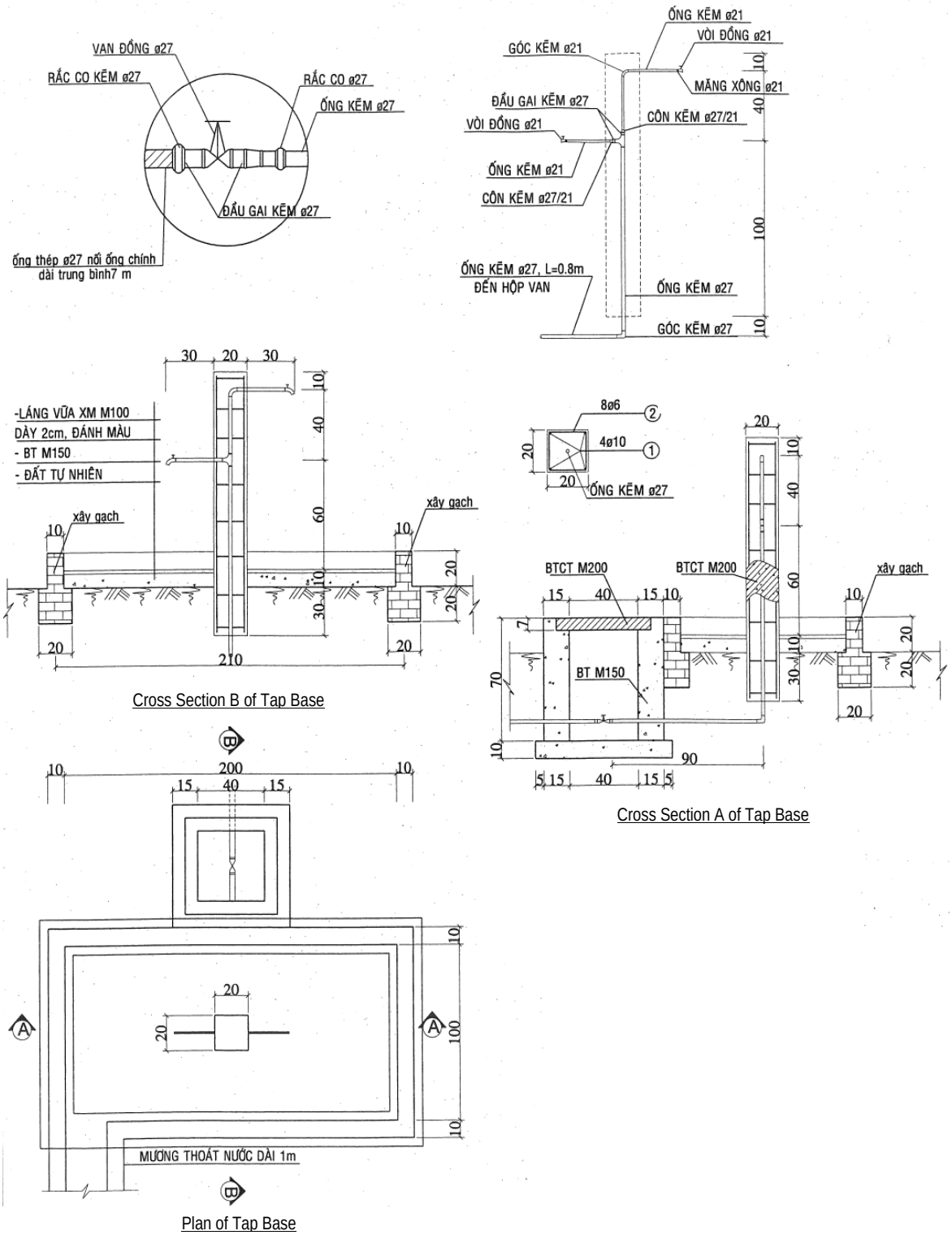


Figure F-9 Typical Design of Rural Infrastructure

Type of Infrastructure		Domestic Water Supply	
Specification	Intake Structure	Concrete Fixed Wier	Lendth=6.5 m, Crest Width=1.5 m, Height=1.0 m
	Head race channel	Galvanized pipe + PVC	200 m
	Water Treatment Tank	Concrete tank	14,700 lit.
	Water supply channel	PVC	400 m
	Tap Base		16 nos. for 100 Household

Typical Drawing



Cross Section B of Tap Base

Cross Section A of Tap Base

Plan of Tap Base

Annex G

Final Report
for
the Preparatory Survey
on the Project for Restoration and Sustainable Management of Protection Forests in the Socialist Republic of Vietnam

Annex G: Draft Terms of Reference and Cost Estimation of Mid-term and Terminal Evaluations of the Project

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Annex G: Draft Terms of Reference and Cost Estimation of Mid-term and Terminal Evaluations of the Project

1. Mid-term Evaluation

1.1. Background and Purpose of the Evaluation

1.1.1. Background and purpose

The mid-term evaluation study is a part of project evaluation activities of the Project. The primary purpose of mid-term evaluation is to confirm the relevance of the Project and to determine the effectiveness of the Project in achieving the goals comparing to the initial project plans, resulting in recommendations for the most effective strategy for moving forward.

The mid-term evaluation also allows for ensuring the accountability for the GOV and Donor country taxpayers. The mid-term evaluation must comply with the requirements of the Government of Vietnam, the Circular No 4/2007/TT-BKH guiding the implementation of the regulation on management and utilization of official development assistance, issued by the MPI on 30 July 2007 and all other relevant GOV regulations.

1.1.2 Implementation arrangements

To ensure objectivity of evaluation, the mid-term evaluation study is conducted by third-party contractor selected by the Central Project Management Unit (CPMU), which will be established in MARD.

1.2 Scope of work

1.2.1 The Project

The Project for Restoration and Sustainable Management of Protection Forests aims at (i) restoration and improvement of watershed and coastal protection forests, (ii) strengthening the capacity of the local governments and the owners of protection forests, and (iii) improvement of the livelihoods of communities who will manage protection forests. The Project will be implemented in 12 provinces in the central coastal area of the country, namely, Thanh Hoa, Nghe An, Ha Tinh, Quang Bunh, Quang Tri, T.T.Hue, Quang Nam, Quang Ngai, Bubh Dinh, Phu Yen, Ninh Thuan, and Binh Thuan.

The main components of the Project are: i) survey and detailed planning, ii) capacity development of government staff and local community, iii) development and improvement of protection forests, iv) livelihood improvement, v) small scale infrastructure development for livelihood improvement, vi) forest fire control, vii) monitoring and evaluation, and viii) project management with consulting services. The following table gives the tentative work quantities of the Project by component.

Component	Major Works
Preparatory work	- Establishment of one CPMU at the central level and 12 PPMUs at the provincial level - Deployment and employment of the project staff - Preparation and establishment of regulations and guidelines for implementation of the project - Development of forms/formats for regular monitoring and monitoring - Development of draft TORs for the contractors to be hired for implementation of the project components - Procurement of equipment for CPMU and PPMUs including a total of 26 nos. of 4x4 vehicles and 62 nos. of motorcycles.

Component	Major Works
Survey and detailed planning	- About 120,260 ha of forest inventory and mapping (new sites only) - Preparation of land use plan of about 120,260 ha with 167 communes (new sites only) - Baseline surveys in 167 communes - Preparation of detailed designs for forest development and improvement component
Capacity development, information dissemination, and phase-in / phase-out works	- Capacity development of i) 12 CPMU staff members, ii) 149 PPMU staff members in the 12 provinces, iii) 570 PFMB staff members (@10 staff/PFMBs) in 57 PFMBs, and iv) district and commune extension workers in the 12 provinces - Information dissemination/public awareness raising in 167 communes - Organization of participating households into forest users' groups in 167 communes - Capacity development of the households in managing the groups and improving/preserving protection forests in 167 communes
Development/improvement of protection forests	<u>Watershed Protection Forest</u> - Reforestation/Afforestation: 23,090 ha - Improvement of existing plantation: 3,300 ha - Assisted natural regeneration (ANR) with enrichment: 4,700 ha - Assisted natural regeneration (ANR): 21,250 ha - Forest protection: 63,970 ha <u>Coastal Protection Forest</u> - Reforestation/Afforestation:1,550 ha - Improvement of existing plantation: 800 ha - Enrichment planting: 1,600 ha <u>Improvement of SPL-III forests</u> - Forest protection: 4,450 ha - Enrichment planting: 1,000 ha - Vegetation clearing & thinning: 10,220 ha <u>Silviculture Infrastructure Development</u> - Forestry roads: 387 km (watershed) and 16 km (coastal) - Firebreak line: 412 km (watershed) and 28 km (coastal) - Fire watch tower: 62 units (watershed) and 2 units (coastal) - Forest protection station: 60 units (watershed) and 4 units (coastal) - Information board: 67 units (watershed) and 3 units (coastal) - <u>Nursery: 22 units (watershed) and 1 unit (coastal)</u>
Livelihood improvement	- Livelihood development needs assessment in 167 communes (new sites) and 35 communes (SPL-III sites) - Introduction and development of demonstration plots/livelihood development models in 167 communes(new sites) and 35 communes (SPL-III sites) - Technical training for the participating households in 167 communes(new sites) and 35 communes (SPL-III sites)
Small-scale infrastructure	- Survey and detailed design of proposed infrastructure - Construction of small-scale infrastructure; the following are tentative targets: - Rural road: 170 km (watershed) and 16 km (coastal) - Irrigation : 558 ha (check dam, irrigation canal & culvert in watershed) - Water supply system: 6 units (watershed) and 2 units (coastal)
Forest fire control	- Provision of equipment for forest fire control to 57 PFMBs (new sites) - Forest fire control training in 12 DARDs, 57 PFMB, 54 DPCs, and one township
Monitoring and evaluation	- Progress monitoring: Monthly, Bi-annual and Annual monitoring - Evaluation: Initial, Mid-term and Terminal evaluations
Technical cooperation / Consulting services	- International consultant: 147 man-months - National consultant: 253 man-months

1.2.2. Principles of the Evaluation

The Project is to be evaluated from the standpoints of DAC Five Evaluation Criteria (i.e., relevance, efficiency, effectiveness, impact and sustainability), which are internationally accepted standards. In particular, the mid-term evaluation should focus on the relevance and effectiveness considering the stage of the project when the mid-term evaluation is made.

1.2.3. Scope of the Works

The evaluation work is composed of seven (7) parts as shown below.

i) Confirmation and analysis of the progress of the project as compared to the plan
   - Review of the progress of the sub-projects that have been implemented in the 12 provinces as compared to the original plans;
   - Accomplishments made by the sub-projects as of the date when the mid-term evaluation is made;

ii) Field validation of the accomplishments under forest development component

   Reforestation and Enrichment (Target areas for field validation will be 2 % of the planted areas. The size of one sample plot should be 400 m2/plot.)
   - Year of planting
   - Number of trees planted and survival rate of trees planted in the selected plantations
   - Height of trees and diameter of tree trunk
   - Quality of planted trees
   - Growing stock of trees

   ANR/Protection (Target areas for field validation will be 1 % of the contracted areas. The size of one sample plot should be 500 m2/plot.)
   - Year of contract
   - Vegetation covers
   - Height of trees and diameter of tree trunk
   - Growing stock of trees

iii) Evaluation of general social impact on the target villages
   - Number of villages and households involved in the project
   - Number of forest users' groups organized
   - Any changes in forest management practices / forest resource uses
   - Number of beneficiaries involved in the project
   - Livelihood improvement activities introduced

iv) Evaluation of economic impact on local households (Target sample size for the evaluation is 20 % of the households who have taken part in the project activities.)
   - Cash income generated by the project
   - Income generating activities additionally introduced

v) Evaluation of the performance of the project

vi) Lessons learned though the project implementation

vii) Recommendations on project designs

1.2.4. Estimated Work Volume

Assuming about 50 % of the forest development contracts between PFMBs and the forest users' groups are made by the time when the mid-term evaluation is undertaken, the estimated targets for field validation and economic impact evaluation would be:

Reforestation/Afforestation: 250 ha (24,640 ha x 50% x 2 % = 246 ha)

ANR/Forest protection: 460 ha (91,5200 ha x 50% x 1% = 458 ha)

Communes surveyed: 17 communes (167 communes x 50 % x 20 % = 17)

1.2.5. Main Tasks of the Contractors

The contractor is to perform the following tasks:

a. To design the mid-term evaluation study along with the DAC Five Evaluation Criteria and propose the design in the form of the evaluation design sheet. Submit the evaluation design sheet to the CPMU for their comments.

b. To prepare questionnaires and other survey instruments, such as checklists and interview sheets, to be used for the study. Submit those materials to the CPMU for their comments.

c. To collect data/ information for evaluation in such ways as documentation review, hearings from the executing agency and other Project-related organizations, surveys to direct and indirect beneficiaries, observation and direct measurement.

d. To analyze the collected data and information and compile the evaluation findings in the form of the evaluation summary sheet. Submit the evaluation summary sheet to CPMU and PPMUs for their comments.

e. To discuss the contents of the evaluation summary sheet with CPMU and PPMUs and finalize them.

f. To prepare the mid-term evaluation report based on the finalized version of the evaluation summary sheet, and submit it to CPMU for their comments.

g. To submit to CPMU the final version of the mid-term evaluation report with the supplementary information collected through the study.

1.3. Timeframe

The mid-term evaluation will be carried out in the fifth year of the project. The total length of the evaluation from designing of the work to submission of final evaluation report will be 6 months.

2. Terminal Evaluation (Physical Evaluation)

2.1. Background and Purpose of the Evaluation

2.1.1. Background and purpose

The terminal evaluation study is a part of project evaluation activities of the Project. The primary purpose of terminal evaluation is to confirm the efficiency, effectiveness, impact, and sustainability of the project by revising the physical development of the project. The terminal evaluation also allows for ensuring the accountability for the GOV and Donor country taxpayers.

The terminal evaluation must comply with the requirements of the Government of Vietnam, the Circular No 4/2007/TT-BKH guiding the implementation of the regulation on management and utilization of official development assistance, issued by the MPI on 30 July 2007 and all other relevant GOV regulations. Hence, the terminal evaluation shall be composed of two activities, namely i) physical evaluation and ii) socio-economic evaluation. This section gives the draft terms of reference for evaluation of physical aspects of the project.

2.1.2. Implementation arrangements

To ensure objectivity of evaluation, the terminal evaluation study is conducted by third-party contractor selected by the Central Project Management Unit (CPMU), which will be established in MARD.

2.2. Scope of Work

2.2.1. The Project

The same descriptions given in Section 1.2.1 are given in this section.

2.2.2. Principles of the Evaluation

The Project is to be evaluated from the standpoints of DAC Five Evaluation Criteria (i.e., relevance, efficiency, effectiveness, impact and sustainability), which are the internationally accepted standards. In particular, the terminal evaluation should focus on the relevance and effectiveness considering the stage of the project when the terminal evaluation is made.

2.2.3. Scope of the Works

The evaluation work is composed of seven (5) parts as shown below.

(1) Review of project design and overall process of the project implementation

- Review of the project designs and overall framework;
- Review of the progress of the sub-projects that have been implemented in the 12 provinces as compared to the original plans;
- Implementation process of the project.

(2) Forestry Inventory using Satellite Photo Maps

a. Analysis of the Satellite Photos and Preparation of Satellite photomaps

- Purchase of the latest high resolution (2.5 m resolution) satellite images covering the target sites of forestry development components.

  CARTOSAT-1 is considered one of the potential sources of satellite images that can be used for this purpose. In the case CARTOSAT-1 is used for the work, a total of 15-20 scenes per province need to be purchased.

- Overlap the satellite photos with GIS data (contour lines, roads, demographic and land use boundaries).
- Produce satellite image based photomaps with ground truth verification.

b. Forestry Inventory

- Conduct forestry inventory survey in sampled target areas using satellite image-based photomaps according to the guidelines prepared in SPLIII/Afforestation Sector Component.
- The outlines of the guidelines are summarized below:

➢ Forest Inventory of the reforestation and enrichment

Target: 0.75 % of the planted areas (1 % for enrichment and 0.5 % for reforestation)

Size of plot: 400m2/plot (20mx20m)

Survey items: Area developed, species planted, survival rate, density, Vegetation covers, quality of planted trees, growing stock of trees, forest state.

➢ Forest Inventory for Others (ANR, Protection and Improvement)

Target: 5 samples for major three forest types (i.e., regenerating, poor and medium) for each target villages

Size of plot: 500m2/plot (25mx20m)

Survey items: Area developed, species planted, survival rate, density, Vegetation covers, quality of planted trees, growing stock of trees, forest state.

➢ Estimate work quantity

Assuming 100% of the planted activities are completed by the time when the terminal evaluation is made, the estimated work quantity of the forest inventory would be:

Reforestation/Afforestation: about 750 ha (36,700 ha x 0.75 % = 275 ha)

ANR/Forest protection: 120 ha (161 x 5 x 3 = 2,415 plots 2,415 plots x 0.05 ha=120 ha)

(3) Evaluation of the efficiency of the inputs and activities made for the forest related components

- Input and activities for forest inventory and detailed designing
- Input and activities for forest development and improvement
- Input and activities for silviculture infrastructure development
- Input and activities for forest fire control

(4) Sustainability of the project

- Technical and financial capacity of PFMBs to manage the protection forests
- Technical and financial capacity of PFMBs to manage and maintain silviculture infrastructure
- Technical and financial capacity of forest users' groups to manage the assigned protection forests
- Organizational capacity of the forest users' groups

(5) Lessons learned and Recommendation

- Organizational capacity of the forest users' groups
- Lessons learned through implementation of the project and sub-projects in the 12 provinces
- Good practices found in the course of the project
- Recommendations

2.2.4. Main Tasks of the Contractors

The contractor is to perform the following tasks:

a. To design the terminal evaluation study along with the DAC Five Evaluation Criteria and propose the design in the form of the evaluation design sheet. Submit the evaluation design sheet to the CPMU for their comments.

b. To collect data/ information for evaluation in such ways as documentation review, hearings from the executing agency and other Project-related organizations, surveys to direct and indirect beneficiaries, observation and direct measurement.

c. To analyze the collected data and information and compile the evaluation findings in the form of the evaluation report. Submit the evaluation report to CPMU and PPMUs for their comments.

d. To discuss the contents of the evaluation report with CPMU and PPMUs and finalize them.

e. To assign and allocate necessary human resources and arrange facilities and equipment needed for the evaluation.

2.3. Timeframe

The terminal evaluation will be carried out in the ninth year of the project. The total length of the evaluation from designing of the work to submission of final evaluation report will be 6 months.

3. Terminal Evaluation (Socio-economic Evaluation)

3.1. Background and Purpose of the Evaluation

3.1.1. Background and purpose

As described in Section 2.1, the terminal evaluation shall be composed of two activities, namely i) physical evaluation and ii) socio-economic evaluation. This section gives the draft terms of reference for evaluation of socio economic impact made by the project.

The main purpose of the work is to evaluate how the project impacted the socio-economic conditions of local communities in the target communes and villages so as to evaluate the project in terms of relevance, effectiveness, efficiency, impact and sustainability. The results of the evaluation will be compared with those prepared in the beginning of the project as baseline data.

3.1.2. Implementation arrangements

To ensure objectivity of evaluation, the terminal evaluation study is conducted by a third-party contractor selected by the Central Project Management Unit (CPMU), which will be established in MARD.

3.2. Scope of Work

3.2.1. The Project

The same descriptions given in Section 1.2.1 are given in this section.

3.2.2. Scope of the Work

The works will be carried out in the same manner taken for the baseline survey, which are:

(1) To conduct the interview survey to the same households that the baseline survey select for interview. The items to be surveyed shall include, but not limited to, the following.

- General background of the household: family size, number of main and supported laborers, ethnicity, etc.
- Annual income level, main income sources and income/expenditure balance
- Healthcare status and education
- Understanding of JBIC project by the household.
- Support/ assistance needed to be expressed by the household
- Recommendations/proposals for possible intervention to support local people, especially the household under contract with project.

(2) To interview the commune/village leaders to collect the updated general socio economic information of the target communes/villages. The following topics are to be covered.

- General information: Population, ethnicity, rural labor force
- Production: Agriculture (land area, main crops, livestock population, farming systems and practices, etc), forestry, fisheries, and handicrafts if there is.
- Infrastructure: Road system and transportation, irrigation, electricity, market, etc.
- Social services: education, healthcare, dirking water and sanitation, etc.
- Development and poverty alleviation projects or programmes implemented or being implemented in the commune.
- Mass-organizations operated in the commune (farmer union, women union…).
- Difficulties faced by the commune and possible support activities recommended.

(3) To encode/input all the data collected in the interview surveys into Excel sheets, so that data can be maintained and used as a data base of socio-economic data of the target communes/villages.

3.2.3. Main Tasks of the contractor

The contractor is to perform the following tasks:

a. To design a work plan for the baseline survey in consultation with CPMU and PPMUs

b. To be responsible for preparation of questionnaire forms used in the survey

c. To arrange necessary equipment and facilities to collect and analyze the collected data

d. To employ and arrange the field enumerators and data encoders for the survey

e. To take necessary arrangements/coordination to conduct the field surveys

f. To analyze the collected data and information and generate the outputs required

3.3. Timeframe

The work will be carried out in the ninth year of the project. The total length of the work from designing of the work to submission of final products will be six (6) months.

4. Cost Estimation

Tables G-1~2 shows the estimated costs for "Mid-term Evaluation" and "Evaluation of Physical Accomplishment for Terminal Evaluation" The estimated cost of "Evaluation of Socio-economic Impact for Terminal Evaluation" is the same as the cost for socio-economic baseline survey (refer to Table A-2)

Tables

Table G-1 Cost Estimation of Mid-term Evaluation

Unit: 1000 VND

Category	Unit	Number of persons	Unit cost	Quantity	Total
1. Remuneration					
-Team leader/evaluator	man-month	1	25,000	3	75,000
- Vice team leader	man-month	1	20,000	3	60,000
-Team members	man-month	4	15,000	3	180,000
-Field assistants	man-month	4	12,000	3	144,000
2. Airfare for fieldwork	VND/ trip	6	4,000	1	24,000
3. Land transportation	VND/ day	1	4,000	30	120,000
4. Communication cost	VND/week	1	500	16	8,000
5. Research assistant and survey cost	VND/province	1	20,000	12	240,000
6. Reporting	VND/day	4	15,000	10	600,000
7. Others	VND				50,000
Sub-total					1,501,000
Management fee (%)					120,080
Total (without VAT)					1,621,080

Table G-2 Cost Estimation of Terminal Evaluation

Category	Unit	Quantity	Unit cost		Amount
			(US$)	(VND)	(VND)
1 Remuneration					6,787,200,000
Team leader	man-month	6	900	15,271,200	91,627,200
Elevator	man-month	18	900	15,271,200	274,881,600
Forest inventory	man-month	464	550	9,332,400	4,330,233,600
Inventory of others (ANR, protection & improvement)	man-month	224	550	9,332,400	2,090,457,600
2 Satellite Images Analysis	communes				4,438,828,800
Purchase of satellite images*	scene	245	800	13,574,400	3,325,728,000
GIS making	man-day	492	40	678,720	333,930,240
Satellite image pre-processing	man-day	492	40	678,720	333,930,240
Satellite image interpretation	man-day	656	40	678,720	445,240,320
3 Land transportation	Trip	2,464		90,000	221,760,000
4 Reporting	report	3		12,000,000	36,000,000
5 Communication cost	month	6		2,000,000	12,000,000
6 Equipment, power, stationary..etc	month	6		10,000,000	60,000,000
Sub total					11,555,788,800
7 Management Fee (8%)					924,463,104
Total (without VAT)					12,480,251,904

This cost excludes purchase of satellite images. Exchange rate 1 US$ = 16,968 VND

Annex H

Final Report
for
the Preparatory Survey
on the Project for Restoration and Sustainable Management of Protection Forests in the Socialist Republic of Vietnam

Annex H: Tentative Terms of References and Cost Estimation of the Consulting Services

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Annex H: Tentative Terms of References and Cost Estimation of the Consulting Services

1. Scope of the Consulting Services

The Project Consultant is expected to provide the CPMU and PPMUs with overall technical and managerial assistance in project implementation. The objective of assistance is to realize the improvement in efficiency, effectiveness and quality of the project implementation.

The duration of the consulting services is eight years. It is assumed the Project Consultant will be selected through international competitive bidding in accordance with JICA Guidelines and in place towards the end of the first year of the project. The tentative scope of services of the consulting services is as follow:

a) Assist CPMU and PPMUs in managing the project in an effective and efficient manner;

b) Assist CPMU and PPMUs in formulating a project implementation plan of the project at the beginning of the project;

c) Assist CPMU in formulating the project implementation guidelines and necessary materials for smooth implementation of the project;

d) Assist CPMU and PPMUs in formulating the regulations on benefit sharing mechanism on harvests from the project sites;

e) Assist DARDs/PPMUs in developing the Forest Protection and Development Fund in accordance with present regulations so that the provincial government could pool their shares derived from the project areas;

f) Assist CPMU and PPMUs in procuring and supervising the contractors for the project components, namely, Survey and Mapping of the project area, Baseline survey, Capacity Development and Information Dissemination, Development and Improvement of Protection Forests, Livelihood Development Assistance, Small Scale Infrastructure Development, Forest Fire Prevention/Control, and Mid-term and Terminal Impact Assessment;

g) Assist CPMU and PPMUs in procuring necessary equipment;

h) Assist CPMU in improving periodical monitoring system by development of simplified monitoring formats and establishment of user-friendly databases;

i) Assist CPMU and PPMUs in preparing annual work plans and budget plans based on the appropriate estimation of work quantity at the field level and of unit costs;

j) Assist CPMU in fund management and smooth communication / coordination with JICA;

k) Assist CPMU in providing guidance and orientation to DARDs and PPMUs on technical and managerial aspects necessary for implementation of the project;

l) Assist PPMUs in providing guidance and orientation to the contractors hired for the implementing project components;

m) Assist PPMUs, PFMBs and relevant stakeholders in development of an operation and maintenance plan for small scale infrastructure facilities in the post-project periods;

n) Provide technical assistance to CPMU, PPMUs, PFMBs and contractors in the execution of their works; and

o) Review, analyze, and recommend improvement/revision of existing related regulations and guidelines (e.g., circulars and decisions).

2. Required Experts and Man-Months

The total inputs of the project consultant for nine years are expected to be 147 man-months for international experts, 253 man-months for national experts and 251 man-months for the national supporting staff. The breakdown of the required man-months is summarized below.

International Experts	**MM**
i) Team leader	52
ii) Forest Development Planning and Monitoring	65
iii) Community / Rural Development	21
iv) Satellite Image Analysis /GIS	9
Sub-total	**147**

National Supporting staff	**MM**
i) Administrative Officer	100
ii) Interpreter	51
iii) Secretary	100
Sub-total	**251**

National Experts	**MM**
i) Forest Development and Management	74
ii) Community Organizing	48
iii) Livelihood Development	59
iv) Institutional / Capacity Development	10
v) NTFP Development	33
vi) GIS	29
Sub-total	**253**

3. Specific Tasks of Experts

Responsibilities and tasks of the respective experts of the consultant team are described below:

International Experts

(1) Team Leader

(a) To supervise activities of all international and national experts and national supporting staff;

(b) To maintain close coordination with CPMU, PPMUs and the offices of the Central and Provincial Governments concerned;

(c) To assist CPMU and PPMU in communicating and coordinating with JICA;

(d) To undertake managerial responsibilities for the consultant team, including the preparation of work schedule for the consulting services, the development of the plan of operation (POs), human resources management, accounting and general affair of consultant team;

(e) To assist CPMU in;

- Establishing appropriate institutional arrangement and strengthening the personnel and organizational mechanisms;
- Reviewing and recommending improvement on the implementation scheme of the Project
- Preparing the project implementation guidelines;
- Preparing benefit sharing regulation of the Project;
- Reviewing and recommending improvement on the development plans of the Project in each province;
- Reviewing and updating the implementation schedule and cost estimate of the Project;
- Review existing policies, strategy, and guidelines related to the Project and recommend improvement if any;
- Monitoring the progress of the Project;
- Preparing guidelines, manuals and information materials relating to the Project;
- Providing technical, administrative and managerial support and assistance on matters pertaining to the Project; and
- Organizing international training / study tours

(f) To prepare and compile all periodical report of consulting services.

(2) Forest Planning and Monitoring Expert

(a) To assist the Team Leader for smooth and effective execution of the consulting services by coordinating with the consultant team members, CPMU and PPMUs;

(b) To assist CPMU in:

- Reviewing and recommending improvement on existing policies, strategy, and guidelines related to the project implementation;

- Reviewing and recommending improvement on forestry development plans of the Project in each province;
- Establishing easy-to-apply monitoring and evaluation system of the reforestation activities including establishment of measurable qualitative and quantitative indicators and recording and reporting formats in coordination with National Experts
- Monitoring and evaluating the progress and quality of forestry development activities of the Project; and
- Reviewing and updating the implementation schedule and cost estimate of the Project

(c) To assist PPMUs in:

- Preparing forestry development plans of the Project in each province;
- Monitoring the progress and quality of forestry development activities of the Project;
- Updating the project database

(d) To provide technical support and assistance to CPMU and PPMUs on matters pertaining to his specialty;

(e) To support the Forest Development and Management Expert (National) in performing his/her tasks;

(f) To accomplish the tasks related to the Project as directed by the Team Leader; and

(g) To prepare brief travel reports and monthly accomplishment reports pertaining to his/her specialty and submit them to the Team Leader.

(3) Community / Rural Development Expert

(a) To assist CPMU in:

- Reviewing and recommending improvement on existing policies, strategy, manuals, and guidelines related to project implementation;
- Preparing the Terms of Reference of contractors for baseline survey, capacity development, information dissemination, phase-in/phase-out works, and livelihood development to be contracted out by CPMU and PPMUs; and
- Preparing guiding materials to PPMUs and other stakeholders regarding capacity development and livelihood development components of the Project

(b) To assist PPMUs in:

- Providing guidance to contractors for capacity development, information dissemination, phase-in/phase-out works, and livelihood development;
- Supervising the contractors to ensure the quality of works; and
- Providing technical assistance to the contractors in performing their tasks including identification of potential livelihood development opportunity and plan preparation for trainings/ extension services;

(c) To provide technical support and assistance to CPMU and PPMU on matters pertaining to his specialty;

(d) To support the Community Organizing and Livelihood Development Experts (National) in performing their tasks;

(e) To accomplish the tasks related to the Project as directed by the Team Leader; and

(f) To prepare brief travel reports and monthly accomplishment reports pertaining to his/her specialty and submit them to the Team Leader.

(4) Satellite Data Analysis/ GIS Expert

(a) To assist CPMU in:

- Procuring contractors for forest inventory survey (survey and mapping) and terminal evaluation survey (physical) including preparation of detailed TOR;
- Supervising the activities of above contractors to ensure the quality of outputs;
- Delivering the outputs of the forest inventory survey to PPMUs;
- Procuring equipment and software necessary for CPMU and PPMUs; and
- Preparing guiding materials related to GIS and mapping to be referred by CPMU and PPMUs

(b) To assist PPMUs in:

- Utilizing the outputs of forest inventory survey for planning, implementation and monitoring of project implementation

(c) To support the GIS Expert (National) in performing his/her tasks;

(d) To provide technical support and assistance to CPMU and PPMU on matters pertaining to his specialty;

(f) To accomplish the tasks related to the Project as directed by the Team Leader; and

(e) To prepare brief travel reports and monthly accomplishment reports pertaining to his/her specialty and submit them to the Team Leader.

National Experts

(1) Forest Development and Management Expert

The Expert shall conduct the tasks below in close coordination with the Forest Development Planning and Monitoring Expert (International)

(a) To assist CPMU in:

- Reviewing and recommending improvement on existing policies, strategy, and guidelines related to the project implementation;
- Reviewing and recommending improvement on forestry development plans of the Project;
- Monitoring and evaluating the progress and quality of forestry development activities of the Project;

- Reviewing and updating the implementation schedule and cost estimate of the Project; and
- Preparing guiding and reference materials for long-term protection and management of protection forest envisaged by the Project for information dissemination and field guidance

(b) To assist PPMUs in:

- Preparing forestry development plans of the Project in each province;
- Monitoring the progress of forestry development activities of the Project;
- Providing technical support for contractors of forest development component regarding long-term forest protection and management plan

(c) To provide technical support and assistance to CPMU and PPMUs on matters pertaining to his specialty;

(d) To accomplish the tasks related to the Project as directed by the Team Leader; and

(e) To prepare brief travel reports and monthly accomplishment reports pertaining to his/her specialty and submit them to the Team Leader.

(2) Community Organizing Expert

The Expert shall conduct the tasks below in close coordination with the Community/Rural Development Expert (International)

(a) To assist CPMU in:

- Reviewing and recommending improvement on existing policies, strategy, manuals, and guidelines related to project implementation;
- Preparing the Terms of Reference of contractors for baseline survey, capacity development, and information dissemination to be contracted out by CPMU and PPMUs;
- Preparing guiding materials to PPMUs and other stakeholders regarding capacity development and information dissemination components of the Project;

(b) To assist PPMUs in:

- Procuring contractors for capacity development and information dissemination;
- Supervising the contractors to ensure the quality of works; and
- Providing technical assistance to contractors in performing their tasks including dissemination of project information;

(c) To provide technical support and assistance to CPMU and PPMU on matters pertaining to his specialty;

(d) To accomplish the tasks related to the Project as directed by the Team Leader; and

(e) To prepare brief travel reports and monthly accomplishment reports pertaining to his/her specialty and submit them to the Team Leader.

(3) Livelihood Development Expert

The Expert shall conduct the tasks below in close coordination with the Community/Rural Development Expert (International)

(a) To assist CPMU in:

- Reviewing and recommending improvement on existing policies, strategy, manuals, and guidelines related to project implementation;
- Preparing the Terms of Reference of contractors for capacity development, livelihood development support and phase-in/phase-out works to be contracted by CPMU and PPMUs;
- Preparing guiding materials to PPMUs and other stakeholders regarding livelihood development components of the Project;

(b) To assist PPMUs in:

- Procuring contractors for capacity development, livelihood development support and phase-in/phase-out works;
- Supervising the contractors to ensure the quality of works;
- Providing technical assistance to the contractors in performing their tasks including identification of potential livelihood development opportunity and plan preparation for trainings/ extension services;
- Assessing the needs for providing rural infrastructure and preparing preliminary plan

(c) To provide technical support and assistance to CPMU and PPMU on matters pertaining to his specialty;

(d) To accomplish the tasks related to the Project as directed by the Team Leader; and

(e) To prepare brief travel reports and monthly accomplishment reports pertaining to his/her specialty and submit them to the Team Leader.

(4) Institutional/ Capacity Development Expert

(a) To assist CPMU in:

- Reviewing and recommending improvement on existing policies, strategy, manuals, and guidelines related to project implementation;
- Recommending project management and financial management system of the project;
- Preparing the Terms of Reference of contractors for capacity development of the project staff and local government staff to be contracted out by CPMU and PPMUs;
- Preparing project implementation guidelines and other guiding materials to PPMUs and other stakeholders regarding project management; and
- Providing guidance to PPMUs pertaining to project management

(b) To assist PPMUs in:

- Procuring contractors for capacity development of the project staff and local government staff;
- Supervising the contractors to ensure the quality of works; and
- Providing technical assistance to contractors in performing their tasks;

(c) To provide technical support and assistance to CPMU and PPMU on matters pertaining to his specialty;

(d) To accomplish the tasks related to the Project as directed by the Team Leader; and

(e) To prepare brief travel reports and monthly accomplishment reports pertaining to his/her specialty and submit them to the Team Leader.

(5) NTFP Development Expert

(a) To assist CPMU in:

- Reviewing and recommending improvement on existing policies, strategy, manuals, and guidelines related to project implementation; and
- Preparing guiding materials to PPMUs and other stakeholders regarding NTFP development and management;

(b) To assist PPMUs in:

- Providing technical assistance to the contractors of livelihood development support regarding survey on NTFP development potential and marketing of the products;
- Supervising the contractors to ensure the quality of works; and
- Providing technical assistance to contractors in performing their tasks;

(c) To provide technical support and assistance to CPMU and PPMUs on matters pertaining to his specialty;

(d) To accomplish the tasks related to the Project as directed by the Team Leader; and

(e) To prepare brief travel reports and monthly accomplishment reports pertaining to his/her specialty and submit them to the Team Leader.

(6) GIS Expert

The Expert shall conduct the tasks below in close coordination with the Satellite Data Analysis/ GIS Expert (International)

(a) To assist CPMU in:

- Procuring contractors for forest inventory survey (survey and mapping) and terminal evaluation survey (physical) including preparation of detailed TOR;
- Supervising the activities of above contractors to ensure the quality of outputs;
- Delivering the outputs (GIS maps) of the forest inventory survey to PPMUs;
- Procuring equipment and software necessary for CPMU; and

- Preparing guiding materials related to GIS and mapping to be referred by CPMU and PPMUs

(b) To assist PPMUs in:

- Utilizing the outputs of forest inventory survey for plan preparation, implementation and monitoring of the Project; and
- Procuring equipment and software necessary for PPMUs; and

(c) To provide technical support and assistance to CPMU and PPMU on matters pertaining to his specialty;

(d) To accomplish the tasks related to the Project as directed by the Team Leader; and

(e) To prepare brief travel reports and monthly accomplishment reports pertaining to his/her specialty and submit them to the Team Leader.

Tables

Table H-1 Proposed Assignment Schedule and Cost Estimates for Consulting Services

	Rate	Man-Months												Amount											
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Remuneration of International Experts (1,000 Yen/month)		-	11	26	24	24	19	14	11	8	10	-	147.0	-	29,900	71,000	66,400	66,400	52,500	38,800	30,700	22,400	27,400	-	348,800
1 Team Leader	2,900		4.0	8.0	8.0	8.0	6.0	5.0	5.0	4.0	4.0		52.0	-	11,600	23,200	23,200	23,200	17,400	14,500	14,500	11,600	11,600	-	150,800
2 Forest Development Planning and Monitoring	2,700		4.0	11.0	11.0	11.0	8.0	6.0	6.0	4.0	4.0		65.0	-	10,800	29,700	29,700	29,700	21,600	16,200	16,200	10,800	10,800	-	175,500
3 Community / Rural Development	2,700			3.0	5.0	5.0	5.0	3.0					21.0	-	-	8,100	13,500	13,500	13,500	8,100	-	-	-	-	
4 Satellite Data Analysis/ GIS	2,500		3.0	4.0							2.0		9.0	-	7,500	10,000	-	-	-	-	-	-	5,000	-	22,500
Direct Expenses (1,000 Yen)														-	6,150	13,700	12,600	12,600	10,350	7,900	6,350	5,000	6,100	-	80,750
Per Diem (per day)	15													-	4,950	11,700	10,800	10,800	8,550	6,300	4,950	3,600	4,500	-	66,150
International Travel (round trip)	200	0	3	7	6	6	6	5	4	4	5	0	46	-	600	1,400	1,200	1,200	1,200	1,000	800	800	1,000	-	9,200
International Communication (month)	50														600	600	600	600	600	600	600	600	600	-	5,400
Total (1,000 Yen)														-	36,050	84,700	79,000	79,000	62,850	46,700	37,050	27,400	33,500	-	486,250
Exchange Rate (1.0Yen= VND)														189	189	189	189	189	189	189	189	189	189	189	
VND Equivallent (mil. VND)														-	6,813	16,008	14,931	14,931	11,879	8,826	7,002	5,179	6,332	-	91,901
Remuneration of National Experts (mil. VND)		0.0	13.0	40.0	43.0	47.0	35.0	30.0	18.0	12.0	15.0	0.0	253.0	-	325	1,000	1,075	1,175	875	750	450	300	375	-	6,325
1 Forest Development and Management	25		4.0	11.0	11.0	11.0	11.0	8.0	6.0	6.0	6.0		74.0	-	100	275	275	275	275	200	150	150	150	-	1,850
2 Community Organizing	25		2.0	11.0	11.0	11.0	5.0	5.0	3.0				48.0	-	50	275	275	275	125	125	75	-	-	-	1,200
3 Livelihood Development	25			3.0	8.0	11.0	11.0	11.0	6.0	6.0	3.0		59.0	-	-	75	200	275	275	275	150	150	75	-	1,475
4 Institutional/ Capacity Development	25		4.0	6.0									10.0	-	100	150	-	-	-	-	-	-	-	-	250
5 NTFP Development	25			3.0	5.0	8.0	8.0	6.0	3.0				33.0	-	-	75	125	200	200	150	75	-	-	-	825
6 GIS	25		3.0	6.0	8.0	6.0					6.0		29.0	-	75	150	200	150	-	-	-	-	150	-	725
Remuneration of National Supporting Staff (mil. VND)		0.0	12.0	34.0	34.0	34.0	29.0	27.0	27.0	27.0	27.0	0.0	251.0	-	176	496	496	496	416	384	384	384	384	-	3,616
1 Administrative Officer	16		4.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		100.0	-	64	192	192	192	192	192	192	192	192	-	1,600
2 Interpreter	16		4.0	10.0	10.0	10.0	5.0	3.0	3.0	3.0	3.0		51.0	-	64	160	160	160	80	48	48	48	48	-	816
3 Secretary	12		4.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		100.0	-	48	144	144	144	144	144	144	144	144	-	1,200
Out-of-Pocket Expenses (mil. VND)	Unit Rate													-	1,317	2,127	2,162	2,248	2,102	1,584	1,282	1,109	1,203	-	15,131
Out of Station Allowance (per day for local experts/staff only)	0.65	0.0	12.5	37.0	38.5	40.5	32.0	28.5	22.5	19.5	21.0	0.0		-	244	722	751	790	624	556	439	380	410	-	4,914
Rental Vehicle in Hanoi (for 60% of Inter'l experts' MM)	5.00	0.0	6.6	15.6	14.4	14.4	11.4	8.4	6.6	4.8	6.0	0.0		-	33	78	72	72	57	42	33	24	30	-	441
Rental Vehicle (4x4) in the field (per day)	2.00	0	180	500	505	525	415	355	280	235	260	0		-	360	1,000	1,010	1,050	830	710	560	470	520	-	6,510
Travel Expenses (Airfare)	2.50	0	25	70	71	74	58	50	39	33	36	0		-	63	175	177	184	145	124	98	82	91	-	1,139
Office Equipment															553				294						847
Local Communication (per month)	6.00													-	24	72	72	72	72	72	72	72	72	-	600
Office Stationary (per month)	5.00													-	20	60	60	60	60	60	60	60	60	-	500
Printing															20	20	20	20	20	20	20	20	20		180
TOTAL (1) -mil. VND														-	8,631	19,631	18,664	18,850	15,272	11,544	9,118	6,971	8,293	-	116,973
- FC														-	6,813	16,008	14,931	14,931	11,879	8,826	7,002	5,179	6,332	-	91,901
- LC														-	1,818	3,623	3,733	3,919	3,393	2,718	2,116	1,793	1,962	-	25,072
Tax (CIT: 5%)														-	432	982	933	942	764	577	456	349	415	-	5,849
- FC	5%													-	341	800	747	747	594	441	350	259	317	-	4,595
- LC	5%													-	91	181	187	196	170	136	106	90	98	-	1,254
TOTAL (2) - mil. VND														-	9,063	20,612	19,597	19,792	16,035	12,122	9,574	7,320	8,708	-	122,822
- FC														-	7,154	16,809	15,678	15,678	12,473	9,268	7,353	5,438	6,648	-	96,496
- LC														-	1,908	3,804	3,919	4,114	3,563	2,854	2,222	1,882	2,060	-	26,326
Price Escalation														-	418	1,882	2,844	4,012	4,311	4,148	3,943	3,745	5,020	-	30,323
- FC (% per annum.)	3.1%													-	222	1,058	1,504	2,036	2,057	1,863	1,752	1,504	2,102	-	14,098
- LC (% per annum.)	10.3%													-	197	824	1,340	1,975	2,254	2,285	2,191	2,241	2,917	-	16,225
TOTAL (3) -mil. VND														-	9,481	22,495	22,440	23,804	20,346	16,270	13,517	11,065	13,727	-	153,145
- FC														-	7,376	17,867	17,181	17,714	14,529	11,131	9,104	6,942	8,750	-	110,595
- LC														-	2,105	4,628	5,259	6,090	5,817	5,139	4,412	4,123	4,977	-	42,550
Physical Contingency (5%)														-	474	1,125	1,122	1,190	1,017	813	676	553	686	-	7,657
- FC	5%													-	369	893	859	886	726	557	455	347	438	-	5,530
- LC	5%													-	105	231	263	304	291	257	221	206	249	-	2,128
TOTAL (4) - mil. VND														-	9,955	23,619	23,562	24,994	21,364	17,083	14,193	11,618	14,414	-	160,802
- FC														-	7,745	18,760	18,040	18,600	15,256	11,687	9,560	7,289	9,188	-	116,124
- LC														-	2,210	4,859	5,522	6,394	6,108	5,396	4,633	4,330	5,226	-	44,678
VAT (10%)														-	995	2,362	2,356	2,499	2,136	1,708	1,419	1,162	1,441	-	16,080
- FC	10%													-	774	1,876	1,804	1,860	1,526	1,169	956	729	919	-	11,612
- LC	10%													-	221	486	552	639	611	540	463	433	523	-	4,468
GRAND TOTAL (mil. VND)														-	10,950	25,981	25,919	27,493	23,500	18,792	15,612	12,780	15,855	-	176,882
- FC														-	8,519	20,636	19,844	20,459	16,782	12,856	10,516	8,018	10,107	-	127,737
- LC														-	2,431	5,345	6,074	7,034	6,718	5,936	5,096	4,762	5,748	-	49,146

Annex I

Final Report
for
the Preparatory Survey
on the Project for Restoration and Sustainable Management of Protection Forests in the Socialist Republic of Vietnam

Annex I: Project Evaluation

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Annex I: Project Evaluation

1. Economic Analysis

1.1 Assumptions for Economic Analysis

1.1.1 Requirements

The requirement for the economic feasibility assessment is outlined in:

a. Circular No 04/2007/TT-BKH Guiding the Implementation of the Regulation on Management and Utilization of Official Development Assistance, Issued on 30 July, 2007 by Ministry of Planning and Investment.

b. JICA requirements for evaluation of ODA Loans[1]

The main advantage of the economic analysis (comparing to the financial/ accounting analysis) is that externalities are observed and price distortions are considered. It aims to demonstrate if the benefits to the society as a whole exceed the costs of the Project.

1.1.2 Basic Assumptions

The following basic assumptions are set for the Project economic analysis:

a. The life of the Project is 50 years

b. For the calculation of net present value the discount rate of 10% is used

c. The costs and benefits of the Projects are estimated in Vietnamese Dong (VND) constant values, the level of price as of July 2009

d. Exchange rate as of July 2009 is USD/VND = 16,968[2]

e. In `without-Project` scenario, the forest in the Project area may be degraded further or the agriculture yields may decrease. However, due to the data limitations, a conservative approach of no changes is taken and "without-Project" scenario is equivalent to present condition

1.1.3 Approaches

The following approaches are applied to the economic analysis:

a. Identification of the costs and benefits of the Project

b. Correction of the fiscal effects

In the economic analysis taxes, levies, subsidies, duties and other fiscal effects are not considered. From the point of view of society these constitute a transfer and not a cash flow (not a social benefit or cost). Price contingencies are also excluded.

c. Calculation of the externalities

The evaluation includes quantified external effects of the Project. Specifically, attention is driven to the positive externalities of CO_2 sequestration by:

- Afforestation by AR/CDM

[1] As recommended by "Evaluation Handbook for ODA Loan Projects" of JICA, updated February 2008
[2] International Financial Statistics (July 2009)

- Sustainable Forest Management by REDD

After calculating the EIRR of the Project without AR/CDM and REDD (probably negative, so proving additionality) => EIRR with AR/CDM and REDD.

d. Economic values of inputs and outputs

The market prices were transferred into the shadow prices to calculate the opportunity cost of inputs and outputs. The correction was done as the markets are imperfect and market prices don't always reflect the opportunity cost of a good. In order to correct the market prices of inputs and outputs the following are used:

- Non-marketed[3] commodities, e.g. local transport – the standard conversion factor (SCF)

> The standard conversion factor is an approximation that is used to convert the prices of minor non-tradable goods into border prices. It is denominated as the ratio of the value at border prices of all imports and exports to their value at domestic prices.
>
> The standard conversion factor is defined as:
>
> $SCF=(M+X)/[(M+T_m)+(X-T_x)]$ where:
>
> M is total imports, X is total exports, T_m is taxes on imports, and T_x is taxes on exports.

The Standard Conversion Factor (SCF) of 0.97 is applied to the evaluation.

- Marketed[4] goods - the border price

  Economic farm gate prices of traded inputs and outputs were based on their export or import parities derived from FOB[5] or CIF[6] price.

- As far as salaries are concerned:

  Economic analysis uses the opportunity cost as the reference price (i.e. the best alternative use of a specific resource). Therefore, if faced with high unemployment the conversion factor will be less than one.[7]

1. Rural area in Vietnam is experiencing high unemployment and underemployment (6.1% in rural areas in 2008, according to GSO)
2. Large share of labour force is engaged in agriculture sector, though these people cultivate relatively small areas[8], which is too small for people to work full time
3. The time utilization in rural areas according to MOLISA is less than 80%, implying that 20% of time has been redundant (or one fifth of available human resources wasted)
4. 37% of employed people in rural areas (estimated by MOLISA) were looking for additional jobs
5. Role of agriculture sector in job creation is declining
6. Recent economic downturn makes laid off factory workers return to rural areas

[3] Non-traded goods: goods that cannot be imported or exported, for example local services, unskilled labor and land. In the economic analysis non-marketed goods are assessed at the value of their marginal return if they are intermediate goods or services, or according to the willingness to pay criterion if they are final goods or services. Since the data is difficult to obtain –the SCF will be applied to the non-traded goods.

[4] Traded goods: goods that can be traded internationally in the absence of any restrictive trade policies.

[5] Free-On-Board, FOB-trade values include the transaction value of the goods and the value of services performed to deliver goods to the border of the exporting country. Export values are mostly reported as FOB.

[6] Cost-Insurance-Freight, CIF-trade values include the transaction value of goods, the value of services performed to deliver goods to the border of the exporting country and the value of the services performed to deliver the goods from the border of the exporting country to the border of the importing country. Import values are mostly reported as CIF.

[7] If the contrary was true the conversion factor would be greater than one, i.e. the project would probably divert labor resources from more productive jobs.

[8] The Socioeconomic Survey of 2009 reports that surveyed communes average agriculture land holding is 2,400m2 (0.24ha) per person, ranging from 778m2 per person in Quang Trach commune in Quang Binh province to 4,704m2 in Hoa Thang commune in Binh Thuan province.

The conversion factor of 0.6 is applied to semi-skilled and unskilled labour (to reflect the excess supply of labour and lack of alternative employment opportunities in the labour market), since those are assumed to complement the existing employment and not to compete with other employment opportunities).

e. Economic return of the Project

The economic net present value (ENPV) and the economic internal rate of return (EIRR) are calculated. EIRR is a standard indicator for economic evaluation, and JICA normally required EIRR to be estimated for its ex-ante evaluation (it will be reviewed at mid-term review and recalculated at ex-post evaluation). EIRR is the discount rate at which cost and benefit streams (of cash flows of the Project) over the evaluation period are equalized.

1.2 Economic Costs of the Project

1.2.1 Project Cost

The economic cost of the project is estimated based on the conditions mentioned above. The financial cost and estimated economic cost are summarized in the table below. Breakdown of the estimated economic costs of the project components are given in **Table I-1**.

Summary of Currency Components for the Project Cost

(Unit: VND million)

Component	Financial Cost	Economic Cost
1. Preparatory Works	15,432	14,968
2. Survey and Planning	20,750	19,880
3. Capacity Development, Information Dissemination, Phase-in/-out Works	53,160	51,556
4. Development of Watershed Protection Forest	845,441	565,464
5. Improvement of SPL-3 Forests	38,927	23,933
6. Development of Coastal Protection Forest	61,732	40,715
7. Livelihood Development Assistance	75,127	72,859
8. Infrastructure for Livelihood Development	231,158	207,205
9. Forest Fire Control	5,274	5,115
10. Monitoring and Evaluation	15,661	14,890
11. Sub-total of Direct Costs (Sum of 1~10)	**1,362,662**	**1,110,204**
12. Project Management	113,580	110,891
13. Sub-total (11+12)	**1,476,242**	**1,118,476**
14. Price Contingency	933,584	0
15. Sub-total (13+14)	**2,409,826**	**1,118,476**
16. Physical Contingency	120,491	55,924
17. Consulting Services	160,802	128,129
18. Taxes and Duties	258,484	0
19. Grand Total (Sum of 15~18)	**2,949,603**	**1,302,528**

Source: JICA Preparatory Survey Team (2009)

1.2.2 Operation and Maintenance (O&M) Cost

In addition to the capital costs stated above, the following operation and maintenance (O&M) costs are estimated for the economic analysis.

a. Maintenance cost for protection forests

b. Operation cost for forest exploitation activities

c. O&M cost for small scale rural infrastructure

The following table give the estimated O&M costs and their bases for calculation.

Annual Operation and Maintenance Cost

(Unit: VND million)

Items	Economic Cost	Basis for estimation
Maintenance cost for protection forest	VND 265,000 ~ 483,000/ha/yr	Labor cost for patrolling and other protection activities
Operation cost for forest exploitation	VND 72,000 ~ 144,000/ha/time	Labor cost for timber exploitation
O&M cost for small scale rural infrastructure	VND 0.99 million for road in watershed VND 0.87 million for road in coastal VND 0.60 million for unit (for 15 ha) VND 0.21 million for unit	0.5% of the economic cost for small scale infrastructure development

Source: JICA Preparatory Survey Team (2009)

1.2.3 Replacement Cost

The following replacement costs are taken into account in the estimation.

- Sixty four units of watch tower would be replaced every 15 years at VND 6,714 million (in economic term)
- Sixty four units of forest protection station would be reconstructed every 20 years at VND 11,469 million.
- Irrigation systems covering 558 ha would be replaced every 20 years at 22,553 million.
- Eight units of water supply systems would be reinstalled every 20 years at VND 2,636 million.

1.3 Expected Economic Benefits

1.3.1 Benefits from Afforestation

The results of assessment of the expected benefits from harvesting wood and timber in the project areas are compiled in **Attachment I-1**. **Table I-2** also gives a flow of the benefits to be generated from the harvest of timber and wood in the project areas.

1.3.2 Benefits from CO_2 Sequestration through Afforestation – AR/CDM

The results of the analysis and estimation of benefits coming from CO_2 Sequestration through Afforestation (AR-CDM) is discussed in **Attachment I-2.** Some highlights are summarized below.

Assumptions/Methodologies:

There is high possibility to transform afforestation sub-projects into small-scale AR-CDM projects under the proposed project. The benefits of small-scale AR-CDM projects are the value of temporary Certified Emission Reduction (tCER). The amount of tCER was estimated based on the estimation of net anthropogenic GHG removal by sinks, which was calculated applying "Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands (AR-AMS0001 / Version 05)." The project should meet "land eligibility" (where the project area should be non-forest land as of December 1989) and "additionality" (where no afforestation activity is expected to be carried out or no forest recovery is expected unless the proposed project is implemented). Land eligibility and additionality of the small-scale AR-CDM projects under the Project could be justified as follows:

< Land Eligibility> It is judged from the field survey that much of the watershed afforestation area and most of the coastal afforestation area were not forest as of December 1989.

< Additionality> Because of the barriers described below, the area for small-scale AR-CDM projects would not be forested without the proposed Project, thus the small-scale AR-CDM projects under the Project could be considered additional.

Barriers due to local ecological conditions

Due to the soil degradation, the pressure of the human activities and sandy nature of the land (in coastal area), the natural regeneration of forest in the proposed afforestation area is not expected and the area would remain as it is or will be more degraded without tree planting activities under the Project.

Investment barriers

The afforestation area has been owned by PFMB but has not been subject of afforestation under 5MHRP mainly due to poor access (in watershed area), insufficient ceiling budget per hectare of afforestation, and severe natural condition (in coastal area) such as strong wind associated with sands. Since 5MHRP will be completed in 2010, it will become more difficult for PFMB to establish plantations in the area.

To simplify the calculation of the benefits from small-scale AR-CDM projects, afforestation designs of the Project were classified into six models, considering the natural conditions of each province. The areas of small-scale AR-CDM projects were conservatively estimated at 50% of the watershed afforestation area and 90% of the costal afforestation area. **Attachment I-2: Table 4 to Table 8** show the afforestation models and estimated area of small-scale AR-CDM projects in each province.

Results:

The estimated amount of tCER obtained is 7.3 million in total in 30 years of the credit period with the total value of US$ 25.5 million or VND 447 billions (the present value of US$ 2,860 and VND 50 billions). On the other hands, the total cost of validations and verifications is VND 87 billions or the present value of VND 23.9 billion.

Project Yr	Total estimated tCER	tCER Value		Validation cost
		US$ 1000 (@ tCER price = $3.5)	VND Million (@ 16,968/$)	US$ 30,000 per project at a time
0~10	0	0	0	14,427
11	157,885	553	9,670	14,427
12~15	0	0	0	0
16	1,083,305	3,792	66,552	14,427
17~20	0	0	0	0
21	1,694,498	5,931	103,788	14,427
22~25	0	0	0	0
26	2,198,400	7,694	134,562	14,427
27~30	0	0	0	0
31	2,613,397	7,572	132,508	14,427
Total	**7,297,484**	**25,541**	**446,971**	**86,562**
NPV (@ 10 % discount rate)		2,860	50,056	22,947

Source: JICA Survey Team (2009)

1.3.3 Benefits from CO_2 Sequestration through Sustainable Forest Management - REDD

Attachment I-3 gives the assumption, process and results of the estimation of benefits from CO_2 sequestration through sustainable forest management (REDD). The following are its summary.

Assumptions:

While AR/ CDM in principle pays for new plantations, REDD is a method to pay for protecting the existing forests. Depletion and loss of forests is a second leading cause of global warming; preserving existing natural forests is an effective way of storing carbon.

Reductions from deforestation and forest degradation, REDD, have far reaching approval of

UNFCCC and in December 2009 will most probably become one of the post-Kyoto emissions reductions mechanisms, to be effective after 2012. Vietnam, with the leadership of MARD, is actively working on participating in REDD.

The baseline scenario, additionality, leakage and the approach to calculate the carbon stock based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories is explained in detail in **Attachment I-3.**

The Project economic benefits from forest sustainable management are evaluated from the following Project activities:

Project Activities Included in Scope of Assessment by REDD

Subcategory	Project activities of Forest Development/ Improvement to be evaluated by REDD	Area
Forest Land Remaining Forest Land	Improvement of Existing Plantations	4,100ha
	Forest Protection	63,970ha
	Watershed ANR + Enrichment	4,700ha
	Watershed ANR	21,250ha
	Coastal Forest ANR/ Enrichment planting	1,600ha

The following scenarios for the valuation of 1 tonne of CO2-equivalent emission reduction obtained by REDD are taken into consideration:

Options for Valuation of REDD carbon credits

Option	Comment	Value
Voluntary pessimistic	Assumption: REDD traded in voluntary markets for carbon credits, very conservative valuation of forestry VERs (voluntary emission reductions)	0.25 USD/ tone ofCO_2 e
Voluntary optimistic	Assumption: REDD traded in voluntary markets It is highly probable that REDD will be more widely adopted – when REDD becomes recognized by UNFCCC as official emissions reduction scheme in December 2009.	2 USD/ tone ofCO_2 e and annual appreciation of 10%
JI compliance	Assumption: REDD compliance with the Joint Implementation (JI), after 2012, in case REDD is decided to be a post-Kyoto regime.	12 USD/ tone ofCO_2 e
CER compliance	Assumption: REDD compliance with Certified Emissions Reductions (CER)[9], after 2012, in case REDD is decided to be a post-Kyoto regime.	38 USD/ tone ofCO_2 e
EUA compliance	Assumption: REDD compliance with the UE Allowances (EUA)[10], after 2012, in case REDD is decided to be a post-Kyoto regime.	47 USD/ tone ofCO_2 e

The verification and validation costs are assumed for each sub-project independently, i.e. USD 15,000 per Province and running costs of USD 0,04 per each CO2e certificate issued.

Results:

The model prepared follow to the IPCC Tier 1 method and the assumptions for scenarios of REDD carbon credits valuation generated the results as in the table below.

Benefit from REDD (PV) Scenarios:		Voluntary pessimistic	Voluntary optimistic	Compliance JI	Compliance CER	Compliance EUA
Thanh Hoa	USD m	0.02	1.51	1.51	4.76	5.89
Nghe An	USD m	0.01	1.28	1.28	1.28	4.05
Ha Tinh	USD m	0.01	1.27	1.27	4.01	4.96
Quang Binh	USD m	0.00	0.83	0.83	2.62	3.24
Quang Tri	USD m	0.00	0.46	0.46	1.46	1.81
T.T. Hue	USD m	0.01	1.27	1.27	1.27	4.01
Quang Nam	USD m	0.00	0.65	0.65	2.08	2.57
Quang Ngai	USD m	-0.01	0.08	0.08	0.28	0.35

[9] Certified Emission Reductions (CER) are generated from Clean Development Mechanism (CDM) projects in the form of futures and options contracts.

[10] EU Allowances (EUA) are issued under the EU Emissions Trading Scheme, 1 EUA equals 1 tone of CO_2 right-to-emit.

Benefit from REDD (PV) Scenarios:		Voluntary pessimistic	Voluntary optimistic	Compliance JI	Compliance CER	Compliance EUA
Binh Dinh	USD m	-0.01	0.22	0.22	0.71	0.88
Phu Yen	USD m	0.00	0.93	0.93	2.95	3.64
Ninh Thuan	USD m	0.01	1.21	1.20	3.81	4.71
Binh Thuan	USD m	0.00	0.81	0.81	2.57	3.17
Project	**USD m**	**0.04**	**10.51**	**10.50**	**27.80**	**39.30**

The benefits achieved under the 'Voluntary optimistic' scenario seem to be the most appropriate to apply for the evaluation of the Project. Under this scenario, the Project would yield the total Present Value (PV) of USD 9.8 million, which is VND 166,240 million, over the Project life of 50 years, corresponding to the annual CO_2-e sequestration of 102,017 tones. The flow of expected benefits from REDD is shown in **Table I-3**.

If well designed and governed, REDD provides opportunities to positively affect forest-dependent livelihoods by:

- Generating revenue that governments could direct to social services in rural areas (water systems, irrigation, etc.)

- Creating new income streams for forest dwellers if they are participants in conservation payment programs or monitors of forest areas

1.3.4 Benefits from Small Rural Infrastructure

(1) Rural Roads

Assumptions:

- Road construction and up-grading provides benefits in the form of reduced transport costs (e.g., reduced fuel requirements and lower vehicle maintenance costs). Gathering the necessary information requires significant time and cost investment in the collection of data on traffic patterns.

- Relatively low volumes of traffic, between 20 and 45 passenger car (equivalent) units (PCU) are needed to justify providing a gravel road, but between 150 and 300 PCU are needed to justify sealing a road. The thresholds are lower in mountainous areas. Traffic varies greatly on rural roads. The counts carried out by the WB Project[11] at 40 randomly selected sites on district and commune roads in the 4 provinces[12] confirmed that the most common vehicle is the bicycle, with an average daily volume of nearly 1,200 per day, and second most common is the motorcycle, with an average daily volume of nearly 800. Bicycles account for an average of 54% of the total number of vehicles and 32% of the PCU. Motorcycle account for 36% of all vehicles and 34% of total PCU. Freight vehicles, mainly conventional light and medium trucks and *cong nong*, account for approximately 14% of all motorized vehicles and 40% of motorized PCU.[13]

- The vehicle operating cost saving follow to improved road is assumed to be 47 VND/PCU/year[14]

- Moreover, the benefits from road construction and upgrading can be reflected in increased agricultural trade, lower transport costs and increased access to social institutions (education, health care). The evidence shows, that where roads are constructed, the number of traders increase, resulting in lower costs for agricultural inputs and increased prices for market output.

[11] Third Rural Transport Project, January 2006, the World Bank
[12] Hung Yen, Thanh Hoa, Quang Nam, Tuyen Quant
[13] The following indices were used come up with the Passenger Car Units (PCU): bicycle=0.6 PCU, motorcycle=0.9 PCU, light truck= 2.9 PCU.
[14] After assumptions of JICA project of 'Nhat Tan Bridge (Vietnam-Japan Friendship Bridge)'

Road construction means the improved access of farmers to markets. At this stage, those benefits are not monetized.

- In 'with-Project scenario': the road is significantly improved, bringing about the decrease in 'vehicle operating cost' as well as enabling increased mobility and improved access to neighbor communities and markets; 'without-Project scenario' is assumed as present condition.
- Economic benefits are estimated as an increment (between 'with-'and 'without-Project' conditions), in present values (PV).

Results:

Present Value of Economic Benefits from Small Infrastructure: Rural Roads

Province	Road construction [km]	Economic benefit [VND million]
Thanh Hoa	17	16
Nghe An	18	18
Ha Tinh	9	9
Quang Binh	20	20
Quang Tri	15	15
T.T. Hue	12	12
Quang Nam	22	22
Quang Ngai	10	10
Binh Dinh	23	22
Phu Yen	18	18
Ninh Thuan	9	9
Binh Thuan	14	13
Total	**187**	**183**

Table I-4 gives more details of the expected benefits from the rural road improvement.

(2) Irrigation Systems

Assumptions:

- Irrigation systems economic benefits will be accrued from increase in cropping areas
- In 'with-Project scenario': one irrigation system irrigates an incremental area of 15ha; additional irrigated area is planted by paddy, yielding 2 crops per year, of an average yield for the province reported in 2008 by GSO and follow to model crop budgets issued by MARD.
- Economic benefits are estimated as an increment (between 'with-' and 'without-Project' conditions), in present values (PV).

Results:

Economic Benefits from Small Infrastructure: Irrigation Systems

Province	Additional irrigated area [ha]	Economic benefit [VND million]
Thanh Hoa	0	0
Nghe An	45	12,430
Ha Tinh	90	18,661
Quang Binh	0	0
Quang Tri	0	0
T.T. Hue	13	3,423
Quang Nam	15	2,335
Quang Ngai	0	0
Binh Dinh	0	0
Phu Yen	150	23,354
Ninh Thuan	160	41,655
Binh Thuan	0	0
Total	**473**	**101,858**

A flow of the expected benefits from improvement of irrigation systems is presented in **Table I-5**.

(3) Water Supply

The water supply systems bring unquestionable economic benefits. However, due to the early stage of the Project the benefits are not monetized.

1.3.5 Benefits from Livelihood Development

The Socioeconomic Survey [15] concluded in September 2009 that: target communes had one agriculture extension worker (of the district authorities) per 436 to 2,439 households, while on average, in Vietnam one agriculture extension worker is in charge of 1,100 households.

The Socioeconomic Survey reveals that the poverty in surveyed areas is often a result of lack of production and business experience, poor scientific and technology knowledge, shortage of production land, poor infrastructure, difficult access to capital and insufficient access to markets. Although farmers appreciated the help of extension service, less than half of them had had contact with an extension agent in the past year. There is a difficulty in access to agriculture extension centres, since the Project areas are comparatively remote. However, due to the early stage of the Project the benefits are not monetized.

The agricultural sector has enjoyed strong growth in recent years. Vietnam is the second largest exporter of rice. The source of additional production will have to be yield growth. However, MARD assesses that the rice yield has reached its peak (5,200 kg/ha on average) and that the rice yield will not increase sharply in the coming years if it continues current agricultural techniques. The Institute for Policies and Strategies on Agriculture and Rural Development says that what Vietnam needs to do is to urgently push up the modernization and industrialization of agriculture and rural areas. The average rice export price of Vietnam in first half of 2009 is of USD 325/t. Rice from Thailand, in August 2009 achieved USD 525/t (five percent broken rice) and USD 432/t (twenty percent broken rice). Moreover, the increased risks from global warming (e.g. increasing the frequency of events such as drought and flood) are affecting adversely rice yield and. Productivity growth through the development and dissemination if improved technologies are the only long-term viable solution. A main justification of the Project is that increased agricultural production will supplant the need to harvest forest products and enable the participating population to involve in the sustainable protection forest management and protection.

1.4 Intangible Benefits

The Project yields numerous economic benefits, some of which may not be exhibited in the tangible, measurable manner. Some of the Project intangible benefits are as follows:

(1) Watershed Protection

Due to the data limitations, i.e. the inexistent data of monitoring of erosion of watershed, others, it is not possible to demonstrate the tangible benefits of watershed protection. Those include:

- Ecological functions: biodiversity conservation, catchment protection, smoothing of peak flows and reduction of downstream flooding, climate and moisture regulation by evapo-transpiration, prevention of soil erosion by reduction of velocity of precipitation and increased

[15] Social-Economic Survey in Sample Communes for the Preparatory Survey to Formulate the Plan for Restoration and Sustainable Management of Protection Forests Project in Vietnam

percolation and maintenance of soil moisture, water filtration and protection/ improvement of water quality for downstream processes including domestic consumption.

- Economic contribution: avoided costs of flood damage, water available for additional crops, retention of soil fertility, savings from reduced need to apply artificial fertilizers as replacements, avoided costs of alternative methods of water filtration, and economic benefits on high quality water. Watershed protection is of particular economic importance to the existing and proposed hydropower plants downstream of protected areas targeted by the Project.[16]

(2) Maintenance of Forest and Ecosystem

Maintaining forests will regulate ecosystem services, which may enhance adaptive capacity in changing climate, where risks of extreme weather are projected to increase.

- Climate change increases the frequency of extreme weather events such as storm, flood and drought. Vietnam is likely to suffer from the climate change, because of its long coast and two big deltas. Sea level rise will make Red River Delta and Mekong Delta in danger of flood and land loss. According to estimates of IPCC, if sea level increases by 1m, total areas in flood in Red River Delta will be 5,000km^2 and in Mekong Delta will be 15,000 -20,000km^2, and those two are largest production regions in the country. As a result, the flood in these regions will lead to disasters for the whole country. Climate change causes also impacts on other fields such as water resources, rural irrigation and drainage, animal husbandry, fisheries, forestry and forest ecosystem, power supply and transportation and healthcare, etc. Therefore the general opinion in Vietnam is that actions related to mitigation should be incorporated and linked into all activities, strategies in all industries.

(3) Benefits from Payment for Environmental Services (PES)

Assumptions:

The 'Payment for Environmental Services' (PES) is a possible mechanism for redistributing national or sub-national level income from environmental services to local communities of the protected areas for their effective management.

There are a number of pilot activities for the pilot policy of PES in Vietnam. In particular, the Policy on Pilot Payment for Forest Environmental Services[17] has just started. USAID is supporting the testing of PES in Lam Dong province (upstream location of Dong Nai river basin, in the Central Highlands) through Winrock International, while GTZ is supporting the testing PES in Son La province.

Until September 2009, the Lam Dong province Forest Protection and Development Fund received VND 24 billion (USD 1.5 million) for first 6 months of 2009 from Da Nhim and Dai Ninh HydroPower Companies for payment for forest environmental services. The Fund is supposed to support rural families who can choose to plant more sustainable crops or get involved in reducing deforestation and safeguard forests in priority watersheds.

Using the above example of PES as the assumption for the Project, the value of environmental services of VND 243,700/ha might be applied (that is USD 2.7 million per year from EVN for

[16] Those benefits as presented as intangible due to the unavailability of the data on erosion monitoring and the sedimentation rate of the downstream water reservoirs.

[17] Pilot Forest PES Policy for the Pilot Application in Lam Dong and Son La, issued on 23 October 2007 by the PM Office

188,000 ha of forest conserved in Da Nhim and Dai Ninh) for estimation of the project benefit.[18] However, the project areas selected in the project are rather fragmented as compared to those of Da Nhim and Dai Nin watersheds and the price of PES is still unfixed and under discussion, the economic benefits from PES are just estimated as trial estimation for reference. The areas of afforestation in watershed protection[19] are used for the trial estimation.

Results:

Present Value of Economic Benefits from PES

Province	Afforestation Areas [ha]	Economic benefit [PV VND million]
Thanh Hoa	1,270	3,165
Nghe An	2,300	5,731
Ha Tinh	1,960	4,884
Quang Binh	1,600	3,987
Quang Tri	2,900	7,226
T.T. Hue	3,000	7,476
Quang Nam	970	2,417
Quang Ngai	3,500	8,722
Binh Dinh	2,480	6,180
Phu Yen	1,500	3,738
Ninh Thuan	1,610	4,012
Binh Thuan	0	0
Total	**23,700**	**57,538**

Under the above assumptions, the Project yields the economic benefits from PES of VND 57,538 million in present value, corresponding to payment for environmental services for afforestation of 23,700ha.

1.5 Cost-Benefit Analysis

To validate the feasibility of the Project the economic net present value (ENPV) and the economic internal rate of return (EIRR) are calculated. In general, a community-based forestry development project does not generate substantial direct benefits in a short period of time (like an infrastructure development project), and so the calculations are done for the 50 year life of the Project.

Table H-6 shows the projected economic cash flow of the estimated project benefits and economic costs of the project. As a result, the NPV and EIRR are estimated at VND 491 billion and 13.4 % at 10 % discount rate.

Results of Economic Analysis

Items	Result
Net present value	VND 491 billion
EIRR	13.4 %

Source: JICA Preparatory Survey Team (2009)

In the estimation above, the estimated benefit from PES is not incorporated since the implementation of PES is not still uncertain at present. The result shows that the project will not generate substantial tangible benefits, unlike an infrastructure development project, but it suggests that the project is still worth implementing especially from the viewpoint of environmental protection and restoration on provincial and regional levels.

[18] "Ecosystem Services in Lam Dong Province Vietnam: Challenges and Responses in Moving from Theory to Implementation", Winrock International, August 20, 2009

[19] The values for the PES of the Lam Dong pilot project are used due to the unavailability of the data on erosion monitoring and the sedimentation rates of the downstream water reservoirs of the Project areas.

1.6 Sensitivity Analysis

A sensitivity analysis is carried out to examine the viability of the Project under enforceable changes to conditions by changing the benefit and cost levels; (i) 20% increase in cost, (ii) 10% decrease of benefit and 20% increase in cost, (iii) 20% decrease in benefit.

The results of the calculation are given in **Table I-7**, and summarized as follows.

Sensitivity Analyses by EIRR and NPV

EIRR	**Change in Benefit**		
Change in cost	Base case	- 10 %	-20 %
Base case	13.4 %	12.7 %	11.8 %
+10 %	12.7 %	12.0 %	11.2 %
+20 %	12.1 %	11.4 %	10.6 %

Source: JICA Preparatory Survey Team (2009)

NPV	**Change in Benefit**		
Change in cost	Base case	- 10 %	-20 %
Base case	491 billion	367 billion	243 billion
+10 %	416 billion	292 billion	167 billion
+20 %	341 billion	217 billion	92 billion

Source: JICA Preparatory Survey Team (2009)

2 Impact on Beneficiary Household Income

Two types of data are analyzed to gather the information on the beneficiary households income and the impact of the Project:

(1) General statistics, data from the GSO of Vietnam, i.e. the data from the 2006 Household Living Standard Survey, and

(2) Socioeconomic Survey[20], field visit and findings of the JICA Preparatory Survey

2.1 Present Household Income

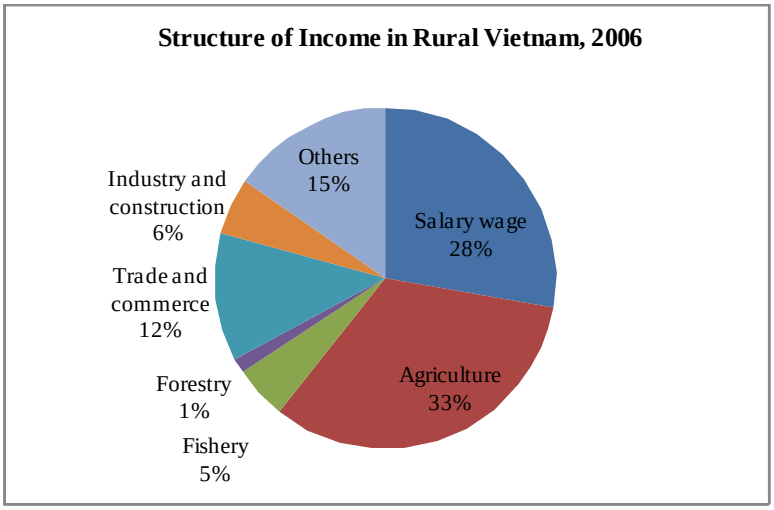
The national Gini coefficient[21] – a measure of income inequality – has been rising from 0.345 in 1990 to 0.432 in 2006. While the poorest 20% of households in Vietnam accounted for 8% of total incomes in 1990, this dropped to 5.6% in 2006. Adequately, the richest 20% of households saw their share of total income increase from 42.7% to 49.3% over the same period.

The greatest incidence of poverty is among rural households, heavily dependent on agriculture, including forestry, for income generation. Those households are often ethnic minorities, who are in danger of being left behind by economic growth.

For the rural areas, the structure of income in Vietnam is shown in the graph below:

[20] Social-Economic Survey in Sample Communes for the Preparatory Survey to Formulate the Plan for Restoration and Sustainable Management of Protection Forests Project in Vietnam

[21] Gini coefficient - a measure of inequality of income. It can range from 0 to 1. A low Gini coefficient indicates a more equal distribution, with 0 corresponding to perfect equality, while higher Gini coefficient indicates more unequal distribution, with 1 corresponding to perfect inequality.



Source: 2006 Household Living Standard Survey, General Statistics Office of Vietnam

The structure of income in the Project target sites is more precisely analyzed by the Socioeconomic Survey, the results of which are presented in the table below:

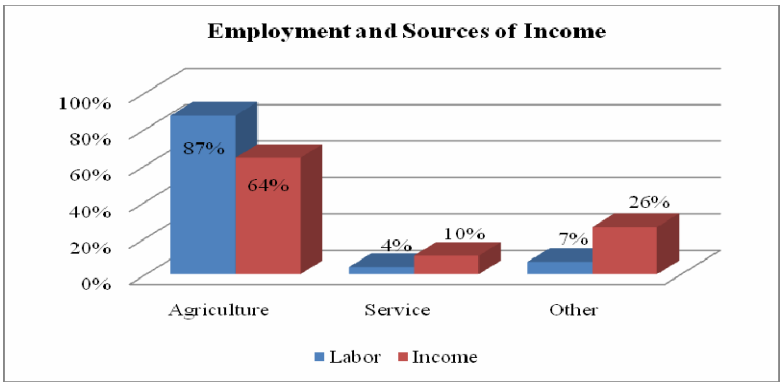
Average Agriculture Land and Annual Income per Person in Selected Project Communes

Province	Commune	Agriculture Land	Annual Income						
		m^2/person	VND mil/person/yr	Crop	Husbandry	Forestry	Services	Handicraft	Others
Nghe An	Tam Thai	1 189	4.0	32%	15%	5%	11%	0%	37%
	Dong Van	1 036	2.7	40%	10%	10%	7%	0%	33%
Quang Binh	Q. Thach	794	3.0	46%	30%	10%	0%	0%	14%
	Hai Ninh	463	4.9	10%	14%	0%	1%	0%	76%
T.T.Hue	Binh Dien	1 606	8.6	9%	8%	11%	60%	7%	5%
	Duong Hoa	1 605	5.5	50%	15%	15%	5%	5%	10%
Quang Ngai	Som Ky	3 009	2.5	45%	30%	10%	0%	0%	15%
	Ba Giang	633	2.4	45%	30%	10%	8%	0%	7%
Phu Yen	Song Hinh	4 523	4.5	65%	25%	0%	5%	0%	5%
	Phuroc Tan	3 763	1.4	54%	20%	10%	0%	0%	16%
Binh Thuan	Phong Phu	3 500	9.0	4%	25%	6%	24%	0%	41%
	Hoa Thang	4 704	1.8	40%	20%	0%	0%	0%	40%
Average		2 235	4.2	37%	20%	7%	10%	1%	25%

Source: Social-Economic Survey in Sample Communes for the Preparatory Survey to Formulate the Plan for Restoration and Sustainable Management of Protection Forests Project in Vietnam, September 2009

The main income sources in the Project localities surveyed by the Socioeconomic Survey are: crop cultivation, animal husbandry and forestry production.

The average annual income per person in the Project communes surveyed by the Socioeconomic Survey is of VND 4.2 million, corresponding to the average land holding per person of 2,300m^2. The results reported by the Socioeconomic Survey as shown in the above table offer a clear conclusion that income levels of the communes which rely heavily on the crop cultivation are the lowest. Those communes which diversify their sources of income exhibit much better results. The Survey reveals that in the surveyed communes on average 87% of people are employed in agriculture, though it corresponds to only 64% of the income generated.



Source: Socioeconomic Survey, September 2009, data for 12 Communes.

The Socioeconomic Survey reports that in the targeted communes the agriculture productivity is relatively low, due to exhausted soils, poor cultivation and tending technique and low investments.

The evidence shows that the initial efforts to reduce rural poverty and raise rural incomes should focus on income diversification, especially into high-value crops. The site survey shows that rice is an important source of income for the Project communes. Some communes have diversified into high-value crops, gradually shifting from rice and cassava cultivation to fruit trees, tea, rubber trees, other production. In principle, the pace of diversification is greater where market access is better.

Forests provide safety nets for vulnerable individuals and communities. Poor households with limited land and livelihood options depend critically on forest produce, including the non-timber forest products, for their livelihood. However, the households cannot live on forests alone. As for the forestry land, the average area per capita is quite high, and in the surveyed communes it is about 2-3ha per head (though it must be stressed that a major share of the forestry land in these communes belongs to various owners).

Nonfarm income is concentrated among the high-income households. The results of the Socioeconomic Survey reveal that almost none of the communes are active in the handicraft or home industries for the income sources.

2.2 Project Impact on Household Income ("with-Project Condition")

(1) Household Economy Analysis

The household economy under the "with-project condition" was estimated with the assumption one household would engage in the following forest development/improvement activities:

Case 1: two (2) ha of afforestation

Case 2: five (5) ha of ANR with enrichment

Case 3: 20 ha of protection of natural forest

However, the reliable data were not sufficiently available hence the results of the analysis/estimation should be considered "indicative." The results of the analysis are presented in **Table I-8,** and outlined in the following table.

Analysis of Household Economy under "With-Project" Conditions

Case 1: 2 ha of Afforestation

Items	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6-15	Yr16~25
1. Basic Income <1	4.2	4.2	4.2	4.2	4.2	4.2/yr	4.2/yr
2. Gross Income from the Project							
2.1 Wage <2	17.9	8.5	4.8	4.8	0.0	0.0	0.0
2.2 Forest resources <3	0.0	0.0	0.0	0.0	0.0	0.5~14.8	0.0~31.3
3. Cash expenditures							
3.1 Harvesting and transportation	0.0	0.0	0.0	0.0	0.0	0.4~0.8	0.0~0.9
3.2 Sharing benefit with GOV	0.0	0.0	0.0	0.0	0.0	0.7~1.4	0.0~3.1
4. Labor requirement <4							
3.1 Family labor	298.7	142.2	80.0	80.0	14.6	19.6~23.6	17.6~19.6
3.2 Hired labor	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. Net Cash Benefit							
5.1 Total Net Cash Income	22.1	12.7	9.0	9.0	4.2	8.6~16.9	4.2~32.0
5.2 Additional Cash Income	17.9	8.5	4.8	4.8	0.0	4.4~12.7	0.0~27.8
Ave. add. income from 1st to 5th	11.4						
Ave. add. income from 6th to 15th						11.8	
Ave. add. income from 16th to 25th							13.2

Case 2: 5 ha of ANR with enrichment

Items	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6-15	Yr16~25
1. Basic Income <1	4.2	4.2	4.2	4.2	4.2	4.2/yr	4.2/yr
2. Gross Income from the Project							
2.1 Wage <2	12.3	8.7	7.2	2.8	2.8	0.0	0.0
2.2 Forest resources <3	0.0	0.0	0.0	0.0	0.0	0.5~14.8	0.0~31.3
3. Cash expenditures							
3.1 Harvesting and transportation	0.0	0.0	0.0	0.0	0.0	0.0	0.0~0.1
3.2 Sharing benefit with GOV	0.0	0.0	0.0	0.0	0.0	0.0	0.0~3.0
4. Labor requirement <4							
3.1 Family labor	205.1	144.5	119.4	46.4	46.4	36.4~41.4	36.4~51.4
3.2 Hired labor	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. Net Cash Benefit							
5.1 Total Net Cash Income	16.5	12.9	11.4	7.0	4.2	4.2	4.2~31.1
5.2 Additional Cash Income	12.3	8.7	7.2	2.8	2.8	0.0	0.0~8.9
Ave. add. income from 1st to 5th	6.7						
Ave. add. income from 6th to 15th						0.3	
Ave. add. income from 16th to 25th							3.6

Case 3: 20 ha of Protection

Items	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6-15	Yr16~25
1. Basic Income <1	4.2	4.2	4.2	4.2	4.2	4.2/yr	4.2/yr
2. Gross Income from the Project							
2.1 Wage <2	8.7	8.7	8.7	8.7	8.7	0.0	0.0
2.2 Forest resources <3, <5	0.0	0.0	0.0	0.0	0.0	0.0~130.6	0.0~253.5
3. Cash expenditures							
3.1 Harvesting and transportation	0.0	0.0	0.0	0.0	0.0	0.0~1.4	0.0~2.5
3.2 Sharing benefit with GOV	0.0	0.0	0.0	0.0	0.0	0.0~12.9	0.0~25.1
4. Labor requirement <4							
3.1 Family labor	145.6	145.6	145.6	145.6	145.6	145.6~205.6	145.6~205.6
3.2 Hired labor	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. Net Cash Benefit							
5.1 Total Net Cash Income	12.9	12.9	12.9	12.9	12.9	4.2~120.5	4.2~230.1
5.2 Additional Cash Income	8.7	8.7	8.7	8.7	8.7	0.0~116.3	0.0~225.9
Ave. cash income from 1st to 5th	8.7						
Ave. cash income from 6th to 15th						11.4	
Ave. cash income from 16th to 25th							22.6

Note: <1 Basic income is based on the average household income given by Socio-economic Survey conducted by the JICA Preparatory Survey (2009)

<2 Wages are the payments made by PFMBs under the project.

<3 Firewood, chip woods and timber are considered as forest resources that can be exploited by the forest management group in the post-project period in accordance with the long-term agreement between the management group and PFMB.
<4 Labor cost is not estimated assuming only family members will be used for management and maintenance works.
<5 Prices of medium grade of wood/timber in the country is employed for estimation.

Members of the forest management group may be able to earn VND 6.7 million ~ VND 11.4 million for the first five years from the payments for the project activities. Though they will not be able to receive cash income on a constant basis from 6th year, the rough estimation suggests that the members might be able to earn VND 11.8 million/year from 6th year to 15th year and VND 13.2 million/year from 16th year to 25th year in from 2 ha of afforested/reforested protection forest. The returns from ANR are estimated to be rather low. The estimated average additional income from 5 ha of ANR with enrichment ranges from VND 0.3 million to VND 3.6 million per annum. Though members will not harvest forest resources every year, they may be able to earn as high as VND 22.6 million/year from 20 ha of natural forest between 16th year and 25th year.

(2) Potential Income from Crop Production

In addition to the income from forestry activities, incremental crop production may contribute to the improvement of household economic condition. The potential increase of income from crop production as a result of the small scale infrastructure and livelihood improvement components of the project is assessed as follows.

- Area expansion: The area of agricultural land of the communes is quite low, in the communes reviewed by the Socioeconomic Survey, which is between 600 and 4,700m2 per person, an average of 2,300m2 per person. The component of small scale infrastructure includes the irrigation systems improvement and development (total area of 353ha), which may result in increased irrigated area depending on local conditions of the particular sub-project site.

- Increasing cropping intensity: The number of harvests per year can be increased by adopting varieties of crops with shorter growing cycles or by improving water control on the off season. The Project component of small scale infrastructure includes the irrigation systems improvement and development (total area of 353ha), which may result in creased cropping intensity (i.e. shifting from two to three rice crops per year), depending on local conditions of the particular sub-project site.

- Yield increases: Higher yields, defined as the output per sown area, are associated with improved seed, greater or more effective use of modern inputs, improved water control, and/ or better cultivation methods. The Project component of livelihood improvement will focus on the livelihood development models/ demonstration plots in 161 communes participating in the Project.

- Higher agricultural prices: These may be caused by improved transport infrastructure, or better coordination between farmers and buyers. The Project component of small scale infrastructure will focus on the rural roads improvement (total 219 km), which is expected to bring about the possible increase in agriculture prices, improved connectivity between the communes and better access to markets.

- Crop diversification: Even if prices, cropping yields, intensity, and area remain constant, farmers can increase their income by reallocating land from low-value crops (typically staple food crops) to higher-value crops (typically commercial crops). Those may be the effect of the demonstration plots of the Project.

All of these factors play some role in the growth of rural income, but the relative importance of each factor varies across households depending on agro-ecological conditions, market access and household characteristics. The importance of each factor changes over time.

(3) Potential Income from Firewood and NTFPs

Firewood harvesting

The Socioeconomic Survey estimates that up to 80% of primary needs for energy of some households are met by fuel wood. Collecting wood for cooking and heating remains high at present and the evidence from some protected areas suggests that the fuel wood extraction rate exceeds forest regeneration rates.[22] The Socioeconomic Survey reports that the households harvest up to 0.7 m2 per month. It is possible that with the improved protection forest management the firewood harvesting will have to be scaled down, meaning in practice the negative impact on the forest-dependent households. It is however expected that this negative impact may be neutralized by multiple positive impacts of the Project.

NTFP harvesting

The economic importance and value of NTFPs is substantial. The most common NTFP include rattan, bamboo, resin, essential oils, medicines, spices, mushrooms and honey. NTPF harvesting is less destructive than other forest uses. Socio-economic situation of local forest users may be improved through trade of specific NTFP, which offers a benefit of additional and stable income and/ or employment. Some NTFPs have high market value (e.g. rattan: VND 7,000/kg, honey: up to VND 150,000/ liter, etc.). NTFPs have also cultural meanings and are important for the preservation of local communities indigenous knowledge (e.g. medicines, construction materials). The NTFP are collected for food, for sale, for construction and handicraft, and to produce medicines.

Some communes' households specialize in collecting NTFP, i.e. spend 18 to 21 days in a forest during summer, i.e. April to September.

Small scale local producers are little integrated in marketing logistics, they generally lack sufficient market information. For example, the market chains for rattan are that products are sold locally for very low prices, and in the international market they are highly valued.

In general, NTFP as a strategy to develop rural livelihoods is unlikely to create viable economic opportunities for low-income forest users. NTFPs are likely to be substituted in the process of agricultural intensification and industrial development, cultivations in man-made production systems in the agricultural and settlement areas. Therefore, NTFP tend to be useful for short or middle term.

Taking the above into the consideration, the impacts of the Project activities on household financial status are highly variable. It appears that the income from allowed portion of wood harvesting from protection forests, after the Project end, might be small in terms of the income fraction per each respective household. However, in case the Forest Users Groups are functional, the income may be invested in the collective infrastructure services. Looking beyond household to commune level benefits may improve the impact and sustainability of the Project.

[22] Vietnam: National Report on Protected Areas and Development, MARD, MONRE, MoF, 2002

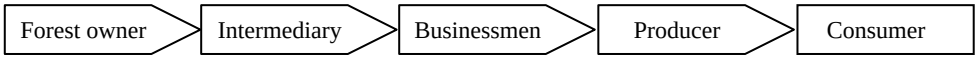
Even though there is an assumption that the legally binding benefit sharing mechanism will be introduced for the Project as a whole and enforced by the respective Provinces regulations, it must be stressed that at present the principle is that timber harvesting in protection forests is illegal and no Provinces (also looking at the SPL III host Provinces) have introduced the working benefit sharing mechanism. The payments for the forest protection within existing arrangements (e.g. Program 661) are widely perceived as insufficient to motivate the proper protection. The active participation of the population cannot be realistically assumed with present income levels, and the tangible financial incentive is a necessary condition to get the involvement of the households.

2.3 Marketing Conditions of Timber

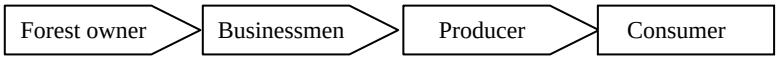
(1) Market Chains and Main Players in the Chains

The participants of the market chain include forest owners (state forest companies, households), intermediaries (private companies, middle-men), businessmen (state forest companies, joint-stock companies, joint venture companies, Ltd. Companies, private companies), producers (processing enterprises), and consumers (domestic and international). In principle, there are 3 types of market chains:

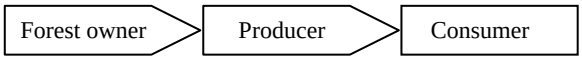
Type 1: Full market chain, where middlemen buy the living trees from the households plantations or from the private companies.



Type 2: Market chain without intermediary



Type 3: Market chain, where producers buy directly from the households and forestry companies. This model applies to timber from plantation and natural forests.



(2) Price of Timber

Price of timber for wood chipboard and plywood production is relatively comparable among the provinces, i.e. Acacia 590,000 VND/tone, Eucalyptus 600,000 VND/tone. Price of native timber is relatively different among the provinces. Market price is often higher (1.5-2 times) than the price regulated by the PPC. Market price fluctuates over the year, e.g. increases in the beginning of year, when the government construction projects get approved and started and decreases during the rainy season, when the contracts cannot be implemented. The table below briefly presents the level of price of round wood.

Selected Market Prices of Round Wood, 2008, VND/m3

Province	**Kiền kiền (*Hopea pierrei*)**	**Lim (*Erythrophleum fordii*)**	**Giổi (*Michelia mediocris*)**
	D=30-90cm, L>2.5m	**D=35-120cm, L>2.5m**	**D>48cm, L>6m**
Quang Binh	n.a.	10,500,000	n.a.
Quang Tri	6,800,000	10,500,000	5,200,000
T.T. Hue	6,500,000	7,500,000	n.a.
Quang Nam	3,000,000	3,500,000	2,200,000

Source: WWF, Report on Timber Market Price Survey in Central Truong Son, 2008

Tables

Table I-1. Breakdown of Economic Costs of the Project Components

Project Components		Total	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1. Preparatory Survey		**14,968**	**0**	**13,396**	**0**	**0**	**0**	**1,572**	**0**	**0**	**0**	**0**	**0**
1.1 Procurement of equipment			0	13,396	0	0	0	1,572	0	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	13,396	0	0	0	1,572	0	0	0	0	0
2. Survey and Planning		**19,880**	**0**	**0**	**8,250**	**4,763**	**4,483**	**2,384**	**0**	**0**	**0**	**0**	**0**
2.1 Forest Inventory			0	0	6,307	0	0	0	0	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	6,307	0	0	0	0	0	0	0	0
2.2 Participatory Land Use Planning			0	0	1,148	1,905	1,304	0	0	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	1,148	1,905	1,304	0	0	0	0	0	0
2.3 Detailed Designing			0	0	795	1,591	3,178	2,384	0	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	795	1,591	3,178	2,384	0	0	0	0	0
2.4 Socio-economi Baseline Survey			0	0	0	1,268	0	0	0	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	396	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	872	0	0	0	0	0	0	0
3. Capacity Development and Information Dissemination		**51,556**	**0**	**1,490**	**13,210**	**8,179**	**7,219**	**5,655**	**5,787**	**4,786**	**3,345**	**1,885**	**0**
3.1 Capacity Building of Government Staff and Local Government			0	1,490	8,478	4,704	5,401	3,236	3,236	2,417	1,614	921	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	1,490	8,478	4,704	5,401	3,236	3,236	2,417	1,614	921	0
3.2 Capacity Building of Local Communities			0	0	4,732	3,475	1,818	2,296	2,089	1,920	1,283	964	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	4,732	3,475	1,818	2,296	2,089	1,920	1,283	964	0
3.3 Phase-in/-out Works			0	0	0	0	0	122	462	449	449	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	0	122	462	449	449	0	0
4. Development of Watershed Protection Forest		**565,464**	**0**	**0**	**0**	**86,910**	**157,674**	**164,926**	**93,787**	**43,118**	**18,849**	**200**	**0**
4.1 Afforestation of watershed protection forest			0	0	0	52,032	89,570	90,577	47,308	27,114	11,620	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	40,484	69,691	70,475	36,808	21,096	9,041	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	11,548	19,879	20,102	10,499	6,018	2,579	0	0
4.2 Improvement of existing plantation			0	0	0	4,208	7,580	8,379	5,575	3,606	1,545	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	2,944	5,302	5,861	3,900	2,522	1,081	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	1,265	2,278	2,518	1,676	1,084	464	0	0
4.3 Forest protection			0	0	0	4,145	8,291	8,291	8,291	8,291	4,145	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	4,145	8,291	8,291	8,291	8,291	4,145	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	0	0	0	0	0	0	0
4.4 ANR with enrichment			0	0	0	3,541	6,266	6,794	3,335	1,659	466	200	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	2,755	4,875	5,286	2,595	1,291	362	155	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	786	1,391	1,508	740	368	103	44	0
4.5 ANR			0	0	0	8,229	16,457	16,457	9,606	2,449	1,072	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	8,229	16,457	16,457	9,606	2,449	1,072	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	0	0	0	0	0	0	0
4.6 Silvicultural Infrastructure			0	0	0	14,755	29,510	34,428	19,673	0	0	0	0
(1) Silviculture Infra (Foresty Road)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	3,985	7,970	9,299	5,314	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	6,189	12,378	14,441	8,252	0	0	0	0
(2) Silviculture Infra (Fire Breakline)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	1,468	2,936	3,425	1,957	0	0	0	0
(3) Silviculture Infra (Watch tower)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	182	365	425	243	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	796	1,593	1,858	1,062	0	0	0	0
(4) Silviculture Infra (Protection station)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	327	654	763	436	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	1,295	2,590	3,021	1,727	0	0	0	0
(5) Silviculture Infra (Information board)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	38	76	89	51	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	96	193	225	128	0	0	0	0
(6) Silviculture Infra (Nursery)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	56	112	131	75	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	321	643	750	429	0	0	0	0

Table I-1. Breakdown of Economic Costs of the Project Components

Project Components		Total	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
5. Improvement of SPL III Forests		**23,933**	**0**	**0**	**482**	**9,000**	**9,887**	**2,111**	**1,737**	**716**	**0**	**0**	**0**
5.1 Forest Protection			0	0	0	288	577	577	288	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	288	577	577	288	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	0	0	0	0	0	0	0
5.2 Enrichment planting			0	0	482	707	615	173	107	46	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	285	418	363	102	64	27	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	197	289	252	71	44	19	0	0	0
5.3 Vegetation clearing and thninning			0	0	0	8,004	8,696	1,362	1,341	670	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	7,748	8,418	1,319	1,298	649	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	256	278	43	43	21	0	0	0
6. Development of Coastal Protection Forest		**40,715**	**0**	**0**	**0**	**7,982**	**13,011**	**12,337**	**4,612**	**1,864**	**778**	**132**	**0**
6.1 Afforestation			0	0	0	5,313	8,359	7,483	2,373	1,097	470	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	3,716	5,847	5,234	1,660	768	329	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	1,597	2,512	2,249	713	330	141	0	0
6.2 Improvement of existing plantation			0	0	0	976	1,627	1,628	678	362	145	62	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	976	1,627	1,628	678	362	145	62	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	0	0	0	0	0	0	0
6.3 Forest protection			0	0	0	0	0	0	0	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	0	0	0	0	0	0	0
6.4 ANR with enrichment			0	0	0	1,090	1,818	1,818	757	404	162	69	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	791	1,318	1,318	549	293	118	50	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	300	500	500	208	111	45	19	0
6.5 Silviculture Infrastructure			0	0	0	603	1,207	1,408	804	0	0	0	0
(1) Silviculture Infra (Foresty Road)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	145	290	338	193	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	225	450	525	300	0	0	0	0
(2) Silviculture Infra (Fire Breakline)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	87	174	203	116	0	0	0	0
(3) Silviculture Infra (Watch tower)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	5	11	12	7	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	23	46	54	31	0	0	0	0
(4) Silviculture Infra (Protection station)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	20	40	46	26	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	78	157	183	105	0	0	0	0
(5) Silviculture Infra (Information board)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	2	3	4	2	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	4	8	9	5	0	0	0	0
(6) Silviculture Infra (Nursery)													
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	2	4	5	3	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	12	24	29	16	0	0	0	0
7. Livelihood Development Support		**72,859**	**0**	**0**	**517**	**15,217**	**12,499**	**16,769**	**17,432**	**4,597**	**4,211**	**1,617**	**0**
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	517	15,217	12,499	16,769	17,432	4,597	4,211	1,617	0
8. Infrastructure for Livelihood Development		**207,205**	**0**	**0**	**0**	**0**	**41,441**	**82,882**	**62,161**	**20,720**	**0**	**0**	**0**
8.1 Rural road (watershed)		100,895	0	0	0	0	33,632	67,264	50,448	16,816	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	3,310	6,621	4,966	1,655	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	30,321	60,643	45,482	15,161	0	0	0
8.2 Rural road (coastal)			0	0	0	0	2,755	5,510	4,133	1,378	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	271	542	407	136	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	2,484	4,968	3,726	1,242	0	0	0
8.3 Irrigation			0	0	0	0	4,527	9,054	6,790	2,263	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	1,773	3,546	2,660	887	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	2,754	5,507	4,131	1,377	0	0	0
8.4 Water supply			0	0	0	0	527	1,054	791	264	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	154	308	231	77	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	373	746	560	187	0	0	0
9. Forest Fire Control		**5,115**	**0**	**0**	**0**	**3,090**	**1,058**	**967**	**0**	**0**	**0**	**0**	**0**
9.1 Purchase of equipment			0	0	0	3,090	0	0	0	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	3,090	0	0	0	0	0	0	0
9.2 Training			0	0	0	0	1,058	967	0	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	1,058	967	0	0	0	0	0

Table I-1. Breakdown of Economic Costs of the Project Components

Project Components		Total	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
10. Monitoring and Evaluation		**14,890**	**0**	**0**	**0**	**0**	**0**	**1,519**	**0**	**0**	**0**	**13,371**	**0**
10.1 Mid-term evaluation			0	0	0	0	0	1,519	0	0	0	0	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	86	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	0	1,432	0	0	0	0	0
10.2 Terminal evaluation (Physical)			0	0	0	0	0	0	0	0	0	12,104	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	0	0	0	0	0	12,104	0
10.3 Terminal evaluation (Social)			0	0	0	0	0	0	0	0	0	1,268	0
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	396	0
Skilled labor / Material / equipment	SCF 0.97		0	0	0	0	0	0	0	0	0	872	0
11. Project Management		**101,891**	**2,754**	**11,015**	**11,015**	**11,015**	**11,015**	**11,015**	**11,015**	**11,015**	**11,015**	**11,015**	**8261**
Unskilled / Semi-skilledLabour	conversion factor 0.60		0	0	0	0	0	0	0	0	0	0	0
Skilled labor / Material / equipment	SCF 0.97		2,754	11,015	11,015	11,015	11,015	11,015	11,015	11,015	11,015	11,015	8261
12. Sub total (1-10)		1,118,476	**2,754**	**25,900**	**33,474**	**146,156**	**258,287**	**302,138**	**196,532**	**86,817**	**38,198**	**28,220**	**8261**
13. Physical Contingency	0.05	55,924	138	1,295	1,674	7,308	12,914	15,107	9,827	4,341	1,910	1,411	413
14. Consulting Services		**128,129**	**0**	**9,455**	**21,522**	**20,452**	**20,651**	**16,724**	**12,637**	**9,982**	**7,626**	**9,078**	**0**
15. GRAND TOTAL		1,302,528	**2,891**	**36,651**	**56,670**	**173,916**	**291,853**	**333,969**	**218,995**	**101,140**	**47,734**	**38,709**	**8674**

Table I-2. Annual Benefits from Afforestation and Reforestation

(1) Annual Gross Benefit

Provinces	Unit	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Thanh Hoa	VND m	0	0	0	0	0	0	0	3,119	3,267	1,126	2,781	4,636	9,658	11,106	7,904	7,366	7,057	35,428	36,999	10,373	10,727	7,300	41,285	44,109	11,602	13,192	19,870	78,162	79,622	27,869	22,480	23,631	102,586	96,287	27,541	41,877	32,012	97,679	115,143	34,482	29,524	37,439	171,087	143,008	0	0	0	0	0	0
Nghe An	VND m	0	0	0	0	0	0	0	1,938	2,033	1,808	4,863	8,396	13,307	15,421	13,638	12,832	12,781	31,362	33,849	18,309	19,069	13,220	34,035	32,054	10,322	15,356	19,773	53,604	59,394	28,159	21,507	27,746	78,281	70,047	32,094	42,176	31,037	75,000	85,839	30,968	34,582	44,871	116,631	82,978	0	0	0	0	0	0
Ha Tinh	VND m	0	0	0	0	0	0	0	4,022	4,128	1,574	4,169	7,155	14,013	15,887	11,718	11,008	10,892	47,677	49,847	15,670	16,301	11,266	52,583	51,265	9,679	14,302	18,290	94,198	99,554	26,171	20,060	25,789	120,935	113,466	29,884	39,160	28,709	121,463	131,661	28,876	32,161	41,505	203,359	172,230	0	0	0	0	0	0
Quang Binh	VND m	0	0	0	0	0	0	0	0	0	1,170	3,317	5,841	7,738	9,015	9,230	8,734	8,895	9,910	11,502	12,562	13,139	9,205	8,785	8,622	7,018	7,415	12,883	10,412	10,537	17,511	13,999	13,540	22,115	17,602	15,519	26,127	20,954	14,865	26,709	21,754	17,233	22,978	25,619	8,386	0	0	0	0	0	0
Quang Tri	VND m	0	0	0	0	0	0	0	1,890	1,890	2,120	6,011	10,587	16,156	18,469	16,725	15,828	16,115	34,658	37,546	22,755	23,796	16,669	34,167	36,810	15,718	13,618	27,635	61,164	57,054	36,204	30,204	25,229	87,186	79,299	29,007	55,291	46,295	72,249	102,570	49,884	31,881	40,664	138,743	108,781	1,609	0	0	0	0	0
T.T. Hue	VND m	0	0	0	0	0	0	0	3,781	3,781	2,193	6,219	10,952	18,771	21,163	17,302	16,373	16,671	51,984	54,972	23,539	24,617	17,244	52,961	54,332	14,936	14,200	26,926	98,249	95,885	35,574	29,513	26,534	127,761	119,787	30,563	54,287	45,222	118,105	145,021	48,167	33,854	42,066	217,104	186,448	2,681	0	0	0	0	0
Quang Nam	VND m	0	0	0	0	0	0	0	3,308	3,308	709	2,011	3,541	8,421	9,194	5,594	5,294	5,390	35,242	36,208	7,611	7,959	5,575	37,254	40,102	7,618	5,745	13,882	79,840	76,219	17,907	17,428	13,023	94,691	94,007	15,566	28,005	27,531	94,288	108,456	31,389	19,879	13,601	174,662	168,215	11,261	0	0	0	0	0
Quang Ngai	VND m	0	0	0	0	0	0	0	1,512	1,512	2,559	7,255	12,777	18,631	21,422	20,186	19,102	19,449	35,031	38,516	27,463	28,719	20,118	33,813	36,434	18,450	16,577	32,818	58,033	53,892	43,128	36,069	30,995	87,876	78,589	35,706	65,890	55,335	70,132	104,705	59,455	39,573	49,077	133,091	97,356	3,217	0	0	0	0	0
Binh Dinh	VND m	0	0	0	0	0	0	0	1,753	1,753	1,813	5,141	9,053	13,970	15,948	14,303	13,535	13,781	30,847	33,317	19,459	20,350	14,255	30,538	39,834	20,427	11,493	32,930	64,185	51,066	41,643	36,316	20,987	90,008	83,012	24,054	64,006	55,988	64,004	112,158	63,514	26,081	34,775	150,433	124,352	0	0	0	0	0	0
Phu Yen	VND m	0	0	0	0	0	0	0	2,056	2,056	1,097	3,109	5,476	9,572	10,768	8,651	8,187	8,335	27,454	28,948	11,770	12,308	8,622	28,077	28,338	6,994	6,951	12,640	51,462	50,804	16,781	13,560	12,694	66,240	62,009	14,549	25,513	20,664	61,966	74,362	21,686	15,775	21,033	113,246	97,472	0	0	0	0	0	0
Ninh Thuan	VND m	0	0	0	0	0	0	0	3,734	3,734	1,177	3,337	5,878	11,995	13,280	9,286	8,787	8,947	42,963	44,566	12,634	13,212	9,255	44,873	47,341	9,932	8,175	17,721	90,663	87,267	23,111	20,560	16,376	110,562	107,193	19,134	35,576	31,892	106,749	125,618	35,249	22,513	22,643	199,025	184,188	6,435	0	0	0	0	0
Binh Thuan	VND m	0	0	0	0	0	0	0	1,701	1,701	1	1	1	1,923	1,924	5	11	15	15,048	15,058	29	22	0	16,420	28,011	11,591	0	15,733	50,404	34,880	18,798	18,172	0	58,355	58,355	0	28,537	28,537	39,749	75,916	37,287	1,492	1,119	116,885	116,885	0	0	0	0	0	0
Project	**VND m**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**28,816**	**29,165**	**17,347**	**48,213**	**84,294**	**144,154**	**163,597**	**134,542**	**127,059**	**128,330**	**397,604**	**421,327**	**182,174**	**190,220**	**132,728**	**414,790**	**447,251**	**144,288**	**127,026**	**251,102**	**790,376**	**756,174**	**332,856**	**279,868**	**236,544**	**1,046,595**	**979,653**	**273,617**	**506,445**	**424,176**	**936,249**	**1,208,157**	**462,712**	**304,547**	**371,772**	**1,759,886**	**1,490,298**	**25,204**	**0**	**0**	**0**	**0**	**0**

(2) Annual Maintenance Cost <1

Provinces	Unit	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Thanh Hoa	VND m	0	0	0	0	0	0	0	164	1,090	1,945	1,936	1,882	2,078	2,094	1,877	1,865	1,818	1,828	1,865	1,867	1,865	1,828	2,049	2,107	1,877	1,872	1,880	1,865	1,835	1,926	1,924	1,872	2,121	2,142	1,884	1,926	1,875	2,066	2,157	1,924	1,872	1,860	2,142	2,397	2,433	2,433	2,433	2,433	2,433	2,433
Nghe An	VND m	0	0	0	0	0	0	0	176	836	1,453	1,491	1,446	1,548	1,551	1,401	1,393	1,369	1,369	1,393	1,401	1,393	1,369	1,513	1,521	1,366	1,381	1,371	1,358	1,358	1,394	1,389	1,381	1,514	1,525	1,389	1,394	1,358	1,501	1,538	1,389	1,381	1,371	1,525	1,661	1,685	1,685	1,685	1,685	1,685	1,685
Ha Tinh	VND m	0	0	0	0	0	0	0	167	1,184	2,155	2,182	2,135	2,394	2,403	2,101	2,092	2,066	2,066	2,092	2,101	2,092	2,066	2,364	2,377	2,071	2,088	2,075	2,062	2,062	2,101	2,097	2,088	2,373	2,386	2,097	2,101	2,062	2,360	2,399	2,097	2,088	2,075	2,386	2,680	2,706	2,706	2,706	2,706	2,706	2,706
Quang Binh	VND m	0	0	0	0	0	0	0	76	287	486	517	523	502	479	477	477	468	477	477	468	477	477	468	484	470	444	474	470	444	482	479	444	482	479	444	482	479	444	482	479	444	456	479	486	486	486	486	486	486	486
Quang Tri	VND m	0	0	0	0	0	0	0	139	967	1,768	1,830	1,850	1,952	1,898	1,765	1,764	1,739	1,764	1,765	1,737	1,765	1,764	1,879	1,943	1,780	1,697	1,785	1,779	1,698	1,810	1,807	1,697	1,954	1,948	1,700	1,812	1,809	1,839	1,954	1,808	1,700	1,726	1,945	2,126	2,131	2,131	2,131	2,131	2,131	2,131
T.T. Hue	VND m	0	0	0	0	0	0	0	143	1,290	2,418	2,498	2,514	2,754	2,703	2,424	2,422	2,402	2,422	2,424	2,400	2,424	2,422	2,682	2,732	2,431	2,361	2,435	2,428	2,363	2,455	2,452	2,361	2,740	2,735	2,366	2,458	2,457	2,644	2,740	2,455	2,366	2,383	2,730	3,044	3,054	3,054	3,054	3,054	3,054	3,054
Quang Nam	VND m	0	0	0	0	0	0	0	46	938	1,853	1,979	1,989	2,222	2,187	1,943	1,934	1,931	1,934	1,943	1,922	1,943	1,934	2,176	2,224	1,989	1,935	1,982	1,980	1,944	1,985	2,001	1,935	2,253	2,255	1,958	1,999	2,020	2,194	2,253	2,010	1,958	1,922	2,237	2,231	2,231	2,231	2,231	2,231	2,231	2,231
Quang Ngai	VND m	0	0	0	0	0	0	0	167	1,018	1,844	1,934	1,956	2,022	1,958	1,852	1,849	1,822	1,849	1,852	1,820	1,852	1,849	1,934	2,005	1,868	1,774	1,873	1,865	1,777	1,899	1,897	1,774	2,018	2,012	1,781	1,903	1,902	1,890	2,018	1,900	1,781	1,803	2,006	2,006	2,006	2,006	2,006	2,006	2,006	2,006
Binh Dinh	VND m	0	0	0	0	0	0	0	118	1,072	1,971	1,981	2,027	2,125	2,052	1,957	1,957	1,906	1,957	1,957	1,906	1,957	1,957	2,035	2,173	2,022	1,868	2,027	2,022	1,868	2,078	2,073	1,868	2,208	2,203	1,868	2,078	2,073	1,998	2,208	2,073	1,868	1,924	2,203	2,203	2,203	2,203	2,203	2,203	2,203	2,203
Phu Yen	VND m	0	0	0	0	0	0	0	72	652	1,148	1,142	1,138	1,281	1,258	1,116	1,116	1,106	1,116	1,116	1,106	1,116	1,116	1,258	1,278	1,112	1,093	1,125	1,112	1,093	1,135	1,122	1,093	1,287	1,274	1,093	1,135	1,122	1,245	1,287	1,122	1,093	1,106	1,274	1,274	1,274	1,274	1,274	1,274	1,274	1,274
Ninh Thuan	VND m	0	0	0	0	0	0	0	77	1,087	2,100	2,189	2,202	2,458	2,419	2,146	2,141	2,130	2,141	2,146	2,124	2,146	2,141	2,406	2,455	2,175	2,116	2,173	2,170	2,121	2,185	2,191	2,116	2,474	2,473	2,129	2,192	2,202	2,400	2,474	2,197	2,129	2,120	2,463	2,463	2,463	2,463	2,463	2,463	2,463	2,463
Binh Thuan	VND m	0	0	0	0	0	0	0	52	807	1,499	1,453	1,499	1,625	1,579	1,499	1,499	1,453	1,499	1,499	1,453	1,499	1,499	1,579	1,717	1,591	1,453	1,591	1,591	1,453	1,636	1,636	1,453	1,762	1,762	1,453	1,636	1,636	1,579	1,762	1,636	1,453	1,499	1,762	1,762	1,762	1,762	1,762	1,762	1,762	1,762
Project	**VND m**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,399**	**11,228**	**20,641**	**21,134**	**21,162**	**22,960**	**22,582**	**20,558**	**20,508**	**20,211**	**20,422**	**20,529**	**20,305**	**20,529**	**20,422**	**22,344**	**23,016**	**20,751**	**20,082**	**20,790**	**20,701**	**20,016**	**21,088**	**21,069**	**20,082**	**23,186**	**23,194**	**20,162**	**21,119**	**20,995**	**22,159**	**23,273**	**21,089**	**20,133**	**20,245**	**23,153**	**24,332**	**24,434**	**24,434**	**24,434**	**24,434**	**24,434**	**24,434**

Note: <1 The costs are converted into the economic term.

(3) Incremental Benefit

Provinces	Unit	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Thanh Hoa	VND m	0	0	0	0	0	0	0	2,955	2,177	-819	844	2,754	7,580	9,012	6,027	5,501	5,239	33,600	35,134	8,506	8,862	5,472	39,236	42,002	9,725	11,320	17,990	76,297	77,786	25,943	20,556	21,759	100,465	94,145	25,657	39,951	30,137	95,613	112,985	32,559	27,652	35,579	168,945	140,611	-2,433	-2,433	-2,433	-2,433	-2,433	-2,433
Nghe An	VND m	0	0	0	0	0	0	0	1,761	1,197	356	3,372	6,950	11,759	13,870	12,237	11,440	11,412	29,993	32,456	16,908	17,677	11,851	32,522	30,533	8,957	13,975	18,403	52,247	58,036	26,765	20,118	26,365	76,767	68,522	30,705	40,782	29,680	73,499	84,301	29,579	33,200	43,500	115,106	81,317	-1,685	-1,685	-1,685	-1,685	-1,685	-1,685
Ha Tinh	VND m	0	0	0	0	0	0	0	3,855	2,944	-581	1,986	5,021	11,619	13,484	9,617	8,916	8,826	45,611	47,755	13,570	14,209	9,200	50,219	48,888	7,608	12,214	16,215	92,136	97,492	24,069	17,963	23,701	118,562	111,080	27,787	37,059	26,647	119,103	129,262	26,779	30,073	39,430	200,972	169,550	-2,706	-2,706	-2,706	-2,706	-2,706	-2,706
Quang Binh	VND m	0	0	0	0	0	0	0	-76	-287	684	2,800	5,319	7,236	8,536	8,753	8,257	8,427	9,432	11,024	12,094	12,662	8,727	8,317	8,138	6,548	6,971	12,410	9,942	10,093	17,029	13,520	13,096	21,633	17,123	15,075	25,645	20,475	14,421	26,227	21,275	16,789	22,522	25,140	7,900	-486	-486	-486	-486	-486	-486
Quang Tri	VND m	0	0	0	0	0	0	0	1,752	924	352	4,181	8,736	14,203	16,570	14,960	14,064	14,376	32,894	35,781	21,017	22,031	14,905	32,288	34,867	13,939	11,921	25,851	59,385	55,355	34,393	28,397	23,532	85,232	77,351	27,307	53,478	44,486	70,410	100,616	48,076	30,180	38,938	136,797	106,655	-523	-2,131	-2,131	-2,131	-2,131	-2,131
T.T. Hue	VND m	0	0	0	0	0	0	0	3,638	2,491	-225	3,720	8,438	16,016	18,460	14,878	13,952	14,269	49,562	52,548	21,139	22,192	14,822	50,278	51,600	12,505	11,840	24,491	95,820	93,522	33,120	27,060	24,173	125,021	117,052	28,197	51,829	42,765	115,461	142,281	45,712	31,488	39,684	214,373	183,404	-373	-3,054	-3,054	-3,054	-3,054	-3,054
Quang Nam	VND m	0	0	0	0	0	0	0	3,262	2,371	-1,144	31	1,552	6,199	7,007	3,651	3,360	3,459	33,307	34,264	5,689	6,016	3,641	35,077	37,877	5,629	3,810	11,900	77,860	74,274	15,922	15,427	11,088	92,438	91,752	13,608	26,006	25,511	92,095	106,203	29,378	17,921	11,680	172,425	165,984	9,030	-2,231	-2,231	-2,231	-2,231	-2,231
Quang Ngai	VND m	0	0	0	0	0	0	0	1,345	494	715	5,321	10,821	16,609	19,464	18,334	17,253	17,627	33,182	36,665	25,643	26,868	18,269	31,878	34,430	16,583	14,803	30,945	56,168	52,116	41,229	34,172	29,221	85,858	76,578	33,926	63,986	53,432	68,242	102,687	57,555	37,793	47,274	131,085	95,349	1,211	-2,006	-2,006	-2,006	-2,006	-2,006
Binh Dinh	VND m	0	0	0	0	0	0	0	1,635	681	-158	3,159	7,026	11,845	13,896	12,346	11,578	11,876	28,890	31,360	17,554	18,393	12,298	28,503	37,661	18,406	9,625	30,903	62,164	49,199	39,565	34,243	19,120	87,800	80,810	22,186	61,928	53,915	62,007	109,950	61,441	24,213	32,850	148,231	122,150	-2,203	-2,203	-2,203	-2,203	-2,203	-2,203
Phu Yen	VND m	0	0	0	0	0	0	0	1,984	1,404	-52	1,968	4,337	8,291	9,510	7,536	7,071	7,230	26,339	27,832	10,664	11,193	7,506	26,819	27,060	5,881	5,859	11,515	50,349	49,712	15,646	12,437	11,601	64,952	60,734	13,456	24,378	19,542	60,721	73,074	20,564	14,682	19,927	111,972	96,197	-1,274	-1,274	-1,274	-1,274	-1,274	-1,274
Ninh Thuan	VND m	0	0	0	0	0	0	0	3,657	2,646	-923	1,148	3,675	9,538	10,860	7,140	6,647	6,818	40,822	42,420	10,509	11,066	7,114	42,467	44,885	7,757	6,060	15,547	88,493	85,147	20,927	18,369	14,260	108,088	104,720	17,006	33,384	29,691	104,349	123,144	33,052	20,384	20,524	196,563	181,725	3,972	-2,463	-2,463	-2,463	-2,463	-2,463
Binh Thuan	VND m	0	0	0	0	0	0	0	1,649	894	-1,498	-1,452	-1,498	298	345	-1,494	-1,488	-1,438	13,549	13,559	-1,424	-1,477	-1,499	14,841	26,295	10,001	-1,453	14,143	48,814	33,427	17,161	16,536	-1,453	56,593	56,593	-1,453	26,900	26,900	38,170	74,154	35,650	39	-380	115,123	115,123	-1,762	-1,762	-1,762	-1,762	-1,762	-1,762
Project	**VND m**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**27,416**	**17,937**	**-3,294**	**27,079**	**63,132**	**121,194**	**141,015**	**113,984**	**106,551**	**108,120**	**377,182**	**400,798**	**161,869**	**169,691**	**112,307**	**392,446**	**424,236**	**123,538**	**106,944**	**230,312**	**769,674**	**736,158**	**311,768**	**258,799**	**216,462**	**1,023,409**	**956,459**	**253,456**	**485,326**	**403,182**	**914,090**	**1,184,884**	**441,623**	**284,415**	**351,527**	**1,736,733**	**1,465,966**	**769**	**-24,434**	**-24,434**	**-24,434**	**-24,434**	**-24,434**

Table I-3. Estimated Economic Benefits (Value of tCER) from AR-CDM

Project Year	CDM credit period	tCER per 500 ha of AR-CDM						Estimation of tCER from AR-CDM															Total	tCER Value		Validation/ Verification Cost mil VND	Balance (Benefit) mil VND
		Model-1 WS (a)	Model-2 WS (b)	Model-3 WS (c)	Model-4 WS (d)	Model-5 WS (e)	Model-6 Coastal (f)	Location	Watershed										Coastal					1,000 US$	million VND		
								Province	Thanh Hoa	Nghe Anh	Ha Tinh	Quang Binh	Quang Tri	T.T. Hue	Quang Nam	Quang Ngai	Binh Dinh	Phu Yen	Ninh Thuan	Quang Binh	T.T. Hue	Binh Thuan					
		TH, NA HT, QB QT	HUE, QN	QNg	BD	PY NT	QB HUE BT	G. H. I. tCER	1,270 635 1.3 a * I	2,300 1,150 2.3 a * I	1,960 980 2.0 a * I	1,600 800 1.6 a * I	2,900 1,450 2.9 a * I	3,000 1,500 3.0 b * I	970 485 1.0 b * I	3,500 1,750 3.5 c * I	2,480 1,240 2.5 d * I	1,500 750 1.5 e * I	1,610 805 1.6 e * I	400 360 0.7 f * I	- - - f * I	1,100 990 2.0 f * I	24,590 12,895 25.8	tCER price = $3.5	Exchange rate ($1.0)= VND16,968	$30,000 per project at a time	
1																								0	0	-	-
2																								0	0	-	-
3	1																							0	0	13,128	(13,128)
4	2																							0	0	-	-
5	3																							0	0	-	-
6	4																							0	0	-	-
7	5																							0	0	-	-
8	6																							0	0	-	-
9	7																							0	0	-	-
10	8																							0	0	-	-
11	9	3,577	8,606	3,128	9,009	10,674	3,187		4,543	8,228	7,012	5,724	10,374	25,819	8,348	10,949	22,341	16,011	17,185	2,295	-	6,310	145,142	508	8,620	13,128	(4,508)
12	10																							0	0	-	-
13	11																							0	0	-	-
14	12																							0	0	-	-
15	13																							0	0	-	-
16	14	25,650	54,754	24,628	59,354	57,709	38,807		32,575	58,995	50,274	41,040	74,385	164,263	53,112	86,199	147,198	86,564	92,912	27,941	-	76,839	992,296	3,473	58,930	13,128	45,802
17	15																							0	0	-	-
18	16																							0	0	-	-
19	17																							0	0	-	-
20	18																							0	0	-	-
21	19	41,954	80,000	40,510	80,000	80,000	79,882		53,282	96,495	82,230	67,127	121,667	240,000	77,600	141,784	198,400	120,000	128,800	57,515	-	158,167	1,543,066	5,401	91,640	13,128	78,511
22	20																							0	0	-	-
23	21																							0	0	-	-
24	22																							0	0	-	-
25	23																							0	0	-	-
26	24	80,000	80,000	80,000	80,000	80,000	80,000		101,600	184,000	156,800	128,000	232,000	240,000	77,600	280,000	198,400	120,000	128,800	57,600	-	158,400	2,063,200	7,221	122,529	13,128	109,401
27	25																							0	0	-	-
28	26																							0	0	-	-
29	27																							0	0	-	-
30	28																							0	0	-	-
31	29	80,000	71,249	80,000	80,000	80,000	80,000		101,600	184,000	156,800	128,000	232,000	213,748	69,112	280,000	198,400	120,000	128,800	57,600	-	158,400	2,028,459	7,100	120,466	13,128	107,338
32	30																							0	0	-	-
33																								0	0	-	-
34																								0	0	-	-
35																								0	0	-	-
36																								0	0	-	-
37																								0	0	-	-
38																								0	0	-	-
39																								0	0	-	-
40																								0	0	-	-
Total		231,181	294,610	228,266	308,363	308,384	281,877		293,600	531,717	453,116	369,890	670,426	883,830	285,772	798,932	764,739	462,575	496,497	202,951	-	558,116	6,772,163	23,703	402,185	78,769	323,416
																							NPV@10%	2,639	44,786	20,881	

G.: Reforestation area (ha)
H: Area for AR-CDM = G*50% for watershed and = G*90% for coastal (assuming that 50% of watershed and 90% of coastal reforestation areas would be AR-CDM projects).
I.: No. of AR-CDM = H/500ha

Table I-4. Economic Benefits from REDD

Year		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
PV Benefit from REDD		**NPV**																								
Thanh Hoa	PV VND m	32772																								
Nghe An	PV VND m	19937																								
Ha Tinh	PV VND m	26004																								
Quang Binh	PV VND m	18059																								
Quang Tri	PV VND m	7518																								
T.T. Hue	PV VND m	11489																								
Quang Nam	PV VND m	9042																								
Quang Ngai	PV VND m	1208																								
Binh Dinh	PV VND m	3600																								
Phu Yen	PV VND m	7127																								
Ninh Thuan	PV VND m	16208																								
Binh Thuan	PV VND m	13277																								
Project	**PV VND m**	**166240**																								

Annual Benefits from REDD in VND *		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**
Thanh Hoa	VND m	-255	804	886	976	1075	1184	1304	1436	1581	1740	1915	2108	2320	2554	2810	3093	3403	3745	4121	4534	4989	5490	6040	6645	7311
Nghe An	VND m	-255	492	542	597	657	724	797	877	966	1063	1170	1288	1418	1561	1717	1890	2080	2289	2518	2771	3049	3355	3691	4061	4468
Ha Tinh	VND m	-255	639	705	776	855	941	1036	1141	1256	1383	1522	1676	1844	2030	2234	2459	2705	2977	3276	3605	3966	4364	4801	5282	5812
Quang Binh	VND m	-255	446	491	541	596	656	723	796	876	964	1061	1168	1286	1415	1558	1714	1886	2076	2284	2513	2765	3042	3347	3683	4052
Quang Tri	VND m	-255	189	208	229	252	278	306	337	371	409	450	495	545	600	660	726	799	879	968	1065	1172	1289	1418	1560	1717
T.T. Hue	VND m	-255	286	315	347	382	420	463	510	561	618	680	749	824	907	998	1098	1209	1330	1463	1610	1772	1949	2145	2360	2596
Quang Nam	VND m	-255	226	249	274	302	333	366	403	444	489	538	592	652	718	790	869	956	1052	1158	1274	1402	1542	1697	1867	2054
Quang Ngai	VND m	-255	35	39	43	47	52	57	63	69	76	84	92	101	111	123	135	148	163	180	198	218	239	263	290	319
Binh Dinh	VND m	-255	93	103	113	125	137	151	167	183	202	222	245	269	296	326	359	395	435	478	526	579	637	701	771	849
Phu Yen	VND m	-255	179	198	218	240	264	291	320	352	388	427	470	517	569	627	690	759	835	919	1011	1112	1224	1347	1482	1630
Ninh Thuan	VND m	-255	401	441	486	536	590	649	715	787	867	954	1050	1156	1272	1400	1541	1695	1865	2053	2259	2485	2734	3008	3310	3642
Binh Thuan	VND m	-255	329	363	400	440	485	534	588	647	712	784	863	950	1045	1150	1266	1393	1533	1687	1856	2042	2247	2472	2720	2992
Project	**VND m**	**-3054**	**4120**	**4539**	**5000**	**5506**	**6064**	**6677**	**7352**	**8094**	**8910**	**9808**	**10796**	**11883**	**13078**	**14393**	**15839**	**17430**	**19179**	**21104**	**23222**	**25551**	**28113**	**30931**	**34031**	**37441**

Annual Benefits from REDD in VND *		**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**
Thanh Hoa	VND m	8043	8849	9735	10710	11783	12962	14260	15687	17257	18984	20884	22974	25273	27801	30583	33642	37008	40710	44783	49262	54190	59610	65572	72131	79346
Nghe An	VND m	4915	5408	5949	6545	7200	7921	8714	9586	10546	11601	12762	14039	15444	16989	18689	20559	22616	24878	27366	30104	33115	36428	40071	44079	48488
Ha Tinh	VND m	6394	7034	7739	8514	9366	10304	11335	12470	13718	15091	16601	18262	20090	22100	24311	26743	29418	32361	35599	39159	43077	47385	52125	57338	63073
Quang Binh	VND m	4458	4904	5395	5936	6530	7184	7903	8694	9564	10521	11574	12732	14006	15408	16949	18645	20510	22562	24819	27302	30032	33036	36341	39976	43974
Quang Tri	VND m	1889	2078	2286	2515	2767	3044	3348	3684	4052	4458	4904	5395	5934	6528	7181	7900	8690	9559	10515	11567	12724	13997	15397	16937	18631
T.T. Hue	VND m	2856	3142	3457	3803	4184	4603	5064	5571	6128	6742	7416	8158	8975	9873	10860	11947	13142	14457	15903	17494	19244	21168	23286	25615	28177
Quang Nam	VND m	2260	2486	2736	3009	3311	3642	4007	4408	4849	5334	5868	6455	7101	7812	8593	9453	10399	11439	12583	13842	15227	16750	18425	20268	22295
Quang Ngai	VND m	351	386	424	467	514	565	622	684	752	828	911	1002	1102	1212	1333	1467	1614	1775	1953	2148	2363	2599	2859	3145	3460
Binh Dinh	VND m	934	1027	1130	1243	1368	1505	1656	1821	2004	2204	2425	2667	2934	3228	3551	3906	4296	4726	5199	5719	6291	6920	7613	8374	9212
Phu Yen	VND m	1793	1973	2171	2388	2627	2890	3179	3498	3848	4233	4656	5122	5635	6199	6819	7501	8251	9077	9985	10983	12082	13291	14620	16082	17691
Ninh Thuan	VND m	4006	4408	4849	5335	5869	6457	7103	7814	8596	9456	10403	11443	12588	13848	15233	16757	18434	20278	22306	24538	26992	29692	32662	35929	39522
Binh Thuan	VND m	3292	3622	3985	4384	4823	5305	5836	6421	7063	7770	8548	9403	10344	11379	12517	13770	15147	16662	18329	20163	22179	24398	26838	29523	32475
Project	**VND m**	**41192**	**45318**	**49857**	**54850**	**60341**	**66382**	**73028**	**80337**	**88378**	**97223**	**106952**	**117654**	**129426**	**142376**	**156620**	**172289**	**189525**	**208485**	**229340**	**252281**	**277516**	**305274**	**335809**	**369397**	**406343**

Annual Benefits from REDD in US$ *		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**
Thanh Hoa	USD	-15000	47411	52232	57535	63368	69784	76842	84606	93146	102541	112875	124242	136746	150500	165629	182272	200579	220717	242868	267234	294037	323521	355953	391628	430870
Nghe An	USD	-15000	28973	31919	35159	38724	42645	46958	51703	56921	62662	68977	75924	83565	91970	101216	111386	122573	134879	148416	163306	179685	197703	217521	239322	263303
Ha Tinh	USD	-15000	37688	41520	45735	50372	55473	61083	67255	74044	81512	89726	98762	108702	119635	131662	144892	159444	175452	193060	212430	233736	257173	282954	311312	342507
Quang Binh	USD	-15000	26276	28947	31886	35119	38675	42587	46889	51623	56829	62556	68856	75786	83408	91793	101017	111163	122323	134599	148104	162958	179298	197272	217043	238792
Quang Tri	USD	-15000	11133	12265	13510	14879	16386	18043	19866	21872	24078	26504	29173	32109	35339	38892	42799	47098	51827	57028	62749	69043	75966	83581	91958	101173
T.T. Hue	USD	-15000	16836	18548	20431	22503	24781	27288	30045	33078	36414	40083	44120	48560	53445	58817	64727	71228	78379	86246	94899	104417	114887	126404	139072	153008
Quang Nam	USD	-15000	13322	14676	16166	17805	19608	21592	23773	26173	28813	31716	34910	38424	42288	46540	51216	56360	62018	68242	75089	82620	90905	100018	110042	121068
Quang Ngai	USD	-15000	2067	2277	2509	2763	3043	3350	3689	4061	4471	4921	5417	5962	6562	7222	7947	8746	9624	10589	11652	12820	14106	15520	17075	18787
Binh Dinh	USD	-15000	5504	6064	6680	7357	8102	8921	9822	10814	11905	13104	14424	15876	17472	19229	21161	23286	25624	28196	31025	34137	37559	41325	45466	50022
Phu Yen	USD	-15000	10571	11646	12828	14128	15559	17133	18864	20768	22862	25166	27701	30489	33555	36929	40639	44721	49211	54150	59582	65558	72132	79363	87317	96066
Ninh Thuan	USD	-15000	23616	26017	28658	31564	34760	38275	42143	46397	51076	56223	61885	68113	74965	82501	90790	99909	109940	120973	133110	146461	161147	177301	195071	214618
Binh Thuan	USD	-15000	19405	21378	23548	25936	28562	31451	34629	38124	41969	46199	50851	55969	61598	67791	74602	82095	90337	99404	109377	120347	132414	145688	160290	176351
Project	**VND m**	**-180000**	**242800**	**267488**	**294645**	**324518**	**357378**	**393523**	**433284**	**477020**	**525130**	**578052**	**636265**	**700299**	**770737**	**848219**	**933449**	**1027202**	**1130330**	**1243771**	**1368557**	**1505820**	**1656810**	**1822899**	**2005598**	**2206565**

Annual Benefits from REDD in US$ *		**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**
Thanh Hoa	USD	474037	521520	573752	631207	694407	763927	840400	924519	1017051	1118836	1230799	1353959	1489434	1638457	1802383	1982701	2181050	2399235	2639238	2903242	3193646	3513090	3864479	4251006	4676187
Nghe An	USD	289682	318699	350618	385728	424350	466833	513565	564971	621516	683717	752137	827400	910188	1001256	1101430	1211622	1332833	1466164	1612830	1774161	1951626	2146837	2361570	2597775	2857602
Ha Tinh	USD	376821	414566	456086	501758	551998	607261	668050	734918	808474	889384	978386	1076288	1183980	1302442	1432749	1576087	1733759	1907199	2097982	2307843	2538691	2792624	3071949	3379207	3717192
Quang Binh	USD	262715	289031	317978	349820	384846	423375	465757	512377	563658	620068	682119	750375	825457	908047	998896	1098830	1208757	1329677	1462688	1609001	1769946	1946984	2141727	2355944	2591582
Quang Tri	USD	111309	122458	134723	148214	163054	179378	197335	217087	238814	262714	289005	317924	349735	384727	423218	465559	512134	563366	619721	681712	749902	824911	907420	998181	1098018
T.T. Hue	USD	168337	185199	203747	224150	246594	271281	298438	328310	361169	397314	437074	480809	528919	581839	640051	704084	774521	852002	937230	1030981	1134108	1247547	1372330	1509591	1660579
Quang Nam	USD	133198	146540	161216	177360	195119	214653	236140	259777	285777	314377	345837	380443	418510	460383	506444	557111	612844	674151	741589	815770	897369	987128	1085864	1194473	1313942
Quang Ngai	USD	20669	22739	25016	27521	30277	33308	36643	40310	44345	48783	53664	59034	64941	71439	78586	86448	95097	104610	115074	126585	139247	153175	168496	185350	203888
Binh Dinh	USD	55034	60546	66610	73281	80618	88689	97567	107333	118075	129892	142891	157189	172917	190218	209249	230183	253211	278541	306405	337054	370769	407855	448650	493524	542886
Phu Yen	USD	105691	116278	127923	140733	154824	170324	187375	206130	226761	249454	274418	301877	332083	365309	401857	442061	486285	534931	588442	647304	712052	783275	861620	947800	1042597
Ninh Thuan	USD	236120	259771	285788	314406	345887	380515	418606	460507	506597	557296	613066	674412	741893	816122	897774	987591	1086390	1195068	1314615	1446116	1590767	1749884	1924912	2117443	2329227
Binh Thuan	USD	194019	213453	234831	258347	284214	312668	343968	378397	416270	457929	503755	554163	609612	670605	737698	811501	892684	981985	1080216	1188270	1307130	1437875	1581695	1739897	1913920
Project	**VND m**	**2427630**	**2670801**	**2938289**	**3232526**	**3556187**	**3912214**	**4303843**	**4734635**	**5208507**	**5729766**	**6303150**	**6933873**	**7627669**	**8390844**	**9230336**	**10153778**	**11169564**	**12286928**	**13516029**	**14868040**	**16355252**	**17991186**	**19790712**	**21770191**	**23947619**

* estimated in Attachment, include costs for REDD implementation (i.e. net benefits)

Table I-5. Economic Benefits from Small Scale Infrastructure: Rural Roads

PV Benefit from Roads		NPV
Thanh Hoa	PV VND million	16
Nghe An	PV VND million	18
Ha Tinh	PV VND million	9
Quang Binh	PV VND million	20
Quang Tri	PV VND million	15
T.T. Hue	PV VND million	12
Quang Nam	PV VND million	22
Quang Ngai	PV VND million	10
Binh Dinh	PV VND million	22
Phu Yen	PV VND million	18
Ninh Thuan	PV VND million	9
Binh Thuan	PV VND million	13
Project	**PV VND million**	**183**

Assumptions		
Vehicle operation cost	VND/PCU/yr	47
Traffic in Passenger Car Units		
Bicycle	PCU/yr	720
Bicycle	units/yr	1,200
Index: Bicycle to PCU equivalent		1
Motorcycle	PCU/yr	720
Motorcycle	units/yr	800
Index: Motorcycle PCU equivalent		1
Light trucks	PCU/yr	902
Light trucks	units/yr	311
Index: Light trucks PCU equivalent		3
Road construction by Project		
Thanh Hoa	km	17
Nghe An	km	18
Ha Tinh	km	9
Quang Binh	km	20
Quang Tri	km	15
T.T. Hue	km	12
Quang Nam	km	22
Quang Ngai	km	10
Binh Dinh	km	23
Phu Yen	km	18
Ninh Thuan	km	9
Binh Thuan	km	14
Unit saving in voc	VND/yr	110,069

Annual Benefits: Saving Vehicle Operation Costs		
Thanh Hoa	VND	1,827,150
Nghe An	VND	1,981,247
Ha Tinh	VND	990,624
Quang Binh	VND	2,201,386
Quang Tri	VND	1,651,040
T.T. Hue	VND	1,320,832
Quang Nam	VND	2,421,525
Quang Ngai	VND	1,100,693
Binh Dinh	VND	2,476,559
Phu Yen	VND	1,981,247
Ninh Thuan	VND	990,624
Binh Thuan	VND	1,485,936
		20,428,862

Annual Benefits from Roads *		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Thanh Hoa	VND m						1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nghe An	VND m						1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ha Tinh	VND m						0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quang Binh	VND m						1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Quang Tri	VND m						1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
T.T. Hue	VND m						0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quang Nam	VND m						1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Quang Ngai	VND m						0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Binh Dinh	VND m						1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Phu Yen	VND m						1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ninh Thuan	VND m						0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Binh Thuan	VND m						0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Project	**VND m**	**0**	**0**	**0**	**0**	**0**	**7**	**14**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**

* Assumption: annual maintenance cost is 0.55% of total investment cost; major reinvestments are assumed to be equal to 45% of total investment and are done every 15 years.

Annual Benefits from Roads *		2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Thanh Hoa	VND m	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nghe An	VND m	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ha Tinh	VND m	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quang Binh	VND m	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Quang Tri	VND m	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
T.T. Hue	VND m	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quang Nam	VND m	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Quang Ngai	VND m	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Binh Dinh	VND m	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Phu Yen	VND m	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ninh Thuan	VND m	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Binh Thuan	VND m	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Project	**VND m**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**

* Assumption: annual maintenance cost is 0.55% of total investment cost; major reinvestments are assumed to be equal to 45% of total investment and are done every 15 years.

Table I-6. Economic Benefits from Small Rural Infrastructure: Irrigation

PV Benefits from Irrigation		NPV
Thanh Hoa	PV VND million	0
Nghe An	PV VND million	12,430
Ha Tinh	PV VND million	18,661
Quang Binh	PV VND million	0
Quang Tri	PV VND million	0
T.T. Hue	PV VND million	3,423
Quang Nam	PV VND million	2,335
Quang Ngai	PV VND million	0
Binh Dinh	PV VND million	0
Phu Yen	PV VND million	23,354
Ninh Thuan	PV VND million	41,655
Binh Thuan	PV VND million	0
Project	**PV VND million**	**101,858**

Assumptions	Unit	Area	
Irrigated Area			
Thanh Hoa	ha	0	
Nghe An	ha	45	
Ha Tinh	ha	90	
Quang Binh	ha	0	
Quang Tri	ha	0	
T.T. Hue	ha	13	
Quang Nam	ha	15	
Quang Ngai	ha	0	
Binh Dinh	ha	0	
Phu Yen	ha	150	
Ninh Thuan	ha	160	
Binh Thuan	ha	0	
Net Return, 1ha irrigated rice		Spring	Autumn
Thanh Hoa	VND m/ha		
Nghe An	VND m/ha	18	13
Ha Tinh	VND m/ha	12	11
Quang Binh	VND m/ha		
Quang Tri	VND m/ha		
T.T. Hue	VND m/ha	15	14
Quang Nam	VND m/ha	9	9
Quang Ngai	VND m/ha		
Binh Dinh	VND m/ha		
Phu Yen	VND m/ha	9	9
Ninh Thuan	VND m/ha	17	12
Binh Thuan	VND m/ha		

Annual Benefit: Irrigated Rice		
Thanh Hoa	VND m	0
Nghe An	VND m	1,386
Ha Tinh	VND m	2,081
Quang Binh	VND m	0
Quang Tri	VND m	0
T.T. Hue	VND m	382
Quang Nam	VND m	260
Quang Ngai	VND m	0
Binh Dinh	VND m	0
Phu Yen	VND m	2,604
Ninh Thuan	VND m	4,645
Binh Thuan	VND m	0

Annual Benefit from Irrigation		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**
Thanh Hoa	VND m							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nghe An	VND m							462	924	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386
Ha Tinh	VND m							694	1,387	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081
Quang Binh	VND m							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quang Tri	VND m							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T.T. Hue	VND m							127	254	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382
Quang Nam	VND m							87	174	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260
Quang Ngai	VND m							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Binh Dinh	VND m							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phu Yen	VND m							868	1,736	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604
Ninh Thuan	VND m							1,548	3,097	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645
Binh Thuan	VND m							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Project	**VND m**	**0**	**0**	**0**	**0**	**0**	**0**	**3,786**	**7,572**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**	**11,359**

Annual Benefit from Irrigation		**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**
Thanh Hoa	VND m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nghe An	VND m	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386
Ha Tinh	VND m	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081	2,081
Quang Binh	VND m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quang Tri	VND m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T.T. Hue	VND m	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382	382
Quang Nam	VND m	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260
Quang Ngai	VND m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Binh Dinh	VND m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phu Yen	VND m	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604	2,604
Ninh Thuan	VND m	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645	4,645
Binh Thuan	VND m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Project	**VND m**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**	**9,448**

Table I-7. Results of Economic Evaluation of the Project

Yr	Investment Cost (1)													O&M Cost (2)			Replacement Cost (3)		Benefit (4)					Balance
	P. Works	S&P	CD & ID	Dev. of WPF	SPL3 Improve.	Dev. of CPF	Live Dev.	Small Infra	FFC	M&E	PM	P.C.	CS/ES	Small Infra	Silvi Infra	P. Forest	Small Infra	Silvi Infra	Wood/Timber	AR-CDM	REDD	VOC	Crop	(4-1-2-3)
1	0	0	0	0	0	0	0	0	0	0	2,754	138	0	0	0	0	0	0	0	0	(3,054)	0	0	-5,946
2	13,396	0	1,490	0	0	0	0	0	0	0	11,015	1,295	9,455	0	0	0	0	0	0	0	4,120	0	0	-32,531
3	0	8,250	13,210	0	482	0	517	0	0	0	11,015	1,674	21,522	0	0	0	0	0	0	(13,128)	4,539	0	0	-65,260
4	0	4,763	8,179	86,910	9,000	7,982	15,217	3,090	3,090	0	11,015	7,308	20,452	0	0	0	0	0	0	0	5,000	0	0	-172,006
5	0	4,483	7,219	157,674	9,887	13,011	12,499	1,058	1,058	0	11,015	12,914	20,651	15	77	0	0	0	0	0	5,506	0	0	-246,056
6	1,572	2,384	5,655	164,926	2,111	12,337	16,769	967	967	1,519	11,015	15,107	16,724	21	230	0	0	0	0	0	6,064	7	0	-246,235
7	0	0	5,787	93,787	1,737	4,612	17,432	0	0	0	11,015	9,827	12,637	26	410	0	0	0	0	0	6,677	14	3,786	-146,792
8	0	0	4,786	43,118	716	1,864	4,597	0	0	0	11,015	4,341	9,982	26	512	1,399	0	0	28,816	0	7,352	20	7,572	-38,596
9	0	0	3,345	18,849	0	778	4,211	0	0	0	11,015	1,910	7,626	26	512	11,228	0	0	29,165	0	8,094	20	11,359	-10,862
10	0	0	1,885	200	0	132	1,617	0	0	13,371	11,015	1,411	9,078	26	512	20,641	0	0	17,347	0	8,910	20	11,359	-22,251
11	0	0	0	0	0	0	0	0	0	0	8,261	413	0	26	512	21,134	0	0	48,213	(4,508)	9,808	20	11,359	34,546
12														26	512	21,162	0	0	84,294	0	10,796	20	11,359	84,770
13														26	512	22,960	0	0	144,154	0	11,883	20	11,359	143,918
14														26	512	22,582	0	0	163,597	0	13,078	20	11,359	164,935
15														26	512	20,558	0	0	134,542	0	14,393	20	11,359	139,218
16														26	512	20,508	0	0	127,059	45,802	15,839	20	11,359	179,033
17														26	512	20,211	0	0	128,330	0	17,430	20	11,359	136,391
18														26	512	20,422	0	0	397,604	0	19,179	20	11,359	407,203
19														26	512	20,529	0	1,007	421,327	0	21,104	20	11,359	431,736
20														26	512	20,305	0	2,014	182,174	0	23,222	20	11,359	193,918
21														26	512	20,529	0	2,350	190,220	78,511	25,551	20	11,359	282,245
22														26	512	20,422	0	1,343	132,728	0	28,113	20	11,359	149,918
23														26	512	22,344	0	0	414,790	0	30,931	20	11,359	434,219
24														26	512	23,016	0	1,720	447,251	0	34,031	20	11,359	467,388
25														26	512	20,751	5,054	3,441	144,288	0	37,441	20	11,359	163,325
26														26	512	20,082	10,108	4,014	127,026	109,401	41,192	20	11,359	254,256
27														26	512	20,790	7,581	2,294	251,102	0	45,318	20	11,359	276,597
28														26	512	20,701	2,527	0	790,376	0	49,857	20	11,359	827,846
29														26	512	20,016	0	0	756,174	0	54,850	20	11,359	801,849
30														26	512	21,088	0	0	332,856	0	60,341	20	11,359	382,951
31														26	512	21,069	0	0	279,868	107,338	66,382	20	11,359	443,361
32														26	512	20,082	0	0	236,544	0	73,028	20	11,359	300,331
33														26	512	23,186	0	0	1,046,595	0	80,337	20	11,359	1,114,588
34														26	512	23,194	0	1,007	979,653	0	88,378	20	11,359	1,054,672
35														26	512	20,162	0	2,014	273,617	0	97,223	20	11,359	359,505
36														26	512	21,119	0	2,350	506,445	0	106,952	20	11,359	600,769
37														26	512	20,995	0	1,343	424,176	0	117,654	20	11,359	530,334
38														26	512	22,159	0	0	936,249	0	129,426	20	11,359	1,054,357
39														26	512	23,273	0	0	1,208,157	0	142,376	20	11,359	1,338,102
40														26	512	21,089	0	0	462,712	0	156,620	20	11,359	609,085
41														26	512	20,133	0	0	304,547	323,416	172,289	20	11,359	790,962
42														26	512	20,245	0	0	371,772	0	189,525	20	11,359	551,894
43														26	512	23,153	0	0	1,759,886	0	208,485	20	11,359	1,956,059
44														26	512	24,332	0	1,720	1,490,298	0	229,340	20	11,359	1,704,427
45														26	512	24,434	5,054	3,441	25,204	0	252,281	20	11,359	255,397
46														26	512	24,434	10,108	4,014	0	0	277,516	20	11,359	249,801
47														26	512	24,434	7,581	2,294	0	0	305,274	20	11,359	281,807
48														26	512	24,434	2,527	0	0	0	335,809	20	11,359	319,689
49														26	512	24,434	0	1,007	0	0	369,397	20	11,359	354,797
50														26	512	24,434	0	2,014	0	0	406,343	20	11,359	390,736
Results:																			989,606	30,401	166,240	114	57,496	
NPV @10%		491	billion		EIRR		13.4%												15,799,156	646,833	4,422,199	899	488,417	21,357,504

Notes:

1 Operation and maintenance costs for small scale infrastructure, silvicultural infrastructure, and protection forests were calcuated as follows:
- O&M Cost for small scale infrastructure: 0.5 % of the total investment cost for the component
- O&M Cost for protection forest: Labor cost for tending, cleaning, and protection activities

2 Replacement cost
- Rplacement cost for silviculture infrastructure was estimated based on the assumption that watch towers and forest protection stations would be replaced every 15 and 20 years, respectively.
- Rplacement cost for small scale rural infrastructure was estimated assuming that the irrigation systems and water supply systems would be replaced every 20 years.

Table H-8. Results of Sensitivity Analysis (1)

Cae 1: 10% increase in cost NPV @10% 416 billion EIRR 12.7%

Yr	Investment Cost (1)													O&M Cost (2)			Replacement Cost (3)		Benefit (4)					Balance
	P. Works	S&P	CD & ID	Dev. of WPF	SPL3 Improve.	Dev. of CPF	Live Dev.	Small Infra	FFC	M&E	PM	P.C.	CS/ES	Small Infra	Silvi Infra	P. Forest	Small Infra	Silvi Infra	Wood/Timber	AR-CDM	REDD	VOC	Crop	(4-1-2-3)
1	0	0	0	0	0	0	0	0	0	0	3,029	151	0	0	0	0	0	0	0	0	(3,054)	0	0	-6,235
2	14,735	0	1,639	0	0	0	0	0	0	0	12,117	1,425	10,401	0	0	0	0	0	0	0	4,120	0	0	-36,196
3	0	9,075	14,531	0	530	0	569	0	0	0	12,117	1,841	23,675	0	0	0	0	0	0	(13,128)	4,539	0	0	-70,927
4	0	5,239	8,997	95,601	9,900	8,781	16,739	3,399	3,399	0	12,117	8,039	22,498	0	0	0	0	0	0	0	5,000	0	0	-189,707
5	0	4,931	7,941	173,441	10,876	14,312	13,749	1,164	1,164	0	12,117	14,206	22,716	17	84	0	0	0	0	0	5,506	0	0	-271,212
6	1,730	2,622	6,220	181,419	2,323	13,571	18,446	1,064	1,064	1,671	12,117	16,618	18,397	23	253	0	0	0	0	0	6,064	7	0	-271,465
7	0	0	6,366	103,166	1,910	5,073	19,175	0	0	0	12,117	10,809	13,901	28	451	0	0	0	0	0	6,677	14	3,786	-162,519
8	0	0	5,264	47,430	788	2,050	5,057	0	0	0	12,117	4,775	10,981	28	563	1,539	0	0	28,816	0	7,352	20	7,572	-46,832
9	0	0	3,680	20,734	0	855	4,632	0	0	0	12,117	2,101	8,389	28	563	12,351	0	0	29,165	0	8,094	20	11,359	-16,812
10	0	0	2,074	220	0	145	1,779	0	0	14,709	12,117	1,552	9,986	28	563	22,705	0	0	17,347	0	8,910	20	11,359	-28,240
11	0	0	0	0	0	0	0	0	0	0	9,087	454	0	28	563	23,248	0	0	48,213	(4,508)	9,808	20	11,359	31,512
12	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,278	0	0	84,294	0	10,796	20	11,359	82,600
13	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,256	0	0	144,154	0	11,883	20	11,359	141,569
14	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	24,840	0	0	163,597	0	13,078	20	11,359	162,623
15	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,613	0	0	134,542	0	14,393	20	11,359	137,109
16	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,559	0	0	127,059	45,802	15,839	20	11,359	176,929
17	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,232	0	0	128,330	0	17,430	20	11,359	134,316
18	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,464	0	0	397,604	0	19,179	20	11,359	405,107
19	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,582	0	1,108	421,327	0	21,104	20	11,359	429,529
20	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,336	0	2,216	182,174	0	23,222	20	11,359	191,632
21	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,582	0	2,585	190,220	78,511	25,551	20	11,359	279,903
22	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,464	0	1,477	132,728	0	28,113	20	11,359	147,688
23	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	24,578	0	0	414,790	0	30,931	20	11,359	431,931
24	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,317	0	1,892	447,251	0	34,031	20	11,359	464,860
25	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,826	5,559	3,785	144,288	0	37,441	20	11,359	160,347
26	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,090	11,119	4,416	127,026	109,401	41,192	20	11,359	250,782
27	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,869	8,339	2,523	251,102	0	45,318	20	11,359	273,477
28	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,771	2,780	0	790,376	0	49,857	20	11,359	825,469
29	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,017	0	0	756,174	0	54,850	20	11,359	799,794
30	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,197	0	0	332,856	0	60,341	20	11,359	380,788
31	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,176	0	0	279,868	107,338	66,382	20	11,359	441,200
32	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,090	0	0	236,544	0	73,028	20	11,359	298,269
33	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,505	0	0	1,046,595	0	80,337	20	11,359	1,112,216
34	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,513	0	1,108	979,653	0	88,378	20	11,359	1,052,198
35	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,178	0	2,216	273,617	0	97,223	20	11,359	357,234
36	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,231	0	2,585	506,445	0	106,952	20	11,359	598,369
37	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,094	0	1,477	424,176	0	117,654	20	11,359	528,047
38	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	24,375	0	0	936,249	0	129,426	20	11,359	1,052,088
39	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,600	0	0	1,208,157	0	142,376	20	11,359	1,335,721
40	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,198	0	0	462,712	0	156,620	20	11,359	606,922
41	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,146	0	0	304,547	323,416	172,289	20	11,359	788,895
42	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,269	0	0	371,772	0	189,525	20	11,359	549,816
43	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,468	0	0	1,759,886	0	208,485	20	11,359	1,953,690
44	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,765	0	1,892	1,490,298	0	229,340	20	11,359	1,701,768
45	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	5,559	3,785	25,204	0	252,281	20	11,359	252,050
46	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	11,119	4,416	0	0	277,516	20	11,359	245,892
47	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	8,339	2,523	0	0	305,274	20	11,359	278,322
48	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	2,780	0	0	0	335,809	20	11,359	316,939
49	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	0	1,108	0	0	369,397	20	11,359	352,199
50	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	0	2,216	0	0	406,343	20	11,359	388,038
	13,154	14,939	34,941	359,341	16,572	26,523	45,658	3,645	3,645	6,614	69,376	35,813	85,902	180	3,268	102,835	2,613	2,588	989,606	30,401	166,240	114	57,496	416,252

Cae 2: 20% increase in cost **NPV @10%** **341 billion** **EIRR** **12.1%**

Yr	Investment Cost (1)													O&M Cost (2)			Replacement Cost (3)		Benefit (4)					Balance
	P. Works	S&P	CD & ID	Dev. of WPF	SPL3 Improve.	Dev. of CPF	Live Dev.	Small Infra	FFC	M&E	PM	P.C.	CS/ES	Small Infra	Silvi Infra	P. Forest	Small Infra	Silvi Infra	Wood/Timber	AR-CDM	REDD	VOC	Crop	(4-1-2-3)
1	0	0	0	0	0	0	0	0	0	0	3,305	165	0	0	0	0	0	0	0	(3,054)	0	0	-6,524
2	16,075	0	1,787	0	0	0	0	0	0	0	13,218	1,554	11,346	0	0	0	0	0	0	4,120	0	0	-39,861
3	0	9,900	15,852	0	578	0	620	0	0	0	13,218	2,008	25,827	0	0	0	0	0	0	(13,128)	4,539	0	0	-76,594
4	0	5,716	9,815	104,292	10,800	9,579	18,261	3,708	3,708	0	13,218	8,769	24,543	0	0	0	0	0	0	0	5,000	0	0	-207,407
5	0	5,379	8,663	189,208	11,864	15,613	14,999	1,270	1,270	0	13,218	15,497	24,781	19	92	0	0	0	0	0	5,506	0	0	-296,368
6	1,887	2,861	6,786	197,911	2,534	14,805	20,123	1,161	1,161	1,823	13,218	18,128	20,069	25	276	0	0	0	0	0	6,064	7	0	-296,696
7	0	0	6,945	112,545	2,084	5,534	20,918	0	0	0	13,218	11,792	15,165	31	491	0	0	0	0	0	6,677	14	3,786	-178,246
8	0	0	5,743	51,742	860	2,237	5,516	0	0	0	13,218	5,209	11,979	31	614	1,679	0	0	28,816	0	7,352	20	7,572	-55,068
9	0	0	4,014	22,619	0	933	5,053	0	0	0	13,218	2,292	9,151	31	614	13,474	0	0	29,165	0	8,094	20	11,359	-22,762
10	0	0	2,262	240	0	158	1,940	0	0	16,046	13,218	1,693	10,893	31	614	24,769	0	0	17,347	0	8,910	20	11,359	-34,229
11	0	0	0	0	0	0	0	0	0	0	9,913	496	0	31	614	25,361	0	0	48,213	(4,508)	9,808	20	11,359	28,477
12	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,394	0	0	84,294	0	10,796	20	11,359	80,430
13	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,552	0	0	144,154	0	11,883	20	11,359	139,219
14	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,098	0	0	163,597	0	13,078	20	11,359	160,311
15	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,669	0	0	134,542	0	14,393	20	11,359	134,999
16	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,610	0	0	127,059	45,802	15,839	20	11,359	174,824
17	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,253	0	0	128,330	0	17,430	20	11,359	132,241
18	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,506	0	0	397,604	0	19,179	20	11,359	403,011
19	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,635	0	1,209	421,327	0	21,104	20	11,359	427,322
20	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,366	0	2,417	182,174	0	23,222	20	11,359	189,346
21	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,635	0	2,820	190,220	78,511	25,551	20	11,359	277,562
22	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,506	0	1,611	132,728	0	28,113	20	11,359	145,458
23	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	26,813	0	0	414,790	0	30,931	20	11,359	429,642
24	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,619	0	2,064	447,251	0	34,031	20	11,359	462,333
25	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,901	6,065	4,129	144,288	0	37,441	20	11,359	157,369
26	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,098	12,130	4,817	127,026	109,401	41,192	20	11,359	247,308
27	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,948	9,097	2,753	251,102	0	45,318	20	11,359	270,356
28	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,842	3,032	0	790,376	0	49,857	20	11,359	823,093
29	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,019	0	0	756,174	0	54,850	20	11,359	797,739
30	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,306	0	0	332,856	0	60,341	20	11,359	378,626
31	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,283	0	0	279,868	107,338	66,382	20	11,359	439,039
32	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,098	0	0	236,544	0	73,028	20	11,359	296,207
33	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,824	0	0	1,046,595	0	80,337	20	11,359	1,109,843
34	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,833	0	1,209	979,653	0	88,378	20	11,359	1,049,724
35	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,194	0	2,417	273,617	0	97,223	20	11,359	354,963
36	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,342	0	2,820	506,445	0	106,952	20	11,359	595,968
37	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,194	0	1,611	424,176	0	117,654	20	11,359	525,759
38	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	26,591	0	0	936,249	0	129,426	20	11,359	1,049,818
39	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,927	0	0	1,208,157	0	142,376	20	11,359	1,333,340
40	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,307	0	0	462,712	0	156,620	20	11,359	604,759
41	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,159	0	0	304,547	323,416	172,289	20	11,359	786,828
42	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,294	0	0	371,772	0	189,525	20	11,359	547,737
43	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,784	0	0	1,759,886	0	208,485	20	11,359	1,951,321
44	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,198	0	2,064	1,490,298	0	229,340	20	11,359	1,699,109
45	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	6,065	4,129	25,204	0	252,281	20	11,359	248,704
46	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	12,130	4,817	0	0	277,516	20	11,359	241,982
47	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	9,097	2,753	0	0	305,274	20	11,359	274,838
48	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	3,032	0	0	0	335,809	20	11,359	314,189
49	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	0	1,209	0	0	369,397	20	11,359	349,601
50	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	0	2,417	0	0	406,343	20	11,359	385,339
	14,350	16,297	38,118	392,008	18,078	28,934	49,809	3,976	3,976	7,215	75,682	39,068	93,711	196	3,566	112,183	2,851	2,824	989,606	30,401	166,240	114	57,496	341,015

Cae 3: 10% decrease in benefit **NPV @10%** **367 billion** **EIRR** **12.7%**

Yr	Investment Cost (1)													O&M Cost (2)			Replacement Cost (3)		Benefit (4)					Balance
	P. Works	S&P	CD & ID	Dev. of WPF	SPL3 Improve.	Dev. of CPF	Live Dev.	Small Infra	FFC	M&E	PM	P.C.	CS/ES	Small Infra	Silvi Infra	P. Forest	Small Infra	Silvi Infra	Wood/Timber	AR-CDM	REDD	VOC	Crop	(4-1-2-3)
1	0	0	0	0	0	0	0	0	0	0	2,754	138	0	0	0	0	0	0	0	(2,749)	0	0	-5,640
2	13,396	0	1,490	0	0	0	0	0	0	0	11,015	1,295	9,455	0	0	0	0	0	0	3,708	0	0	-32,943
3	0	8,250	13,210	0	482	0	517	0	0	0	11,015	1,674	21,522	0	0	0	0	0	0	(11,815)	4,085	0	0	-64,401
4	0	4,763	8,179	86,910	9,000	7,982	15,217	3,090	3,090	0	11,015	7,308	20,452	0	0	0	0	0	0	0	4,500	0	0	-172,506
5	0	4,483	7,219	157,674	9,887	13,011	12,499	1,058	1,058	0	11,015	12,914	20,651	15	77	0	0	0	0	0	4,956	0	0	-246,607
6	1,572	2,384	5,655	164,926	2,111	12,337	16,769	967	967	1,519	11,015	15,107	16,724	21	230	0	0	0	0	0	5,458	6	0	-246,842
7	0	0	5,787	93,787	1,737	4,612	17,432	0	0	0	11,015	9,827	12,637	26	410	0	0	0	0	0	6,010	12	3,408	-147,840
8	0	0	4,786	43,118	716	1,864	4,597	0	0	0	11,015	4,341	9,982	26	512	1,399	0	0	25,934	0	6,617	18	6,815	-42,972
9	0	0	3,345	18,849	0	778	4,211	0	0	0	11,015	1,910	7,626	26	512	11,228	0	0	26,248	0	7,285	18	10,223	-15,726
10	0	0	1,885	200	0	132	1,617	0	0	13,371	11,015	1,411	9,078	26	512	20,641	0	0	15,612	0	8,019	18	10,223	-26,015
11	0	0	0	0	0	0	0	0	0	0	8,261	413	0	26	512	21,134	0	0	43,392	(4,058)	8,828	18	10,223	28,057
12	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,162	0	0	75,865	0	9,717	18	10,223	74,123
13	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	22,960	0	0	129,739	0	10,694	18	10,223	127,177
14	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	22,582	0	0	147,238	0	11,770	18	10,223	146,129
15	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,558	0	0	121,088	0	12,953	18	10,223	123,187
16	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,508	0	0	114,353	41,222	14,255	18	10,223	159,025
17	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,211	0	0	115,497	0	15,687	18	10,223	120,677
18	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,422	0	0	357,844	0	17,261	18	10,223	364,387
19	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,529	0	1,007	379,194	0	18,994	18	10,223	386,355
20	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,305	0	2,014	163,957	0	20,900	18	10,223	172,240
21	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,529	0	2,350	171,198	70,660	22,996	18	10,223	251,679
22	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,422	0	1,343	119,456	0	25,301	18	10,223	132,696
23	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	22,344	0	0	373,311	0	27,838	18	10,223	388,509
24	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,016	0	1,720	402,526	0	30,628	18	10,223	418,121
25	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,751	5,054	3,441	129,859	0	33,697	18	10,223	144,015
26	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,082	10,108	4,014	114,323	98,461	37,073	18	10,223	225,357
27	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,790	7,581	2,294	225,992	0	40,786	18	10,223	245,817
28	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,701	2,527	0	711,338	0	44,871	18	10,223	742,685
29	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,016	0	0	680,557	0	49,365	18	10,223	719,609
30	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,088	0	0	299,570	0	54,307	18	10,223	342,493
31	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,069	0	0	251,881	96,604	59,744	18	10,223	396,864
32	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,082	0	0	212,889	0	65,725	18	10,223	268,236
33	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,186	0	0	941,936	0	72,304	18	10,223	1,000,757
34	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,194	0	1,007	881,688	0	79,540	18	10,223	946,731
35	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,162	0	2,014	246,255	0	87,500	18	10,223	321,283
36	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,119	0	2,350	455,800	0	96,257	18	10,223	538,292
37	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,995	0	1,343	381,759	0	105,889	18	10,223	475,013
38	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	22,159	0	0	842,624	0	116,484	18	10,223	946,652
39	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,273	0	0	1,087,341	0	128,138	18	10,223	1,201,910
40	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,089	0	0	416,441	0	140,958	18	10,223	546,013
41	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,133	0	0	274,093	291,075	155,060	18	10,223	709,798
42	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,245	0	0	334,595	0	170,573	18	10,223	494,626
43	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,153	0	0	1,583,897	0	187,636	18	10,223	1,758,084
44	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,332	0	1,720	1,341,268	0	206,406	18	10,223	1,531,325
45	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	5,054	3,441	22,683	0	227,053	18	10,223	226,511
46	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	10,108	4,014	0	0	249,764	18	10,223	220,912
47	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	7,581	2,294	0	0	274,747	18	10,223	250,142
48	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	2,527	0	0	0	302,228	18	10,223	284,970
49	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	0	1,007	0	0	332,457	18	10,223	316,719
50	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	0	2,014	0	0	365,709	18	10,223	348,964
	11,958	13,581	31,765	326,673	15,065	24,111	41,508	3,313	3,313	6,013	63,069	32,557	78,093	163	2,971	93,486	2,375	2,353	890,645	27,361	149,616	103	51,747	367,103

Cae 4: 20% decrease in benefit **NPV @10%** **243 billion** **EIRR** **11.8%**

Yr	Investment Cost (1)													O&M Cost (2)			Replacement Cost (3)		Benefit (4)					Balance
	P. Works	S&P	CD & ID	Dev. of WPF	SPL3 Improve.	Dev. of CPF	Live Dev.	Small Infra	FFC	M&E	PM	P.C.	CS/ES	Small Infra	Silvi Infra	P. Forest	Small Infra	Silvi Infra	Wood/Timber	AR-CDM	REDD	VOC	Crop	(4-1-2-3)
1	0	0	0	0	0	0	0	0	0	0	2,754	138	0	0	0	0	0	0	0	(2,443)	0	0	-5,335
2	13,396	0	1,490	0	0	0	0	0	0	0	11,015	1,295	9,455	0	0	0	0	0	0	3,296	0	0	-33,355
3	0	8,250	13,210	0	482	0	517	0	0	0	11,015	1,674	21,522	0	0	0	0	0	0	(10,503)	3,631	0	0	-63,542
4	0	4,763	8,179	86,910	9,000	7,982	15,217	3,090	3,090	0	11,015	7,308	20,452	0	0	0	0	0	0	0	4,000	0	0	-173,006
5	0	4,483	7,219	157,674	9,887	13,011	12,499	1,058	1,058	0	11,015	12,914	20,651	15	77	0	0	0	0	0	4,405	0	0	-247,157
6	1,572	2,384	5,655	164,926	2,111	12,337	16,769	967	967	1,519	11,015	15,107	16,724	21	230	0	0	0	0	0	4,851	5	0	-247,449
7	0	0	5,787	93,787	1,737	4,612	17,432	0	0	0	11,015	9,827	12,637	26	410	0	0	0	0	0	5,342	11	3,029	-148,887
8	0	0	4,786	43,118	716	1,864	4,597	0	0	0	11,015	4,341	9,982	26	512	1,399	0	0	23,053	0	5,882	16	6,058	-47,348
9	0	0	3,345	18,849	0	778	4,211	0	0	0	11,015	1,910	7,626	26	512	11,228	0	0	23,332	0	6,475	16	9,087	-20,589
10	0	0	1,885	200	0	132	1,617	0	0	13,371	11,015	1,411	9,078	26	512	20,641	0	0	13,877	0	7,128	16	9,087	-29,778
11	0	0	0	0	0	0	0	0	0	0	8,261	413	0	26	512	21,134	0	0	38,571	(3,607)	7,847	16	9,087	21,568
12	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,162	0	0	67,435	0	8,637	16	9,087	63,476
13	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	22,960	0	0	115,323	0	9,506	16	9,087	110,435
14	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	22,582	0	0	130,878	0	10,462	16	9,087	127,324
15	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,558	0	0	107,634	0	11,514	16	9,087	107,156
16	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,508	0	0	101,647	36,642	12,671	16	9,087	139,017
17	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,211	0	0	102,664	0	13,944	16	9,087	104,963
18	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,422	0	0	318,083	0	15,344	16	9,087	321,571
19	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,529	0	1,007	337,061	0	16,883	16	9,087	340,974
20	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,305	0	2,014	145,739	0	18,577	16	9,087	150,563
21	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,529	0	2,350	152,176	62,809	20,441	16	9,087	221,113
22	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,422	0	1,343	106,183	0	22,490	16	9,087	115,474
23	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	22,344	0	0	331,832	0	24,745	16	9,087	342,799
24	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,016	0	1,720	357,801	0	27,225	16	9,087	368,855
25	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,751	5,054	3,441	115,431	0	29,953	16	9,087	124,704
26	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,082	10,108	4,014	101,620	87,521	32,954	16	9,087	196,457
27	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,790	7,581	2,294	200,882	0	36,255	16	9,087	215,037
28	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,701	2,527	0	632,301	0	39,886	16	9,087	657,523
29	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,016	0	0	604,939	0	43,880	16	9,087	637,369
30	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,088	0	0	266,285	0	48,273	16	9,087	302,035
31	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,069	0	0	223,894	85,870	53,106	16	9,087	350,367
32	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,082	0	0	189,235	0	58,422	16	9,087	236,141
33	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,186	0	0	837,276	0	64,270	16	9,087	886,926
34	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,194	0	1,007	783,723	0	70,702	16	9,087	838,789
35	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,162	0	2,014	218,894	0	77,778	16	9,087	283,062
36	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,119	0	2,350	405,156	0	85,561	16	9,087	475,814
37	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,995	0	1,343	339,341	0	94,123	16	9,087	419,692
38	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	22,159	0	0	748,999	0	103,541	16	9,087	838,946
39	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,273	0	0	966,526	0	113,901	16	9,087	1,065,719
40	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	21,089	0	0	370,170	0	125,296	16	9,087	482,942
41	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,133	0	0	243,638	258,733	137,831	16	9,087	628,635
42	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	20,245	0	0	297,417	0	151,620	16	9,087	437,359
43	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	23,153	0	0	1,407,909	0	166,788	16	9,087	1,560,109
44	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,332	0	1,720	1,192,238	0	183,472	16	9,087	1,358,223
45	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	5,054	3,441	20,163	0	201,825	16	9,087	197,624
46	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	10,108	4,014	0	0	222,013	16	9,087	192,022
47	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	7,581	2,294	0	0	244,220	16	9,087	218,476
48	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	2,527	0	0	0	268,647	16	9,087	250,252
49	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	0	1,007	0	0	295,517	16	9,087	278,642
50	0	0	0	0	0	0	0	0	0	0	0	0	0	26	512	24,434	0	2,014	0	0	325,075	16	9,087	307,192
	11,958	13,581	31,765	326,673	15,065	24,111	41,508	3,313	3,313	6,013	63,069	32,557	78,093	163	2,971	93,486	2,375	2,353	791,685	24,321	132,992	91	45,997	242,718

Table I-8. Results of Sensitivity Analysis (2)

Cae 5: 10% increase in cost and 10 % decrease in benefit NPV @10% 292 billion EIRR 12.0%

Yr	Investment Cost (1)													O&M Cost (2)			Replacement Cost (3)		Benefit (4)					Balance
	P. Works	S&P	CD & ID	Dev. of WPF	SPL3 Improve.	Dev. of CPF	Live Dev.	Small Infra	FFC	M&E	PM	P.C.	CS/ES	Small Infra	Silvi Infra	P. Forest	Small Infra	Silvi Infra	Wood/Timber	AR-CDM	REDD	VOC	Crop	(4-1-2-3)
1	0	0	0	0	0	0	0	0	0	0	3,029	151	0	0	0	0	0	0	0	0	(2,749)	0	0	-5,929
2	14,735	0	1,639	0	0	0	0	0	0	0	12,117	1,425	10,401	0	0	0	0	0	0	0	3,708	0	0	-36,608
3	0	9,075	14,531	0	530	0	569	0	0	0	12,117	1,841	23,675	0	0	0	0	0	0	(11,815)	4,085	0	0	-70,068
4	0	5,239	8,997	95,601	9,900	8,781	16,739	3,399	3,399	0	12,117	8,039	22,498	0	0	0	0	0	0	0	4,500	0	0	-190,207
5	0	4,931	7,941	173,441	10,876	14,312	13,749	1,164	1,164	0	12,117	14,206	22,716	17	84	0	0	0	0	0	4,956	0	0	-271,763
6	1,730	2,622	6,220	181,419	2,323	13,571	18,446	1,064	1,064	1,671	12,117	16,618	18,397	23	253	0	0	0	0	0	5,458	6	0	-272,072
7	0	0	6,366	103,166	1,910	5,073	19,175	0	0	0	12,117	10,809	13,901	28	451	0	0	0	0	0	6,010	12	3,408	-163,567
8	0	0	5,264	47,430	788	2,050	5,057	0	0	0	12,117	4,775	10,981	28	563	1,539	0	0	25,934	0	6,617	18	6,815	-51,208
9	0	0	3,680	20,734	0	855	4,632	0	0	0	12,117	2,101	8,389	28	563	12,351	0	0	26,248	0	7,285	18	10,223	-21,676
10	0	0	2,074	220	0	145	1,779	0	0	14,709	12,117	1,552	9,986	28	563	22,705	0	0	15,612	0	8,019	18	10,223	-32,003
11	0	0	0	0	0	0	0	0	0	0	9,087	454	0	28	563	23,248	0	0	43,392	(4,058)	8,828	18	10,223	25,023
12	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,278	0	0	75,865	0	9,717	18	10,223	71,953
13	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,256	0	0	129,739	0	10,694	18	10,223	124,827
14	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	24,840	0	0	147,238	0	11,770	18	10,223	143,817
15	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,613	0	0	121,088	0	12,953	18	10,223	121,078
16	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,559	0	0	114,353	41,222	14,255	18	10,223	156,921
17	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,232	0	0	115,497	0	15,687	18	10,223	118,602
18	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,464	0	0	357,844	0	17,261	18	10,223	362,291
19	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,582	0	1,108	379,194	0	18,994	18	10,223	384,148
20	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,336	0	2,216	163,957	0	20,900	18	10,223	169,954
21	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,582	0	2,585	171,198	70,660	22,996	18	10,223	249,337
22	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,464	0	1,477	119,456	0	25,301	18	10,223	130,466
23	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	24,578	0	0	373,311	0	27,838	18	10,223	386,221
24	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,317	0	1,892	402,526	0	30,628	18	10,223	415,594
25	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,826	5,559	3,785	129,859	0	33,697	18	10,223	141,036
26	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,090	11,119	4,416	114,323	98,461	37,073	18	10,223	221,883
27	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,869	8,339	2,523	225,992	0	40,786	18	10,223	242,697
28	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,771	2,780	0	711,338	0	44,871	18	10,223	740,308
29	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,017	0	0	680,557	0	49,365	18	10,223	717,554
30	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,197	0	0	299,570	0	54,307	18	10,223	340,331
31	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,176	0	0	251,881	96,604	59,744	18	10,223	394,703
32	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,090	0	0	212,889	0	65,725	18	10,223	266,174
33	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,505	0	0	941,936	0	72,304	18	10,223	998,384
34	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,513	0	1,108	881,688	0	79,540	18	10,223	944,257
35	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,178	0	2,216	246,255	0	87,500	18	10,223	319,012
36	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,231	0	2,585	455,800	0	96,257	18	10,223	535,891
37	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,094	0	1,477	381,759	0	105,889	18	10,223	472,726
38	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	24,375	0	0	842,624	0	116,484	18	10,223	944,382
39	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,600	0	0	1,087,341	0	128,138	18	10,223	1,199,529
40	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,198	0	0	416,441	0	140,958	18	10,223	543,851
41	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,146	0	0	274,093	291,075	155,060	18	10,223	707,731
42	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,269	0	0	334,595	0	170,573	18	10,223	492,548
43	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,468	0	0	1,583,897	0	187,636	18	10,223	1,755,715
44	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,765	0	1,892	1,341,268	0	206,406	18	10,223	1,528,666
45	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	5,559	3,785	22,683	0	227,053	18	10,223	223,164
46	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	11,119	4,416	0	0	249,764	18	10,223	217,002
47	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	8,339	2,523	0	0	274,747	18	10,223	246,657
48	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	2,780	0	0	0	302,228	18	10,223	282,220
49	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	0	1,108	0	0	332,457	18	10,223	314,121
50	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	0	1,108	0	0	365,709	18	10,223	347,373
	13,154	14,939	34,941	359,341	16,572	26,523	45,658	3,645	3,645	6,614	69,376	35,813	85,902	180	3,268	102,835	2,613	2,579	890,645	27,361	149,616	103	51,747	291,876

Cae 6: 20% increase in cost and 10 % decrease in benefit **NPV @10%** **217 billion** **EIRR** **11.4%**

Yr	Investment Cost (1)													O&M Cost (2)			Replacement Cost (3)		Benefit (4)					Balance
	P. Works	S&P	CD & ID	Dev. of WPF	SPL3 Improve.	Dev. of CPF	Live Dev.	Small Infra	FFC	M&E	PM	P.C.	CS/ES	Small Infra	Silvi Infra	P. Forest	Small Infra	Silvi Infra	Wood/Timber	AR-CDM	REDD	VOC	Crop	(4-1-2-3)
1	0	0	0	0	0	0	0	0	0	0	3,305	165	0	0	0	0	0	0	0	0	(2,749)	0	0	-6,219
2	16,075	0	1,787	0	0	0	0	0	0	0	13,218	1,554	11,346	0	0	0	0	0	0	0	3,708	0	0	-40,273
3	0	9,900	15,852	0	578	0	620	0	0	0	13,218	2,008	25,827	0	0	0	0	0	0	(11,815)	4,085	0	0	-75,735
4	0	5,716	9,815	104,292	10,800	9,579	18,261	3,708	3,708	0	13,218	8,769	24,543	0	0	0	0	0	0	0	4,500	0	0	-207,907
5	0	5,379	8,663	189,208	11,864	15,613	14,999	1,270	1,270	0	13,218	15,497	24,781	19	92	0	0	0	0	0	4,956	0	0	-296,919
6	1,887	2,861	6,786	197,911	2,534	14,805	20,123	1,161	1,161	1,823	13,218	18,128	20,069	25	276	0	0	0	0	0	5,458	6	0	-297,303
7	0	0	6,945	112,545	2,084	5,534	20,918	0	0	0	13,218	11,792	15,165	31	491	0	0	0	0	0	6,010	12	3,408	-179,293
8	0	0	5,743	51,742	860	2,237	5,516	0	0	0	13,218	5,209	11,979	31	614	1,679	0	0	25,934	0	6,617	18	6,815	-59,444
9	0	0	4,014	22,619	0	933	5,053	0	0	0	13,218	2,292	9,151	31	614	13,474	0	0	26,248	0	7,285	18	10,223	-27,626
10	0	0	2,262	240	0	158	1,940	0	0	16,046	13,218	1,693	10,893	31	614	24,769	0	0	15,612	0	8,019	18	10,223	-37,992
11	0	0	0	0	0	0	0	0	0	0	9,913	496	0	31	614	25,361	0	0	43,392	(4,058)	8,828	18	10,223	21,988
12	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,394	0	0	75,865	0	9,717	18	10,223	69,783
13	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,552	0	0	129,739	0	10,694	18	10,223	122,477
14	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,098	0	0	147,238	0	11,770	18	10,223	141,505
15	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,669	0	0	121,088	0	12,953	18	10,223	118,968
16	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,610	0	0	114,353	41,222	14,255	18	10,223	154,816
17	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,253	0	0	115,497	0	15,687	18	10,223	116,527
18	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,506	0	0	357,844	0	17,261	18	10,223	360,195
19	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,635	0	1,209	379,194	0	18,994	18	10,223	381,941
20	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,366	0	2,417	163,957	0	20,900	18	10,223	167,669
21	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,635	0	2,820	171,198	70,660	22,996	18	10,223	246,996
22	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,506	0	1,611	119,456	0	25,301	18	10,223	128,235
23	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	26,813	0	0	373,311	0	27,838	18	10,223	383,932
24	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,619	0	2,064	402,526	0	30,628	18	10,223	413,067
25	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,901	6,065	4,129	129,859	0	33,697	18	10,223	138,058
26	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,098	12,130	4,817	114,323	98,461	37,073	18	10,223	218,408
27	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,948	9,097	2,753	225,992	0	40,786	18	10,223	239,576
28	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,842	3,032	0	711,338	0	44,871	18	10,223	737,931
29	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,019	0	0	680,557	0	49,365	18	10,223	715,498
30	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,306	0	0	299,570	0	54,307	18	10,223	338,168
31	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,283	0	0	251,881	96,604	59,744	18	10,223	392,543
32	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,098	0	0	212,889	0	65,725	18	10,223	264,112
33	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,824	0	0	941,936	0	72,304	18	10,223	996,012
34	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,833	0	1,209	881,688	0	79,540	18	10,223	941,783
35	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,194	0	2,417	246,255	0	87,500	18	10,223	316,741
36	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,342	0	2,820	455,800	0	96,257	18	10,223	533,491
37	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,194	0	1,611	381,759	0	105,889	18	10,223	470,438
38	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	26,591	0	0	842,624	0	116,484	18	10,223	942,112
39	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,927	0	0	1,087,341	0	128,138	18	10,223	1,197,148
40	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,307	0	0	416,441	0	140,958	18	10,223	541,688
41	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,159	0	0	274,093	291,075	155,060	18	10,223	705,664
42	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,294	0	0	334,595	0	170,573	18	10,223	490,470
43	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,784	0	0	1,583,897	0	187,636	18	10,223	1,753,346
44	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,198	0	2,064	1,341,268	0	206,406	18	10,223	1,526,007
45	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	6,065	4,129	22,683	0	227,053	18	10,223	219,817
46	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	12,130	4,817	0	0	249,764	18	10,223	213,093
47	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	9,097	2,753	0	0	274,747	18	10,223	243,172
48	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	3,032	0	0	0	302,228	18	10,223	279,471
49	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	0	1,209	0	0	332,457	18	10,223	311,523
50	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	0	2,417	0	0	365,709	18	10,223	343,567
	14,350	16,297	38,118	392,008	18,078	28,934	49,809	3,976	3,976	7,215	75,682	39,068	93,711	196	3,566	112,183	2,851	2,824	890,645	27,361	149,616	103	51,747	216,630

Cae 7: 10% increase in cost and 20 % decrease in benefit **NPV @10%** **167 billion** **EIRR** **11.2%**

Yr	Investment Cost (1)													O&M Cost (2)			Replacement Cost (3)		Benefit (4)					Balance
	P. Works	S&P	CD & ID	Dev. of WPF	SPL3 Improve.	Dev. of CPF	Live Dev.	Small Infra	FFC	M&E	PM	P.C.	CS/ES	Small Infra	Silvi Infra	P. Forest	Small Infra	Silvi Infra	Wood/Timber	AR-CDM	REDD	VOC	Crop	(4-1-2-3)
1	0	0	0	0	0	0	0	0	0	0	3,029	151	0	0	0	0	0	0	0	0	(2,443)	0	0	-5,624
2	14,735	0	1,639	0	0	0	0	0	0	0	12,117	1,425	10,401	0	0	0	0	0	0	0	3,296	0	0	-37,020
3	0	9,075	14,531	0	530	0	569	0	0	0	12,117	1,841	23,675	0	0	0	0	0	0	(10,503)	3,631	0	0	-69,209
4	0	5,239	8,997	95,601	9,900	8,781	16,739	3,399	3,399	0	12,117	8,039	22,498	0	0	0	0	0	0	0	4,000	0	0	-190,707
5	0	4,931	7,941	173,441	10,876	14,312	13,749	1,164	1,164	0	12,117	14,206	22,716	17	84	0	0	0	0	0	4,405	0	0	-272,313
6	1,730	2,622	6,220	181,419	2,323	13,571	18,446	1,064	1,064	1,671	12,117	16,618	18,397	23	253	0	0	0	0	0	4,851	5	0	-272,679
7	0	0	6,366	103,166	1,910	5,073	19,175	0	0	0	12,117	10,809	13,901	28	451	0	0	0	0	0	5,342	11	3,029	-164,614
8	0	0	5,264	47,430	788	2,050	5,057	0	0	0	12,117	4,775	10,981	28	563	1,539	0	0	23,053	0	5,882	16	6,058	-55,584
9	0	0	3,680	20,734	0	855	4,632	0	0	0	12,117	2,101	8,389	28	563	12,351	0	0	23,332	0	6,475	16	9,087	-26,539
10	0	0	2,074	220	0	145	1,779	0	0	14,709	12,117	1,552	9,986	28	563	22,705	0	0	13,877	0	7,128	16	9,087	-35,767
11	0	0	0	0	0	0	0	0	0	0	9,087	454	0	28	563	23,248	0	0	38,571	(3,607)	7,847	16	9,087	18,533
12	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,278	0	0	67,435	0	8,637	16	9,087	61,306
13	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,256	0	0	115,323	0	9,506	16	9,087	108,086
14	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	24,840	0	0	130,878	0	10,462	16	9,087	125,012
15	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,613	0	0	107,634	0	11,514	16	9,087	105,046
16	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,559	0	0	101,647	36,642	12,671	16	9,087	136,913
17	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,232	0	0	102,664	0	13,944	16	9,087	102,888
18	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,464	0	0	318,083	0	15,344	16	9,087	319,475
19	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,582	0	1,108	337,061	0	16,883	16	9,087	338,767
20	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,336	0	2,216	145,739	0	18,577	16	9,087	148,277
21	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,582	0	2,585	152,176	62,809	20,441	16	9,087	218,771
22	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,464	0	1,477	106,183	0	22,490	16	9,087	113,244
23	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	24,578	0	0	331,832	0	24,745	16	9,087	340,511
24	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,317	0	1,892	357,801	0	27,225	16	9,087	366,328
25	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,826	5,559	3,785	115,431	0	29,953	16	9,087	121,725
26	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,090	11,119	4,416	101,620	87,521	32,954	16	9,087	192,983
27	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,869	8,339	2,523	200,882	0	36,255	16	9,087	211,917
28	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,771	2,780	0	632,301	0	39,886	16	9,087	655,147
29	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,017	0	0	604,939	0	43,880	16	9,087	635,314
30	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,197	0	0	266,285	0	48,273	16	9,087	299,873
31	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,176	0	0	223,894	85,870	53,106	16	9,087	348,207
32	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,090	0	0	189,235	0	58,422	16	9,087	234,079
33	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,505	0	0	837,276	0	64,270	16	9,087	884,553
34	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,513	0	1,108	783,723	0	70,702	16	9,087	836,316
35	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,178	0	2,216	218,894	0	77,778	16	9,087	280,790
36	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,231	0	2,585	405,156	0	85,561	16	9,087	473,414
37	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,094	0	1,477	339,341	0	94,123	16	9,087	417,405
38	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	24,375	0	0	748,999	0	103,541	16	9,087	836,677
39	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,600	0	0	966,526	0	113,901	16	9,087	1,063,338
40	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	23,198	0	0	370,170	0	125,296	16	9,087	480,780
41	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,146	0	0	243,638	258,733	137,831	16	9,087	626,568
42	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	22,269	0	0	297,417	0	151,620	16	9,087	435,280
43	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	25,468	0	0	1,407,909	0	166,788	16	9,087	1,557,740
44	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,765	0	1,892	1,192,238	0	183,472	16	9,087	1,355,564
45	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	5,559	3,785	20,163	0	201,825	16	9,087	194,278
46	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	11,119	4,416	0	0	222,013	16	9,087	188,113
47	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	8,339	2,523	0	0	244,220	16	9,087	214,992
48	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	2,780	0	0	0	268,647	16	9,087	247,502
49	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	0	1,108	0	0	295,517	16	9,087	276,044
50	0	0	0	0	0	0	0	0	0	0	0	0	0	28	563	26,878	0	2,216	0	0	325,075	16	9,087	304,493
	13,154	14,939	34,941	359,341	16,572	26,523	45,658	3,645	3,645	6,614	69,376	35,813	85,902	180	3,268	102,835	2,613	2,588	791,685	24,321	132,992	91	45,997	167,481

Cae 8: 20% increase in cost and 20 % decrease in benefit **NPV @10%** **92 billion** **EIRR** **10.6%**

Yr	Investment Cost (1)													O&M Cost (2)			Replacement Cost (3)		Benefit (4)					Balance
	P. Works	S&P	CD & ID	Dev. of WPF	SPL3 Improve.	Dev. of CPF	Live Dev.	Small Infra	FFC	M&E	PM	P.C.	CS/ES	Small Infra	Silvi Infra	P. Forest	Small Infra	Silvi Infra	Wood/Timber	AR-CDM	REDD	VOC	Crop	(4-1-2-3)
1	0	0	0	0	0	0	0	0	0	0	3,305	165	0	0	0	0	0	0	0	0	(2,443)	0	0	-5,913
2	16,075	0	1,787	0	0	0	0	0	0	0	13,218	1,554	11,346	0	0	0	0	0	0	0	3,296	0	0	-40,685
3	0	9,900	15,852	0	578	0	620	0	0	0	13,218	2,008	25,827	0	0	0	0	0	0	(10,503)	3,631	0	0	-74,876
4	0	5,716	9,815	104,292	10,800	9,579	18,261	3,708	3,708	0	13,218	8,769	24,543	0	0	0	0	0	0	0	4,000	0	0	-208,407
5	0	5,379	8,663	189,208	11,864	15,613	14,999	1,270	1,270	0	13,218	15,497	24,781	19	92	0	0	0	0	0	4,405	0	0	-297,470
6	1,887	2,861	6,786	197,911	2,534	14,805	20,123	1,161	1,161	1,823	13,218	18,128	20,069	25	276	0	0	0	0	0	4,851	5	0	-297,910
7	0	0	6,945	112,545	2,084	5,534	20,918	0	0	0	13,218	11,792	15,165	31	491	0	0	0	0	0	5,342	11	3,029	-180,341
8	0	0	5,743	51,742	860	2,237	5,516	0	0	0	13,218	5,209	11,979	31	614	1,679	0	0	23,053	0	5,882	16	6,058	-63,820
9	0	0	4,014	22,619	0	933	5,053	0	0	0	13,218	2,292	9,151	31	614	13,474	0	0	23,332	0	6,475	16	9,087	-32,489
10	0	0	2,262	240	0	158	1,940	0	0	16,046	13,218	1,693	10,893	31	614	24,769	0	0	13,877	0	7,128	16	9,087	-41,756
11	0	0	0	0	0	0	0	0	0	0	9,913	496	0	31	614	25,361	0	0	38,571	(3,607)	7,847	16	9,087	15,499
12	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,394	0	0	67,435	0	8,637	16	9,087	59,136
13	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,552	0	0	115,323	0	9,506	16	9,087	105,736
14	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,098	0	0	130,878	0	10,462	16	9,087	122,700
15	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,669	0	0	107,634	0	11,514	16	9,087	102,937
16	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,610	0	0	101,647	36,642	12,671	16	9,087	134,808
17	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,253	0	0	102,664	0	13,944	16	9,087	100,813
18	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,506	0	0	318,083	0	15,344	16	9,087	317,379
19	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,635	0	1,209	337,061	0	16,883	16	9,087	336,560
20	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,366	0	2,417	145,739	0	18,577	16	9,087	145,991
21	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,635	0	2,820	152,176	62,809	20,441	16	9,087	216,429
22	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,506	0	1,611	106,183	0	22,490	16	9,087	111,013
23	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	26,813	0	0	331,832	0	24,745	16	9,087	338,222
24	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,619	0	2,064	357,801	0	27,225	16	9,087	363,801
25	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,901	6,065	4,129	115,431	0	29,953	16	9,087	118,747
26	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,098	12,130	4,817	101,620	87,521	32,954	16	9,087	189,509
27	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,948	9,097	2,753	200,882	0	36,255	16	9,087	208,797
28	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,842	3,032	0	632,301	0	39,886	16	9,087	652,770
29	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,019	0	0	604,939	0	43,880	16	9,087	633,258
30	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,306	0	0	266,285	0	48,273	16	9,087	297,710
31	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,283	0	0	223,894	85,870	53,106	16	9,087	346,046
32	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,098	0	0	189,235	0	58,422	16	9,087	232,017
33	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,824	0	0	837,276	0	64,270	16	9,087	882,181
34	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,833	0	1,209	783,723	0	70,702	16	9,087	833,842
35	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,194	0	2,417	218,894	0	77,778	16	9,087	278,519
36	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,342	0	2,820	405,156	0	85,561	16	9,087	471,013
37	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,194	0	1,611	339,341	0	94,123	16	9,087	415,117
38	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	26,591	0	0	748,999	0	103,541	16	9,087	834,407
39	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,927	0	0	966,526	0	113,901	16	9,087	1,060,957
40	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	25,307	0	0	370,170	0	125,296	16	9,087	478,617
41	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,159	0	0	243,638	258,733	137,831	16	9,087	624,501
42	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	24,294	0	0	297,417	0	151,620	16	9,087	433,202
43	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	27,784	0	0	1,407,909	0	166,788	16	9,087	1,555,371
44	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,198	0	2,064	1,192,238	0	183,472	16	9,087	1,352,905
45	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	6,065	4,129	20,163	0	201,825	16	9,087	190,931
46	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	12,130	4,817	0	0	222,013	16	9,087	184,203
47	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	9,097	2,753	0	0	244,220	16	9,087	211,507
48	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	3,032	0	0	0	268,647	16	9,087	244,752
49	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	0	1,209	0	0	295,517	16	9,087	273,446
50	0	0	0	0	0	0	0	0	0	0	0	0	0	31	614	29,321	0	2,417	0	0	325,075	16	9,087	301,795
	14,350	16,297	38,118	392,008	18,078	28,934	49,809	3,976	3,976	7,215	75,682	39,068	93,711	196	3,566	112,183	2,851	2,824	791,685	24,321	132,992	91	45,997	92,244

Table I-9. Analysis of Household Economy under With-Project Condition

Case 1: Afforestation/Reforestation **Area: 2 ha**

Items	Unit	Year																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Basic Income <1		**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**
2. Income from the project <2		**17.9**	**8.5**	**4.8**	**4.8**	**0.0**	**0.0**	**5.2**	**7.8**	**10.3**	**12.7**	**12.5**	**11.2**	**10.9**	**13.3**	**14.8**	**17.3**	**17.0**	**17.4**	**0.0**	**20.3**	**0.0**	**0.0**	**31.3**	**0.0**	**0.0**
2.1 Wage from the project	VND Mil.	17.9	8.5	4.8	4.8																					
2.2 Gross Benefit from harvest		0.0	0.0	0.0	0.0	0.0	0.0	5.2	7.8	10.3	12.7	12.5	11.2	10.9	13.3	14.8	17.3	17.0	17.4	0.0	20.3	0.0	0.0	31.3	0.0	0.0
3. Cash expenditures <2		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.9**	**1.2**	**1.6**	**1.9**	**1.9**	**1.7**	**1.6**	**1.9**	**2.2**	**2.5**	**2.4**	**2.5**	**0.0**	**2.3**	**0.0**	**0.0**	**3.5**	**0.0**	**0.0**
3.1 Cost for harvesting and transportation	VND Mil.	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.6	0.7	0.7	0.6	0.6	0.7	0.8	0.9	0.8	0.8	0.0	0.3	0.0	0.0	0.4	0.0	0.0
3.2 Sharing benefit with the Government	10% of N.I.	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.7	1.0	1.2	1.2	1.1	1.0	1.3	1.4	1.6	1.6	1.7	0.0	2.0	0.0	0.0	3.1	0.0	0.0
4. Labor Requirement after the project support<3																										
4.1 Site development	MD	273.7	16.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.2 Tending, weeding, thinning and pruning	MD	9.4	110.1	64.4	64.4	6.0	6.0	8.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	2.0	4.0	2.0	2.0
4.3 Forest protection	MD	14.6	14.6	14.6	14.6	7.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6
4.4 Clearing for fire break line	MD	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total	**MD**	**298.7**	**142.2**	**80.0**	**80.0**	**14.6**	**21.6**	**23.6**	**21.6**	**21.6**	**19.6**	**19.6**	**19.6**	**19.6**	**19.6**	**19.6**	**19.6**	**19.6**	**19.6**	**19.6**	**19.6**	**17.6**	**17.6**	**19.6**	**17.6**	**17.6**
(Equivallent to VND based on the prevailing labor c	VND Mil.	(17.9)	(8.5)	(4.8)	(4.8)	(0.9)	(1.3)	(1.4)	(1.3)	(1.3)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.2)	(1.1)	(1.1)	(1.2)	(1.1)	(1.1)
5. Net Cash Benefit																										
5.1 Total Net Cash Income	VND Mil.	**22.1**	**12.7**	**9.0**	**9.0**	**4.2**	**4.2**	**8.6**	**10.8**	**12.9**	**15.0**	**14.9**	**13.7**	**13.5**	**15.6**	**16.9**	**19.0**	**18.8**	**19.1**	**4.2**	**22.2**	**4.2**	**4.2**	**32.0**	**4.2**	**4.2**
5.2 Additional Income	VND Mil.	**17.9**	**8.5**	**4.8**	**4.8**	**0.0**	**0.0**	**4.4**	**6.6**	**8.7**	**10.8**	**10.7**	**9.5**	**9.3**	**11.4**	**12.7**	**14.8**	**14.6**	**14.9**	**0.0**	**18.0**	**0.0**	**0.0**	**27.8**	**0.0**	**0.0**
(Additional income per required labor force)	VND Th. /MD	(60.0)	(60.0)	(60.0)	(60.0)	(0.0)	(0.0)	(185.8)	(305.0)	(404.3)	(550.4)	(545.6)	(488.2)	(474.7)	(580.5)	(646.9)	(757.6)	(746.0)	(760.9)	(0.0)	(921.9)	(0.0)	(0.0)	(1421.0)	(0.0)	(0.0)
5.3 Average cash income for a certain period																										
(1) Average C.I for 5 year from 1st to 5th	VND Mil./yr	7.2																								
(2) Average C.I. for 10 years from 6th to 15th	VND Mil./yr	7.6																								
(3) Average C.I. for 10 years from 16th to 25th	VND Mil./yr	9.0																								

Case2: ANR with Enrichment **Area: 5 ha**

Items	Unit	Year																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Basic Income <1		**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**
2. Income from the project <2		**12.3**	**8.7**	**7.2**	**2.8**	**2.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**10.0**	**0.0**	**0.0**	**30.3**	**0.0**
2.1 Wage from the project	VND Mil.	12.3	8.7	7.2	2.8	2.8																				
2.2 Gross Benefit from harvest		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	30.3	0.0
3. Cash expenditures <2		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.1**	**0.0**	**0.0**	**3.4**	**0.0**
3.1 Cost for harvesting and transportation	VND Mil.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.4	0.0
3.2 Sharing benefit with the Government	10% of N.I.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	3.0	0.0
4. Labor Requirement after the project support <2																										
4.1 Clearing climers and insect affedted trees	MD	61.5	61.5	61.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.2 Spots weeding for the regenerating trees	MD	21.5	21.5	21.5	10.0	10.0	5.0	5.0	5.0	5.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0
4.3 Hole digging & back filling for indigenous spec	MD	56.2	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.4 Application of fertilizer	MD	19.1	19.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.5 Transport & planting of tree seedlings	MD	10.5	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.6 Thinning of Hopea	MD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	10.0	0.0
4.7 Protection	MD	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4
Total	**MD**	**205.1**	**144.5**	**119.4**	**46.4**	**46.4**	**41.4**	**41.4**	**41.4**	**41.4**	**41.4**	**36.4**	**41.4**	**36.4**	**41.4**	**36.4**	**41.4**	**36.4**	**41.4**	**36.4**	**41.4**	**46.4**	**41.4**	**36.4**	**51.4**	**36.4**
(Equivallent to VND based on the prevailing labor c	VND Mil.	(12.3)	(8.7)	(7.2)	(2.8)	(2.8)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.2)	(2.5)	(2.2)	(2.5)	(2.2)	(2.5)	(2.2)	(2.5)	(2.2)	(2.5)	(2.8)	(2.5)	(2.2)	(3.1)	(2.2)
5. Net Cash Benefit																										
5.1 Total Net Cash Income	VND Mil.	**16.5**	**12.9**	**11.4**	**7.0**	**7.0**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**13.1**	**4.2**	**4.2**	**31.1**	**4.2**
5.2 Additional Income	VND Mil.	**12.3**	**8.7**	**7.2**	**2.8**	**2.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**8.9**	**0.0**	**0.0**	**26.9**	**0.0**
(Additional income per required labor force)	VND Th. /MD	(60.0)	(60.0)	(60.0)	(60.0)	(60.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(192.3)	(0.0)	(0.0)	(523.4)	(0.0)
5.3 Average cash income for a certain period																										
(1) Average C.I for 5 year from 1st to 5th	VND Mil./yr	6.7																								
(2) Average C.I. for 10 years from 6th to 15th	VND Mil./yr	0.3																								
(3) Average C.I. for 10 years from 16th to 25th	VND Mil./yr	3.6																								

Table I-9. Analysis of Household Economy under With-Project Condition

Case 3: Protection		**20 ha**																								
Items	Unit	Year																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Basic Income <1		**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**
2. Income from the project <2		**8.7**	**8.7**	**8.7**	**8.7**	**8.7**	**0.0**	**0.0**	**0.0**	**0.0**	**130.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**253.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
2.1 Wage from the project	VND Mil.	8.7	8.7	8.7	8.7	8.7																				
2.2 Gross Benefit from harvest		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	130.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	253.5	0.0	0.0	0.0	0.0	0.0
3. Cash expenditures <2		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**14.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**27.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
3.1 Cost for harvesting and transportation	VND Mil.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
3.2 Sharing benefit with the Government	10% of N.I.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.1	0.0	0.0	0.0	0.0	0.0
4. Labor Requirement after the project support <2																										
4.1 Protection	MD	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6	145.6
4.2 selective cutting	MD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0
Total	**MD**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**205.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**	**205.6**	**145.6**	**145.6**	**145.6**	**145.6**	**145.6**
(Equivallent to VND based on the prevailing labor c	VND Mil.	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(12.3)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)	(12.3)	(8.7)	(8.7)	(8.7)	(8.7)	(8.7)
5. Net Cash Benefit																										
5.1 Total Net Cash Income	VND Mil.	**12.9**	**12.9**	**12.9**	**12.9**	**12.9**	**4.2**	**4.2**	**4.2**	**4.2**	**120.5**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**230.1**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**
5.2 Additional Income	VND Mil.	**8.7**	**8.7**	**8.7**	**8.7**	**8.7**	**0.0**	**0.0**	**0.0**	**0.0**	**116.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**225.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
(Additional income per required labor force)	VND Th. /MD	(60.0)	(60.0)	(60.0)	(60.0)	(60.0)	(0.0)	(0.0)	(0.0)	(0.0)	(565.8)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(1098.6)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
5.3 Average cash income for a certain period																										
(1) Average C.I for 5 year from 1st to 5th	VND Mil./yr	8.7																								
(2) Average C.I. for 10 years from 6th to 15th	VND Mil./yr	11.4																								
(3) Average C.I. for 10 years from 16th to 25th	VND Mil./yr	22.6																								

Note:
<1 Basic income is based on the results of household interview survey conducted by JICA Survey Team in July 2009.
<2 Data of harvestable volume of wood/timber and labor requirement for forest management and exploitation are based on the cost benefit analysis presented in Appendix xxxx.
<3 Constant price in 2009 is applied for estimation.

Attachments

ATTACHMENT I-1: ESTIMATION OF BEHEFITS FROM AFFORESTATION / REFORESTATION

Attachment I-1: **Table 3** to **Table 8** show the costs and benefits estimated for the designs of reforestation in watershed and coastal area, ANR with/without enrichment planting, forest protection, improvement of plantation. Based on these estimations per hector the economic benefit and the annual operation and maintenance cost were computed at the provincial level according to the types of activities and their scale, both of which are indicated in **Table 1** and **Table 2**.

Attachment I-1: Table 1. Breakdown of the Gross Benefits from Protection Forests

Province	Activities	Area (ha)	Total cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Thanh Hoa			**1,449,334**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3,119**	**3,267**	**1,126**	**2,781**	**4,636**	**9,658**	**11,106**	**7,904**	**7,366**	**7,057**	**35,428**	**36,999**	**10,373**	**10,727**	**7,300**	**41,285**	**44,109**	**11,602**	**13,192**	**19,870**	**78,162**	**79,622**	**27,869**	**22,480**	**23,631**	**102,586**	**96,287**	**27,541**	**41,877**	**32,012**	**97,679**	**115,143**	**34,482**	**29,524**	**37,439**	**171,087**	**143,008**	**0**	**0**	**0**	**0**	**0**	**0**
	Refo in WS	381	93,298				0	0	0	0	0	0	928	1,395	1,848	2,283	2,263	2,025	1,969	2,407	2,683	3,142	3,093	3,155	0	3,818	0	0	5,886	0	0	8,183	0	0	10,748	0	0	12,318	0	0	11,799	0	0	13,356	0	0	0	0	0	0	0	0	0
	1270	508	124,398					0	0	0	0	0	0	1,238	1,859	2,464	3,044	3,017	2,700	2,625	3,210	3,577	4,189	4,125	4,206	0	5,091	0	0	7,847	0	0	10,911	0	0	14,330	0	0	16,424	0	0	15,732	0	0	17,808	0	0	0	0	0	0	0	0	0
	ha	381	93,298					0	0	0	0	0	0	0	928	1,395	1,848	2,283	2,263	2,025	1,969	2,407	2,683	3,142	3,093	3,155	0	3,818	0	0	5,886	0	0	8,183	0	0	10,748	0	0	12,318	0	0	11,799	0	0	13,356	0	0	0	0	0	0	0	0	0
	Improvement	420	78,295				0	0	0	0	0	148	0	0	0	0	435	0	0	0	0	306	0	0	0	4,209	818	0	6,488	0	0	9,021	1,036	0	11,848	0	1,233	13,579	0	0	13,007	1,445	0	14,723	0	0	0	0	0	0	0	0	0
	1400	560	104,394					0	0	0	0	0	198	0	0	0	0	579	0	0	0	0	408	0	0	0	5,612	1,091	0	8,651	0	0	12,028	1,381	0	15,797	0	1,644	18,105	0	0	17,343	1,926	0	19,631	0	0	0	0	0	0	0	0	0
	ha	420	78,295					0	0	0	0	0	0	148	0	0	0	0	435	0	0	0	0	306	0	0	0	4,209	818	0	6,488	0	0	9,021	1,036	0	11,848	0	1,233	13,579	0	0	13,007	1,445	0	14,723	0	0	0	0	0	0	0	0	0
	PF	3300	401,059				0	0	0	0	3,119	0	0	0	0	3,517	0	0	0	0	27,567	0	0	0	0	30,103	0	0	0	0	62,417	0	0	0	0	67,889	0	0	0	0	72,873	0	0	0	0	133,574	0	0	0	0	0	0	0	0
	6600	3300	401,059					0	0	0	0	3,119	0	0	0	0	3,517	0	0	0	0	27,567	0	0	0	0	30,103	0	0	0	0	62,417	0	0	0	0	67,889	0	0	0	0	72,873	0	0	0	0	133,574	0	0	0	0	0	0	0	0
	ha		0																																																			
	ANR w/o EP	450	37,618				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,484	0	0	0	3,371	0	0	3,894	0	0	4,570	0	0	6,115	0	0	7,750	0	0	9,434	0	0	0	0	0	0	0	0	0
	900	450	37,618					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,484	0	0	0	3,371	0	0	3,894	0	0	4,570	0	0	6,115	0	0	7,750	0	0	9,434	0	0	0	0	0	0	0	0	0
	ha		0																																																		
Nghe An			**1,229,280**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,938**	**2,033**	**1,808**	**4,863**	**8,396**	**13,307**	**15,421**	**13,638**	**12,832**	**12,781**	**31,362**	**33,849**	**18,309**	**19,069**	**13,220**	**34,035**	**32,054**	**10,322**	**15,356**	**19,773**	**53,604**	**59,394**	**28,159**	**21,507**	**27,746**	**78,281**	**70,047**	**32,094**	**42,176**	**31,037**	**75,000**	**85,839**	**30,968**	**34,582**	**44,871**	**116,631**	**82,978**	**0**	**0**	**0**	**0**	**0**	**0**
	Refo in WS	690	168,966				0	0	0	0	0	0	1,681	2,526	3,347	4,134	4,098	3,667	3,565	4,360	4,859	5,690	5,602	5,714	0	6,915	0	0	10,659	0	0	14,820	0	0	19,464	0	0	22,308	0	0	21,369	0	0	24,188	0	0	0	0	0	0	0	0	0
	2300	920	225,288					0	0	0	0	0	0	2,242	3,368	4,463	5,512	5,464	4,890	4,754	5,813	6,478	7,586	7,470	7,618	0	9,220	0	0	14,212	0	0	19,761	0	0	25,952	0	0	29,744	0	0	28,492	0	0	32,251	0	0	0	0	0	0	0	0	0
	ha	690	168,966					0	0	0	0	0	0	0	1,681	2,526	3,347	4,134	4,098	3,667	3,565	4,360	4,859	5,690	5,602	5,714	0	6,915	0	0	10,659	0	0	14,820	0	0	19,464	0	0	22,308	0	0	21,369	0	0	24,188	0	0	0	0	0	0	0	0	0
	Improvement	270	50,333				0	0	0	0	0	95	0	0	0	0	279	0	0	0	0	197	0	0	0	2,706	526	0	4,171	0	0	5,799	666	0	7,616	0	793	8,729	0	0	8,362	929	0	9,465	0	0	0	0	0	0	0	0	0
	900	360	67,110					0	0	0	0	0	127	0	0	0	0	373	0	0	0	0	262	0	0	0	3,608	701	0	5,561	0	0	7,732	888	0	10,155	0	1,057	11,639	0	0	11,149	1,238	0	12,620	0	0	0	0	0	0	0	0	0
	ha	270	50,333					0	0	0	0	0	0	95	0	0	0	0	279	0	0	0	0	197	0	0	0	2,706	526	0	4,171	0	0	5,799	666	0	7,616	0	793	8,729	0	0	8,362	929	0	9,465	0	0	0	0	0	0	0	0	0
	PF	2050	249,143				0	0	0	0	1,938	0	0	0	0	2,185	0	0	0	0	17,125	0	0	0	0	18,701	0	0	0	0	38,774	0	0	0	0	42,173	0	0	0	0	45,270	0	0	0	0	82,978	0	0	0	0	0	0	0	0
	4100	2050	249,143					0	0	0	0	1,938	0	0	0	0	2,185	0	0	0	0	17,125	0	0	0	0	18,701	0	0	0	0	38,774	0	0	0	0	42,173	0	0	0	0	45,270	0	0	0	0	82,978	0	0	0	0	0	0	0	0
	ha		0																																																		
Ha Tinh			**1,700,625**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4,022**	**4,128**	**1,574**	**4,169**	**7,155**	**14,013**	**15,887**	**11,718**	**11,008**	**10,892**	**47,677**	**49,847**	**15,670**	**16,301**	**11,266**	**52,583**	**51,265**	**9,679**	**14,302**	**18,290**	**94,198**	**99,554**	**26,171**	**20,060**	**25,789**	**120,935**	**113,466**	**29,884**	**39,160**	**28,709**	**121,463**	**131,661**	**28,876**	**32,161**	**41,505**	**203,359**	**172,230**	**0**	**0**	**0**	**0**	**0**	**0**
	Refo in WS	588	143,988				0	0	0	0	0	0	1,433	2,152	2,853	3,523	3,492	3,125	3,038	3,715	4,140	4,849	4,774	4,869	0	5,893	0	0	9,083	0	0	12,630	0	0	16,587	0	0	19,010	0	0	18,210	0	0	20,612	0	0	0	0	0	0	0	0	0
	1960	784	191,984					0	0	0	0	0	0	1,911	2,870	3,803	4,697	4,656	4,167	4,051	4,954	5,520	6,465	6,365	6,492	0	7,857	0	0	12,111	0	0	16,839	0	0	22,116	0	0	25,347	0	0	24,280	0	0	27,483	0	0	0	0	0	0	0	0	0
	ha	588	143,988					0	0	0	0	0	0	0	1,433	2,152	2,853	3,523	3,492	3,125	3,038	3,715	4,140	4,849	4,774	4,869	0	5,893	0	0	9,083	0	0	12,630	0	0	16,587	0	0	19,010	0	0	18,210	0	0	20,612	0	0	0	0	0	0	0	0	0
	Improvement	300	55,925				0	0	0	0	0	106	0	0	0	0	310	0	0	0	0	218	0	0	0	3,006	585	0	4,634	0	0	6,444	740	0	8,463	0	881	9,699	0	0	9,291	1,032	0	10,517	0	0	0	0	0	0	0	0	0
	1000	400	74,567					0	0	0	0	0	141	0	0	0	0	414	0	0	0	0	291	0	0	0	4,009	779	0	6,179	0	0	8,592	986	0	11,283	0	1,174	12,932	0	0	12,388	1,376	0	14,022	0	0	0	0	0	0	0	0	0
	ha	300	55,925					0	0	0	0	0	0	106	0	0	0	0	310	0	0	0	0	218	0	0	0	3,006	585	0	4,634	0	0	6,444	740	0	8,463	0	881	9,699	0	0	9,291	1,032	0	10,517	0	0	0	0	0	0	0	0	0
	PF	4255	517,124				0	0	0	0	4,022	0	0	0	0	4,534	0	0	0	0	35,544	0	0	0	0	38,815	0	0	0	0	80,480	0	0	0	0	87,536	0	0	0	0	93,962	0	0	0	0	172,230	0	0	0	0	0	0	0	0
	8510	4255	517,124					0	0	0	0	4,022	0	0	0	0	4,534	0	0	0	0	35,544	0	0	0	0	38,815	0	0	0	0	80,480	0	0	0	0	87,536	0	0	0	0	93,962	0	0	0	0	172,230	0	0	0	0	0	0	0	0
	ha		0																																																		
Quang Binh			**460,843**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,170**	**3,317**	**5,841**	**7,738**	**9,015**	**9,230**	**8,734**	**8,895**	**9,910**	**11,502**	**12,562**	**13,139**	**9,205**	**8,785**	**8,622**	**7,018**	**7,415**	**12,883**	**10,412**	**10,537**	**17,511**	**13,999**	**13,540**	**22,115**	**17,602**	**15,519**	**26,127**	**20,954**	**14,865**	**26,709**	**21,754**	**17,233**	**22,978**	**25,619**	**8,386**	**0**	**0**	**0**	**0**	**0**	**0**
	Refo in WS	480	117,541				0	0	0	0	0	0	1,170	1,757	2,329	2,876	2,851	2,551	2,480	3,033	3,380	3,958	3,897	3,975	0	4,810	0	0	7,415	0	0	10,310	0	0	13,540	0	0	15,519	0	0	14,865	0	0	16,826	0	0	0	0	0	0	0	0	0
	1600	640	156,722					0	0	0	0	0	0	1,560	2,343	3,105	3,834	3,801	3,401	3,307	4,044	4,506	5,277	5,196	5,299	0	6,414	0	0	9,887	0	0	13,746	0	0	18,054	0	0	20,691	0	0	19,820	0	0	22,435	0	0	0	0	0	0	0	0	0
	ha	480	117,541					0	0	0	0	0	0	0	1,170	1,757	2,329	2,876	2,851	2,551	2,480	3,033	3,380	3,958	3,897	3,975	0	4,810	0	0	7,415	0	0	10,310	0	0	13,540	0	0	15,519	0	0	14,865	0	0	16,826	0	0	0	0	0	0	0	0	0
	PF	1500	0				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3000	1500	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ha		0																																																		
	ANR w/o EP	400	33,439				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,208	0	0	2,997	0	0	3,461	0	0	4,062	0	0	5,436	0	0	6,889	0	0	8,386	0	0	0	0	0	0	0	0	0
	800	400	33,439					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,208	0	0	2,997	0	0	3,461	0	0	4,062	0	0	5,436	0	0	6,889	0	0	8,386	0	0	0	0	0	0	0	0	0
	ha		0																																																		
	Refo in CS	120	648				0	0	0	0	0	0	0	0	0	0	2	0	0	4	0	0	8	0	0	0	0	0	0	0	0	227	0	0	0	0	0	0	0	0	407	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	400	160	865					0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	10	0	0	0	0	0	0	0	0	303	0	0	0	0	0	0	0	0	543	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ha	120	648					0	0	0	0	0	0	0	0	0	0	0	2	0	0	4	0	0	8	0	0	0	0	0	0	227	0	0	0	0	0	0	0	0	407	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quang Tri			**1,422,477**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,890**	**1,890**	**2,120**	**6,011**	**10,587**	**16,156**	**18,469**	**16,725**	**15,828**	**16,115**	**34,658**	**37,546**	**22,755**	**23,796**	**16,669**	**34,167**	**36,810**	**15,718**	**13,618**	**27,635**	**61,164**	**57,054**	**36,204**	**30,204**	**25,229**	**87,186**	**79,299**	**29,007**	**55,291**	**46,295**	**72,249**	**102,570**	**49,884**	**31,881**	**40,664**	**138,743**	**108,781**	**1,609**	**0**	**0**	**0**	**0**	**0**
	Refo in WS	870	213,044				0	0	0	0	0	0	2,120	3,185	4,221	5,212	5,167	4,624	4,496	5,497	6,126	7,174	7,064	7,204	0	8,719	0	0	13,440	0	0	18,687	0	0	24,542	0	0	28,128	0	0	26,943	0	0	30,498	0	0	0	0	0	0	0	0	0
	2900	1160	284,058					0	0	0	0	0	0	2,827	4,246	5,628	6,950	6,889	6,165	5,994	7,330	8,168	9,565	9,418	9,605	0	11,625	0	0	17,919	0	0	24,915	0	0	32,722	0	0	37,503	0	0	35,924	0	0	40,664	0	0	0	0	0	0	0	0	0
	ha	870	213,044					0	0	0	0	0	0	0	2,120	3,185	4,221	5,212	5,167	4,624	4,496	5,497	6,126	7,174	7,064	7,204	0	8,719	0	0	13,440	0	0	18,687	0	0	24,542	0	0	28,128	0	0	26,943	0	0	30,498	0	0	0	0	0	0	0	0	0
	PF	2000	243,066				0	0	0	0	1,890	0	0	0	0	2,131	0	0	0	0	16,707	0	0	0	0	18,244	0	0	0	0	37,829	0	0	0	0	41,145	0	0	0	0	44,165	0	0	0	0	80,954	0	0	0	0	0	0	0	0
	4000	2000	243,066					0	0	0	0	1,890	0	0	0	0	2,131	0	0	0	0	16,707	0	0	0	0	18,244	0	0	0	0	37,829	0	0	0	0	41,145	0	0	0	0	44,165	0	0	0	0	80,954	0	0	0	0	0	0	0	0
	ha		0																																																		
	ANR w/ EP	90	6,416				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	179	0	0	538	0	0	688	0	0	880	0	0	1,141	0	0	1,383	0	0	1,609	0	0	0	0	0	0	0	0
	300	120	8,555					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	238	0	0	718	0	0	917	0	0	1,173	0	0	1,521	0	0	1,843	0	0	0	2,145	0	0	0	0	0	0	0
	ha	90	6,416					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	179	0	0	538	0	0	688	0	0	880	0	0	1,141	0	0	1,383	0	0	0	1,609	0	0	0	0	0
	ANR w/o EP	1225	102,405				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,762	0	0	9,178	0	0	10,601	0	0	12,439	0	0	16,646	0	0	21,098	0	0	25,682	0	0	0	0	0	0	0	0	0
	2450	1225	102,405					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,762	0	0	9,178	0	0	10,601	0	0	12,439	0	0	16,646	0	0	21,098	0	0	25,682	0	0	0	0	0	0	0	0
	ha		0																																																		
T.T. Hue			**1,909,738**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3,781**	**3,781**	**2,193**	**6,219**	**10,952**	**18,771**	**21,163**	**17,302**	**16,373**	**16,671**	**51,984**	**54,972**	**23,539**	**24,617**	**17,244**	**52,961**	**54,332**	**14,936**	**14,200**	**26,926**	**98,249**	**95,885**	**35,574**	**29,513**	**26,534**	**127,761**	**119,787**	**30,563**	**54,287**	**45,222**	**118,105**	**145,021**	**48,167**	**33,854**	**42,066**	**217,104**	**186,448**	**2,681**	**0**	**0**	**0**	**0**	**0**
	Refo in WS	900	220,390				0	0	0	0	0	0	2,193	3,294	4,366	5,392	5,345	4,783	4,651	5,687	6,337	7,421	7,307	7,452	0	9,019	0	0	13,903	0	0	19,331	0	0	25,388	0	0	29,097	0	0	27,872	0	0	31,550	0	0	0	0	0	0	0	0	0
	3000	1200	293,853					0	0	0	0	0	0	2,924	4,392	5,822	7,189	7,127	6,378	6,201	7,582	8,450	9,895	9,743	9,937	0	12,026	0	0	18,537	0	0	25,775	0	0	33,850	0	0	38,797	0	0	37,163	0	0	42,066	0	0	0	0	0	0	0	0	0
	ha	900	220,390					0	0	0	0	0	0	0	2,193	3,294	4,366	5,392	5,345	4,783	4,651	5,687	6,337	7,421	7,307	7,452	0	9,019	0	0	13,903	0	0	19,331	0	0	25,388	0	0	29,097	0	0	27,872	0	0	31,550	0	0	0	0	0	0	0	0	0
	Improvement		0				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0		0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ha		0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PF	4000	486,133				0	0	0	0	3,781	0	0	0	0	4,263	0	0	0	0	33,414	0	0	0	0	36,489	0	0	0	0	75,657	0	0	0	0	82,290	0	0	0	0	88,331	0	0	0	0	161,908	0	0	0	0	0	0	0	0
	8000	4000	486,133					0	0	0	0	3,781	0	0	0	0	4,263	0	0	0	0	33,414	0	0	0	0	36,489	0	0	0	0	75,657	0	0	0	0	82,290	0	0	0	0	88,331	0	0	0	0	161,908	0	0	0	0	0	0	0	0
	ha		0																																																		
	ANR w/ EP	150	10,694				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	298	0	0	897	0	0	1,146	0	0	1,466	0	0	1,902	0	0	2,304	0	0	2,681	0	0	0	0	0	0	0	0
	500	200	14,259					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	397	0	0	1,196	0	0	1,528	0	0	1,955	0	0	2,535	0	0	3,072	0	0	3,575	0	0	0	0	0	0	0	0
	ha	150	10,694					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	298	0	0	897	0	0	1,146	0	0	1,466	0	0	1,902	0	0	2,304	0	0	2,681	0	0	0	0	0	0	0	0
	ANR w/o EP	1000	83,596				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,520

Attachment I-1: Table 1. Breakdown of the Gross Benefits from Protection Forests

Province	Activities	Area (ha)	Total cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Quang Ngai			1,514,464	0	0	0	0	0	0	0	1,512	1,512	2,559	7,255	12,777	18,631	21,422	20,186	19,102	19,449	35,031	38,516	27,463	28,719	20,118	33,813	36,434	18,450	16,577	32,818	58,033	53,892	43,128	36,069	30,995	87,876	78,589	35,706	65,890	55,335	70,132	104,705	59,455	39,573	49,077	133,091	97,356	3,217	0	0	0	0	0	0
	Refo in WS	1050	257,122				0	0	0	0	0	0	2,559	3,843	5,094	6,291	6,236	5,581	5,426	6,635	7,393	8,658	8,525	8,694	0	10,523	0	0	16,220	0	0	22,553	0	0	29,619	0	0	33,947	0	0	32,517	0	36,808	0	0	0	0	0	0	0	0	0	0	0	0
	3500	1400	342,829					0	0	0	0	0	0	3,412	5,125	6,792	8,388	8,315	7,441	7,234	8,846	9,858	11,544	11,367	11,593	0	14,030	0	0	21,627	0	0	30,070	0	0	39,492	0	0	45,263	0	0	43,357	0	0	49,077	0	0	0	0	0	0	0	0	0	0
	ha	1050	257,122						0	0	0	0	0	2,559	3,843	5,094	6,291	6,236	5,581	5,426	6,635	7,393	8,658	8,525	8,694	0	10,523	0	0	16,220	0	0	22,553	0	0	29,619	0	0	33,947	0	0	32,517	0	0	36,808	0	0	0	0	0	0	0	0	0	0
	PF	1600	194,453				0	0	0	0	1,512	0	0	0	0	1,705	0	0	0	0	13,366	0	0	0	0	14,596	0	0	0	0	30,263	0	0	0	0	32,916	0	0	0	0	35,332	0	0	0	64,763	0	0	0	0	0	0	0	0	0
	3200	1600	194,453					0	0	0	0	1,512	0	0	0	0	1,705	0	0	0	0	13,366	0	0	0	0	14,596	0	0	0	0	30,263	0	0	0	0	32,916	0	0	0	0	35,332	0	0	0	64,763	0	0	0	0	0	0	0	0	0
	ha		0																																																				
	ANR w/ EP	180	12,833				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	357	0	0	1,077	0	0	1,375	0	0	1,759	0	0	2,282	0	0	2,765	0	0	0	3,217	0	0	0	0	0	0	0	0	0
	600	240	17,110					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	476	0	0	0	1,435	0	0	1,834	0	0	2,346	0	0	3,043	0	0	3,687	0	0	4,290	0	0	0	0	0	0	0	0	0
	ha	180	12,833						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	357	0	0	1,077	0	0	1,375	0	0	1,759	0	0	2,282	0	0	2,765	0	0	3,217	0	0	0	0	0	0	0	0	0
	ANR w/o EP	1350	112,855				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,452	0	0	10,114	0	0	11,682	0	0	13,709	0	0	18,345	0	0	23,251	0	0	28,303	0	0	0	0	0	0	0	0	0
	2700	1350	112,855					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,452	0	0	10,114	0	0	11,682	0	0	13,709	0	0	18,345	0	0	23,251	0	0	28,303	0	0	0	0	0	0	0	0	0
	ha		0																																																			
Binh Dinh			1,451,087	0	0	0	0	0	0	0	1,753	1,753	1,813	5,141	9,053	13,970	15,948	14,303	13,535	13,781	30,847	33,317	19,459	20,350	14,255	30,538	39,834	20,427	11,493	32,930	64,185	51,066	41,643	36,316	20,987	90,008	83,012	24,054	64,006	55,988	64,004	112,158	63,514	26,081	34,775	150,433	124,352	0	0	0	0	0	0
	Refo in WS	744	182,189				0	0	0	0	0	0	1,813	2,723	3,609	4,457	4,419	3,954	3,845	4,701	5,239	6,135	6,041	6,161	0	7,456	0	0	11,493	0	0	15,980	0	0	20,987	0	0	24,054	0	0	23,041	0	0	26,081	0	0	0	0	0	0	0	0	0	0
	2480	992	242,919					0	0	0	0	0	0	2,417	3,631	4,812	5,943	5,891	5,272	5,126	6,268	6,985	8,180	8,054	8,214	0	9,941	0	0	15,324	0	0	21,307	0	0	27,983	0	0	32,072	0	0	30,721	0	0	34,775	0	0	0	0	0	0	0	0	0
	ha	744	182,189						0	0	0	0	0	0	1,813	2,723	3,609	4,457	4,419	3,954	3,845	4,701	5,239	6,135	6,041	6,161	0	7,456	0	0	11,493	0	0	15,980	0	0	20,987	0	0	24,054	0	0	23,041	0	0	26,081	0	0	0	0	0	0	0	0	0
	PF	1855	225,444				0	0	0	0	1,753	0	0	0	0	1,977	0	0	0	0	15,496	0	0	0	0	16,922	0	0	0	0	35,086	0	0	0	0	38,162	0	0	0	0	40,963	0	0	0	75,085	0	0	0	0	0	0	0	0	0
	3710	1855	225,444					0	0	0	0	1,753	0	0	0	0	1,977	0	0	0	0	15,496	0	0	0	0	16,922	0	0	0	0	35,086	0	0	0	0	38,162	0	0	0	0	40,963	0	0	0	75,085	0	0	0	0	0	0	0	0	0
	ha		0																																																			
	ANR w/o EP	2350	196,451				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12,971	0	0	17,606	0	0	20,336	0	0	23,863	0	0	31,934	0	0	40,473	0	0	49,268	0	0	0	0	0	0	0	0	0
	4700	2350	196,451					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12,971	0	0	17,606	0	0	20,336	0	0	23,863	0	0	31,934	0	0	40,473	0	0	49,268	0	0	0	0	0	0	0	0	0
	ha		0																																																		
Phu Yen			971,222	0	0	0	0	0	0	0	2,056	2,056	1,097	3,109	5,476	9,572	10,768	8,651	8,187	8,335	27,454	28,948	11,770	12,308	8,622	28,077	28,338	6,994	6,951	12,640	51,462	50,804	16,781	13,560	12,694	66,240	62,009	14,549	25,513	20,664	61,966	74,362	21,686	15,775	21,033	113,246	97,472	0	0	0	0	0	0
	Refo in WS	450	110,195				0	0	0	0	0	0	1,097	1,647	2,183	2,696	2,673	2,392	2,325	2,843	3,169	3,711	3,654	3,726	0	4,510	0	0	6,951	0	0	9,665	0	0	12,694	0	0	14,549	0	0	13,936	0	0	15,775	0	0	0	0	0	0	0	0	0
	1500	600	146,927					0	0	0	0	0	0	1,462	2,196	2,911	3,595	3,563	3,189	3,100	3,791	4,225	4,947	4,872	4,968	0	6,013	0	0	9,269	0	0	12,887	0	0	16,925	0	0	19,398	0	0	18,581	0	0	21,033	0	0	0	0	0	0	0	0	0
	ha	450	110,195					0	0	0	0	0	0	1,097	1,647	2,183	2,696	2,673	2,392	2,325	2,843	3,169	3,711	3,654	3,726	0	4,510	0	0	6,951	0	0	9,665	0	0	12,694	0	0	14,549	0	0	13,936	0	0	15,775	0	0	0	0	0	0	0	0	0
	PF	2175	264,335				0	0	0	0	2,056	0	0	0	0	2,318	0	0	0	0	18,169	0	0	0	0	19,841	0	0	0	0	41,139	0	0	0	0	44,745	0	0	0	0	48,030	0	0	0	88,037	0	0	0	0	0	0	0	0	0
	4350	2175	264,335					0	0	0	0	2,056	0	0	0	0	2,318	0	0	0	0	18,169	0	0	0	0	19,841	0	0	0	0	41,139	0	0	0	0	44,745	0	0	0	0	48,030	0	0	0	88,037	0	0	0	0	0	0	0	0	0
	ha		0																																																			
	ANR w/o EP	450	37,618				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,484	0	0	3,371	0	0	3,894	0	0	4,570	0	0	6,115	0	0	7,750	0	0	9,434	0	0	0	0	0	0	0	0	0
	900	450	37,618					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,484	0	0	3,371	0	0	3,894	0	0	4,570	0	0	6,115	0	0	7,750	0	0	9,434	0	0	0	0	0	0	0	0	0
	ha		0																																																		
Ninh Thuan			1,565,582	0	0	0	0	0	0	0	3,734	3,734	1,177	3,337	5,878	11,995	13,280	9,286	8,787	8,947	42,963	44,566	12,634	13,212	9,255	44,873	47,341	9,932	8,175	17,721	90,663	87,267	23,111	20,560	16,376	110,562	107,193	19,134	35,576	31,892	106,749	125,618	35,249	22,513	22,643	199,025	184,188	6,435	0	0	0	0	0
	Refo in WS	483	118,276				0	0	0	0	0	0	1,177	1,768	2,343	2,894	2,869	2,567	2,496	3,052	3,401	3,983	3,922	3,999	0	4,840	0	0	7,461	0	0	10,374	0	0	13,625	0	0	15,616	0	0	14,958	0	0	16,932	0	0	0	0	0	0	0	0	0
	1610	644	157,701					0	0	0	0	0	0	1,569	2,357	3,124	3,858	3,825	3,423	3,328	4,069	4,535	5,310	5,229	5,333	0	6,454	0	0	9,948	0	0	13,832	0	0	18,166	0	0	20,821	0	0	19,944	0	0	22,576	0	0	0	0	0	0	0	0	0
	ha	483	118,276						0	0	0	0	0	0	1,177	1,768	2,343	2,894	2,869	2,567	2,496	3,052	3,401	3,983	3,922	3,999	0	4,840	0	0	7,461	0	0	10,374	0	0	13,625	0	0	15,616	0	0	14,958	0	0	16,932	0	0	0	0	0	0	0	0	0
	PF	3950	480,056				0	0	0	3,734	0	0	0	0	4,209	0	0	0	0	32,997	0	0	0	0	36,033	0	0	0	0	74,712	0	0	0	0	81,261	0	0	0	0	87,227	0	0	0	159,884	0	0	0	0	0	0	0	0	0
	7900	3950	480,056					0	0	0	0	3,734	0	0	0	0	4,209	0	0	0	0	32,997	0	0	0	0	36,033	0	0	0	0	74,712	0	0	0	0	81,261	0	0	0	0	87,227	0	0	0	159,884	0	0	0	0	0	0	0	0	0
	ha		0																																																			
	ANR w/ EP	360	25,666				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	714	0	0	2,153	0	0	2,751	0	0	3,519	0	0	4,564	0	0	5,530	0	0	0	6,435	0	0	0	0	0	0	0	0	0
	1200	480	34,221					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	952	0	0	2,871	0	0	3,668	0	0	4,691	0	0	6,085	0	0	7,374	0	0	0	8,580	0	0	0	0	0	0	0	0	0
	ha	360	25,666						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	714	0	0	2,153	0	0	2,751	0	0	3,519	0	0	4,564	0	0	5,530	0	0	0	6,435	0	0	0	0	0	0	0	0	0
	ANR w/o EP	750	62,697				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,140	0	0	5,619	0	0	6,490	0	0	7,616	0	0	10,192	0	0	12,917	0	0	15,724	0	0	0	0	0	0	0	0	0
	1500	750	62,697					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,140	0	0	5,619	0	0	6,490	0	0	7,616	0	0	10,192	0	0	12,917	0	0	15,724	0	0	0	0	0	0	0	0	0
	ha		0																																																		
	Refo in CS	15	81				0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0	51	0	0	0	0	0	0	0	0	0	0	0	0
	50	20	108					0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0	68	0	0	0	0	0	0	0	0	0	0	0	0
	ha	15	81					0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0	51	0	0	0	0	0	0	0	0	0	0	0	0
Binh Thuan			794,567	0	0	0	0	0	0	0	1,701	1,701	1	1	1	1,923	1,924	5	11	15	15,048	15,058	29	22	0	16,420	28,011	11,591	0	15,733	50,404	34,880	18,798	18,172	0	58,355	58,355	0	28,537	28,537	39,749	75,916	37,287	1,492	1,119	116,885	116,885	0	0	0	0	0	0
	PF	1800	218,760				0	0	0	0	1,701	0	0	0	0	1,918	0	0	0	0	15,036	0	0	0	0	16,420	0	0	0	0	34,046	0	0	0	0	37,030	0	0	0	0	39,749	0	0	0	72,859	0	0	0	0	0	0	0	0	0
	3600	1800	218,760					0	0	0	0	1,701	0	0	0	0	1,918	0	0	0	0	15,036	0	0	0	0	16,420	0	0	0	0	34,046	0	0	0	0	37,030	0	0	0	0	39,749	0	0	0	72,859	0	0	0	0	0	0	0	0	0
	ha																																																						
	ANR w/o EP	2100	175,552				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11,591	0	0	15,733	0	0	18,172	0	0	21,325	0	0	28,537	0	0	36,167	0	0	0	44,026	0	0	0	0	0	0	0	0	0
	4200	2100	175,552					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11,591	0	0	15,733	0	0	18,172	0	0	21,325	0	0	28,537	0	0	36,167	0	0	0	44,026	0	0	0	0	0	0	0	0	0
	ha																																																				
	Refo in CS	330	1,783				0	0	0	0	0	0	1	0	0	5	0	0	11	0	0	22	0	0	0	0	0	0	0	0	0	625	0	0	0	0	0	0	0	0	0	1,119	0	0	0	0	0	0	0	0	0	0	0	0
	1100	440	2,377					0	0	0	0	0	0	1	0	0	6	0	0	15	0	0	29	0	0	0	0	0	0	0	0	834	0	0	0	0	0	0	0	0	0	1,492	0	0	0	0	0	0	0	0	0	0	0	0
	ha	330	1,783						0	0	0	0	0	0	1	0	0	5	0	0	11	0	0	22	0	0	0	0	0	0	0	625	0	0	0	0	0	0	0	0	0	1,119	0	0	0	0	0	0	0	0	0	0	0	0

Attachment I-1: Table 2. Annual Operation and Maintenance Cost for Protection Forest

Province	Activities	Area (ha)	NPV @ 10%	Total cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Thanh Hoa			**15,761**	**140,297**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**273**	**1,817**	**3,242**	**3,227**	**3,137**	**3,464**	**3,490**	**3,128**	**3,108**	**3,030**	**3,047**	**3,108**	**3,112**	**3,108**	**3,047**	**3,415**	**3,512**	**3,129**	**3,120**	**3,133**	**3,108**	**3,059**	**3,211**	**3,206**	**3,120**	**3,534**	**3,571**	**3,141**	**3,211**	**3,125**	**3,444**	**3,596**	**3,206**	**3,120**	**3,100**	**3,571**	**3,995**	**4,056**	**4,056**	**4,056**	**4,056**	**4,056**	**4,056**	**4,056**	**4,056**
	Refo in WS	381		5,570				0	0	0	0	101	149	163	149	149	135	135	135	135	135	135	135	135	135	135	135	122	122	135	122	122	135	122	122	135	122	122	135	122	122	135	122	122	135	122	122	122	122	122	122	122	122	122	122
	1270	508		7,264					0	0	0	0	135	199	218	199	199	181	181	181	181	181	181	181	181	181	181	162	162	181	162	162	181	162	162	181	162	162	181	162	162	181	162	162	162	162	162	162	162	162	162	162	162	162
	ha	381		5,327						0	0	0	0	101	149	163	149	149	135	135	135	135	135	135	135	135	135	135	122	122	135	122	122	135	122	122	135	122	122	135	122	122	135	122	122	122	122	122	122	122	122	122	122	122	122
	Improvement	420		7,468				0	0	0	0	172	233	172	142	142	142	203	142	142	142	142	203	142	142	142	142	203	142	203	142	142	203	203	203	142	203	203	142	203	203	203	203	203	203	203	203	203	203	203	203	203	203
	1400	560		9,687					0	0	0	0	230	311	230	189	189	189	270	189	189	189	189	270	189	189	189	189	270	189	270	189	189	270	270	189	270	189	270	270	189	189	270	270	189	270	189	270	270	270	270	270	270	270
	ha	420		7,063						0	0	0	0	172	233	172	142	142	142	203	142	142	142	142	203	142	142	142	142	203	142	203	142	142	203	203	203	142	203	203	142	203	203	203	203	203	203	203	203	203	203	203	203	203	203
	PF	3300		43,849				0	0	0	0	0	934	934	934	934	1,319	934	934	934	934	934	934	934	934	934	1,319	934	934	934	934	934	934	934	934	1,319	934	934	934	934	1,319	934	934	934	934	1,319	1,319	1,319	1,319	1,319	1,319	1,319	1,319	1,319
	6600	3300		42,530					0	0	0	0	0	934	934	934	934	1,319	934	934	934	934	934	934	934	934	934	1,319	934	934	934	934	934	934	934	934	1,319	934	934	934	934	1,319	934	934	934	934	1,319	1,319	1,319	1,319	1,319	1,319	1,319	1,319	1,319
	ha	0		0																																																					
	ANR w/o EP	450		5,854				0	0	0	0	0	135	119	119	135	119	119	135	119	119	135	119	119	135	119	119	168	119	119	168	119	119	185	119	119	185	119	119	185	119	119	135	168	168	168	168	168	168	168	168	168	168
	900	450		5,685					0	0	0	0	0	135	119	119	135	119	119	135	119	119	135	119	119	135	119	119	168	119	119	168	119	119	185	119	119	185	119	119	185	119	119	135	168	168	168	168	168	168	168	168	168	168
	ha	0		0																																																			
Nghe An			**11,794**	**102,118**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**294**	**1,393**	**2,421**	**2,484**	**2,410**	**2,580**	**2,586**	**2,334**	**2,321**	**2,282**	**2,282**	**2,321**	**2,334**	**2,321**	**2,282**	**2,521**	**2,535**	**2,276**	**2,302**	**2,284**	**2,263**	**2,263**	**2,324**	**2,315**	**2,302**	**2,523**	**2,541**	**2,315**	**2,324**	**2,263**	**2,502**	**2,563**	**2,315**	**2,302**	**2,284**	**2,541**	**2,768**	**2,808**	**2,808**	**2,808**	**2,808**	**2,808**	**2,808**	**2,808**
	Refo in WS	690		10,087				0	0	0	0	183	270	296	270	270	245	245	245	245	245	245	245	245	245	245	220	220	220	245	220	220	245	220	220	245	220	220	245	220	220	245	220	220	245	220	220	220	220	220	220	220	220	220	220
	2300	920		13,156					0	0	0	0	244	361	394	361	361	327	327	327	327	327	327	327	327	327	327	294	294	327	294	294	327	294	294	327	294	294	327	294	294	327	294	294	294	294	294	294	294	294	294	294	294	294
	ha	690		9,646						0	0	0	0	183	270	296	270	270	245	245	245	245	245	245	245	245	245	245	220	220	245	220	220	245	220	220	245	220	220	245	220	220	245	220	220	220	220	220	220	220	220	220	220	220	220
	Improvement	270		4,801				0	0	0	0	111	150	111	91	91	91	130	91	91	91	91	130	91	91	91	91	130	91	130	91	91	130	130	91	130	91	130	130	91	91	130	130	91	130	91	130	130	130	130	130	130	130
	900	360		6,228					0	0	0	0	148	200	148	121	121	121	174	121	121	121	121	174	121	121	121	121	174	121	174	121	121	174	174	121	174	121	174	174	121	121	174	174	121	174	121	174	174	174	174	174	174	174
	ha	270		4,540						0	0	0	0	111	150	111	91	91	91	130	91	91	91	91	130	91	91	91	91	130	91	130	91	91	130	130	91	130	91	130	130	91	91	130	130	91	130	91	130	130	130	130	130	130	130
	PF	2050		27,240				0	0	0	0	0	580	580	580	580	819	580	580	580	580	580	580	580	580	580	819	580	580	580	580	580	580	580	580	819	580	580	580	580	819	580	580	580	580	819	819	819	819	819	819	819	819
	4100	2050		26,420					0	0	0	0	0	580	580	580	580	819	580	580	580	580	580	580	580	580	580	819	580	580	580	580	580	580	580	580	819	580	580	580	580	819	580	580	580	580	819	819	819	819	819	819	819	819
	ha	0		0																																																		
Ha Tinh			**17,687**	**156,703**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**279**	**1,974**	**3,592**	**3,637**	**3,558**	**3,989**	**4,004**	**3,501**	**3,487**	**3,443**	**3,443**	**3,487**	**3,501**	**3,487**	**3,443**	**3,939**	**3,962**	**3,451**	**3,481**	**3,459**	**3,437**	**3,437**	**3,502**	**3,495**	**3,481**	**3,955**	**3,977**	**3,495**	**3,502**	**3,437**	**3,933**	**3,998**	**3,495**	**3,481**	**3,459**	**3,977**	**4,466**	**4,510**	**4,510**	**4,510**	**4,510**	**4,510**	**4,510**
	Refo in WS	588		8,596				0	0	0	0	156	230	252	230	230	209	209	209	209	209	209	209	209	209	209	188	188	209	188	188	209	188	188	209	188	188	209	188	188	209	188	188	209	188	188	188	188	188	188	188	188	188	188	188
	1960	784		11,211					0	0	0	0	208	307	336	307	307	279	279	279	279	279	279	279	279	279	279	250	250	279	250	250	279	250	250	279	250	250	279	250	250	279	250	250	279	250	250	250	250	250	250	250	250	250
	ha	588		8,220						0	0	0	0	156	230	252	230	230	209	209	209	209	209	209	209	209	209	209	188	188	209	188	188	209	188	188	209	188	188	209	188	188	209	188	188	209	188	188	188	188	188	188	188	188	188
	Improvement	300		5,334				0	0	0	0	123	167	123	101	101	101	145	101	101	101	101	145	101	101	101	101	145	101	145	101	101	145	145	101	145	101	145	145	101	101	145	145	101	145	101	145	145	145	145	145	145	145
	1000	400		6,919					0	0	0	0	164	222	164	135	135	135	193	135	135	135	135	193	135	135	135	135	193	135	193	135	135	193	193	135	193	135	193	193	135	135	193	193	135	193	135	193	193	193	193	193	193	193
	ha	300		5,045						0	0	0	0	123	167	123	101	101	101	145	101	101	101	101	145	101	101	101	101	145	101	145	101	101	145	145	101	145	101	145	145	101	101	145	145	101	145	101	145	145	145	145	145	145	145
	PF	4255		56,539				0	0	0	0	0	1,204	1,204	1,204	1,204	1,701	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,701	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,701	1,204	1,204	1,204	1,204	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701
	8510	4255		54,838					0	0	0	0	0	1,204	1,204	1,204	1,204	1,701	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,701	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,204	1,701	1,204	1,204	1,204	1,204	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701	1,701
	ha	0		0																																																			
Quang Binh			**3,974**	**33,136**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**127**	**478**	**810**	**862**	**871**	**836**	**798**	**795**	**795**	**781**	**795**	**795**	**781**	**795**	**795**	**781**	**807**	**784**	**740**	**789**	**784**	**740**	**804**	**798**	**740**	**804**	**798**	**740**	**804**	**798**	**740**	**804**	**798**	**740**	**760**	**798**	**810**	**810**	**810**	**810**	**810**	**810**	**810**	**810**
	Refo in WS	480		7,017				0	0	0	0	127	188	206	188	188	171	171	171	171	171	171	171	171	171	171	153	153	171	153	153	171	153	153	171	153	153	171	153	153	171	153	153	171	153	153	153	153	153	153	153	153	153	153	153
	1600	640		9,152					0	0	0	0	170	251	274	251	251	228	228	228	228	228	228	228	228	228	228	204	204	228	204	204	228	204	204	228	204	204	228	204	204	228	204	204	228	204	204	204	204	204	204	204	204	204
	ha	480		6,711						0	0	0	0	127	188	206	188	188	171	171	171	171	171	171	171	171	171	171	153	153	171	153	153	171	153	153	171	153	153	171	153	153	171	153	153	171	153	153	153	153	153	153	153	153	153
	PF	1500		0																																																		
	3000	1500		0																																																		
	ha	0		0																																																		
	ANR w/o EP	400		5,203				0	0	0	0	0	120	106	106	120	106	106	120	106	106	120	106	106	120	106	106	150	106	106	150	106	106	164	106	106	164	106	106	164	106	106	120	150	150	150	150	150	150	150	150	150	150
	800	400		5,054					0	0	0	0	0	120	106	106	120	106	106	120	106	106	120	106	106	120	106	106	150	106	106	150	106	106	164	106	106	164	106	106	164	106	106	120	150	150	150	150	150	150	150	150	150	150
	ha	0		0																																																		
	Refo in CS	120		0																																																		
		160		0																																																		
		120		0																																																		
Quang Tri			**14,704**	**129,088**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**231**	**1,611**	**2,947**	**3,050**	**3,084**	**3,254**	**3,164**	**2,942**	**2,940**	**2,898**	**2,940**	**2,942**	**2,896**	**2,942**	**2,940**	**3,131**	**3,238**	**2,966**	**2,828**	**2,975**	**2,964**	**2,831**	**3,017**	**3,011**	**2,828**	**3,256**	**3,246**	**2,834**	**3,020**	**3,015**	**3,065**	**3,256**	**3,013**	**2,834**	**2,877**	**3,242**	**3,543**	**3,552**	**3,552**	**3,552**	**3,552**	**3,552**	**3,552**
	Refo in WS	870		12,718				0	0	0	0	231	341	373	341	341	309	309	309	309	309	309	309	309	309	309	278	278	309	278	278	309	278	278	309	278	278	309	278	278	309	278	278	309	278	278	278	278	278	278	278	278	278	278	278
	2900	1160		16,588					0	0	0	0	308	455	497	455	455	412	412	412	412	412	412	412	412	412	412	370	370	412	370	370	412	370	370	412	370	370	412	370	370	412	370	370	412	370	370	370	370	370	370	370	370	370
	ha	870		12,163						0	0	0	0	231	341	373	341	341	309	309	309	309	309	309	309	309	309	309	278	278	309	278	278	309	278	278	309	278	278	309	278	278	309	278	278	309	278	278	278	278	278	278	278	278	278
	PF	2000		26,575				0	0	0	0	566	566	566	566	566	799	566	566	566	566	566	566	566	566	566	799	566	566	566	566	566	566	566	566	799	566	566	566	566	799	566	566	566	566	799	799	799	799	799	799	799	799
	4000	2000		25,776					0	0	0	0	0	566	566	566	566	799	566	566	566	566	566	566	566	566	566	799	566	566	566	566	566	566	566	566	799	566	566	566	566	799	566	566	566	566	799	799	799	799	799	799	799	799
	ha	0		0																																																		
	ANR w/ EP	90		1,190				0	0	0	0	0	27	27	27	27	27	24	27	24	27	24	27	24	27	24	27	30	27	24	34	24	27	30	27	24	37	24	27	34	27	24	37	24	27	24	34	34	34	34	34	34	34
	300	120		1,542					0	0	0	0	0	36	36	36	36	36	32	36	32	36	32	36	32	36	32	36	40	36	32	45	32	36	40	36	32	49	32	36	45	36	32	49	32	36	32	45	45	45	45	45	45	45
	ha	90		1,123						0	0	0	0	0	27	27	27	27	24	27	24	27	24	27	24	27	24	27	30	27	24	34	24	27	30	27	24	37	24	27	34	27	24	37	24	27	24	34	34	34	34	34	34	34	34
	ANR w/o EP	1225		15,935				0	0	0	0	0	369	324	324	369	324	324	369	324	324	369	324	324	369	324	324	458	324	324	458	324	324	502	324	324	502	324	324	502	324	324	502	324	324	369	458	458	458	458	458	458	458	458	458
	2450	1225		15,477					0	0	0	0	0	369	324	324	369	324	324	369	324	324	369	324	324	369	324	324	458	324	324	458	324	324	502	324	324	502	324	324	502	324	324	502	324	324	369	458	458	458	458	458	458	458	458	458
	ha	0		0																																																		
T.T. Hue			**20,253**	**179,670**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**239**	**2,150**	**4,030**	**4,164**	**4,189**	**4,590**	**4,505**	**4,040**	**4,037**	**4,004**	**4,037**	**4,040**	**4,000**	**4,040**	**4,037**	**4,470**	**4,554**	**4,051**	**3,935**	**4,058**	**4,047**	**3,938**	**4,091**	**4,087**	**3,935**	**4,567**	**4,558**	**3,944**	**4,097**	**4,095**	**4,407**	**4,567**	**4,091**	**3,944**	**3,971**	**4,550**	**5,073**	**5,090**	**5,090**	**5,090**	**5,090**	**5,090**	**5,090**
	Refo in WS	900		13,157				0	0	0	0	239	353	385	353	353	320	320	320	320	320	320	320	320	320	320	287	287	320	287	287	320	287	287	320	287	287	320	287	287	320	287	287	320	287	287	287	287	287	287	287	287	287
	3000	1200		17,160					0	0	0	0	319	470	514	470	470	427	427	427	427	427	427	427	427	427	427	383	383	427	383	383	427	383	383	427	383	383	427	383	383	427	383	383	427	383	383	383	383	383	383	383	383	383
	ha	900		12,582						0	0	0	0	239	353	385	353	353	320	320	320	320	320	320	320	320	320	320	287	287	320	287	287	320	287	287	320	287	287	320	287	287	320	287	287	320	287	287	287	287	287	287	287	287	287
	PF	4000		53,151				0	0	0	0	0	1,132	1,132	1,132	1,132	1,599	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,599	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,599	1,132	1,132	1,132	1,132	1,599	1,132	1,132	1,132	1,132	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599
	8000	4000		51,552					0	0	0	0	0	1,132	1,132	1,132	1,132	1,599	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,599	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,599	1,132	1,132	1,132	1,132	1,599	1,132	1,132	1,132	1,132	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599	1,599
	ha	0		0																																																		
	ANR w/ EP	150		1,984				0	0	0	0	0	45	45	45	45	45	40	45	40	45	40	45	40	45	40	45	51	45	40	56	40	45	51	45	40	62	40	45	56	45	40	62	40	45	40	56	56	56	56	56	56	56
	500	200		2,571					0	0	0	0	0	60	60	60	60	60	53	60	53	60	53	60	53	60	53	75	53	60	67	60	53	82	53	60	53	75	60	53	82	53	60	53	75	75	75	75	75	75	75	75	75	75
	ha	150		1,872						0	0	0	0	0	45	45	45	45	40	45	40	45	40	45	40	45	40	45	51	45	40	62	40	45	56	45	40	62	40	45	56	45	40	62	40	45	56	56	56	56	56	56	56	56	56
	ANR w/o EP	1000		13,008				0	0	0	0	0	301	265	265	301	265	265	301	265	265	301	265	265	301	265	265	374	265	265	374	265	265	410	265	265	410	265	265	410	265	265	301	374	374	374	374	374	374	374	374	374	374
	2000	1000		12,634					0	0	0	0	0	301	265	265	301	265	265	301	265	265	301	265	265	301	265	265	374	265	265	374	265	265	410	265	265	410	265	265	410	265	265	301	374	374	374	374	374	374	374	374	374	374
	ha	0		0																																																		
Quang Nam			**16,070**	**142,548**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**77**	**1,563**	**3,089**	**3,299**	**3,316**	**3,703**	**3,646**	**3,239**	**3,224**	**3,219**	**3,224**	**3,239**	**3,204**	**3,239**	**3,224**	**3,627**	**3,707**	**3,316**	**3,225**	**3,304**	**3,300**	**3,240**	**3,308**	**3,336**	**3,225**	**3,755**	**3,759**	**3,263**	**3,331**	**3,366**	**3,656**	**3,755**	**3,351**	**3,263**	**3,203**	**3,728**	**3,718**	**3,718**	**3,718**	**3,718**	**3,718**	**3,718**	**3,718**
	Refo in WS	291		4,254				0	0	0	0	77	114	125	114	114	103	103	103	103	103	103	103	103	103	103	93	93	103	93	93	103	93	93	103	93	93	103	93	93	103	93	93	103	93	93	93	93	93	93	93	93	93
	970	388		5,548					0	0	0	0	103	152	166	152	152	138	138	138	138	138	138	138	138	138	138	124	124	138	124	124	138	124	124	138	124	124	138	124	124	138	124	124	138	124	124	124	124	124	124	124	124	124
	ha	291		4,068						0	0	0	0	77	114	125	114	114	103	103	103	103	103	103	103	103	103	103	93	93	103	93	93	103	93	93	103	93	93	103	93	93	103	93	93	103	93	93	93	93	93	93	93	93	93
	PF	3500		46,507				0	0	0	0	0	991	991	991	991	1,399	991	991	991	991	991	991	991	991	991	1,399	991	991	991	991	991	991	991	991	1,399	991	991	991	991	1,399	991	991	991	991	1,399	1,399	1,399	1,399	1,399	1,399	1,399	1,399
	7000	3500		42,250					0	0	0	0	0	991	991	991	991	1,399	991	991	991	991	991	991	991	991	991	1,399	991	991	991	991	991	991	991	991	1,399	991	991	991	991	1,399	991	991	991	991	1,399	991	991	991	991	991	991	991
	ha	0		0																																																		
	ANR w/ EP	630		8,333				0	0	0	0	0	190	190	190	190	190	167	190	167	190	167	190	167	190	167	190	213	190	167	235	167	190	213	190	167	258	167	190	235	190	167	258	167	190	167	235	235	235	235	235	235	235
	2100	840		10,155					0	0	0	0	0	253	253	253	253	253	222	253	222	253	222	253	222	253	283	253	222	314

Province	Activities	Area (ha)	NPV @ 10%	Total cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Binh Dinh			**16,194**	**141,757**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**197**	**1,787**	**3,285**	**3,302**	**3,379**	**3,541**	**3,420**	**3,262**	**3,262**	**3,176**	**3,262**	**3,262**	**3,176**	**3,262**	**3,262**	**3,392**	**3,622**	**3,369**	**3,113**	**3,378**	**3,369**	**3,113**	**3,464**	**3,455**	**3,113**	**3,680**	**3,671**	**3,113**	**3,464**	**3,455**	**3,329**	**3,680**	**3,455**	**3,113**	**3,207**	**3,671**	**3,671**	**3,671**	**3,671**	**3,671**	**3,671**	**3,671**	**3,671**	**3,671**
	Refo in WS	744		10,876				0	0	0	0	197	292	319	292	292	265	265	265	265	265	265	265	265	265	265	265	238	238	265	238	238	265	238	238	265	238	238	265	238	238	265	238	238	265	238	238	238	238	238	238	238	238	238	238
	2480	992		14,185					0	0	0	0	263	389	425	389	389	353	353	353	353	353	353	353	353	353	353	353	317	317	353	317	317	353	317	317	353	317	317	353	317	317	353	317	317	353	317	317	317	317	317	317	317	317	317	317
	ha	744		10,591						0	0	0	0	197	292	319	292	292	265	265	265	265	265	265	265	265	265	265	265	238	238	265	238	238	265	238	238	265	238	238	265	238	238	265	238	238	265	238	238	265	265	265	265	265	265	265	265
	PF	1855		24,649				0	0	0	0	0	525	525	525	525	741	525	525	525	525	525	525	525	525	525	525	741	525	525	525	525	525	525	525	525	741	525	525	525	525	741	525	525	525	525	741	741	741	741	741	741	741	741	741
	3710	1855		22,393					0	0	0	0	0	525	525	525	525	741	525	525	525	525	525	525	525	525	525	525	741	525	525	525	525	525	525	741	525	525	525	525	741	525	525	525	525	525	525	525	525	525	525	525	525	525
	ha	0		0																																																			
	ANR w/o EP	2350		30,569				0	0	0	0	0	707	622	622	707	622	622	707	622	622	707	622	622	707	622	622	878	622	622	878	622	622	964	622	622	964	622	622	964	622	622	964	622	622	707	878	878	878	878	878	878	878	878	878
	4700	2350		28,495					0	0	0	0	0	707	622	622	707	622	622	707	622	622	707	622	622	707	622	622	878	622	622	878	622	622	964	622	622	964	622	622	964	622	622	964	622	622	707	707	707	707	707	707	707	707	707	707
	ha	0		0																																																		
Phu Yen			**9,392**	**81,624**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**119**	**1,087**	**1,914**	**1,903**	**1,897**	**2,135**	**2,097**	**1,859**	**1,859**	**1,843**	**1,859**	**1,859**	**1,843**	**1,859**	**1,859**	**2,097**	**2,129**	**1,854**	**1,821**	**1,876**	**1,854**	**1,821**	**1,892**	**1,870**	**1,821**	**2,146**	**2,124**	**1,821**	**1,892**	**1,870**	**2,075**	**2,146**	**1,870**	**1,821**	**1,843**	**2,124**	**2,124**	**2,124**	**2,124**	**2,124**	**2,124**	**2,124**	**2,124**	**2,124**
	Refo in WS	450		6,579				0	0	0	0	119	176	193	176	176	160	160	160	160	160	160	160	160	160	160	144	144	160	144	144	160	144	144	160	144	144	160	144	144	160	144	144	160	144	144	144	144	144	144	144	144	144	144	144
	1500	600		8,580					0	0	0	0	159	235	257	235	235	213	213	213	213	213	213	213	213	213	213	192	192	213	192	192	213	192	192	213	192	192	213	192	192	213	192	192	213	192	192	192	192	192	192	192	192	192	192	192
	ha	450		0																																																		
	PF	2175		28,901				0	0	0	0	0	616	616	616	616	869	616	616	616	616	616	616	616	616	616	616	869	616	616	616	616	616	616	616	616	869	616	616	616	616	869	616	616	616	616	616	869	869	869	869	869	869	869	869
	4350	2175		26,255					0	0	0	0	0	616	616	616	616	869	616	616	616	616	616	616	616	616	616	869	616	616	616	616	616	616	616	616	869	616	616	616	616	869	616	616	616	616	616	616	616	616	616	616	616	616	616	616
	ha	0		0																																																		
	ANR w/o EP	450		5,854				0	0	0	0	0	135	119	119	135	119	119	135	119	119	135	119	119	135	119	119	168	119	119	168	119	119	185	119	119	185	119	119	185	119	119	185	119	119	135	168	168	168	168	168	168	168	168	168
	900	450		5,456					0	0	0	0	0	135	119	119	135	119	119	135	119	119	135	119	119	135	119	119	168	119	119	168	119	119	185	119	119	185	119	119	185	119	119	185	119	119	135	135	135	135	135	135	135	135	135	135
	ha	0		0																																																		
Ninh Thuan			**17,830**	**157,076**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**128**	**1,812**	**3,501**	**3,649**	**3,670**	**4,096**	**4,032**	**3,577**	**3,568**	**3,549**	**3,568**	**3,577**	**3,541**	**3,577**	**3,568**	**4,010**	**4,092**	**3,625**	**3,526**	**3,622**	**3,616**	**3,535**	**3,641**	**3,652**	**3,526**	**4,123**	**4,122**	**3,548**	**3,654**	**3,670**	**4,000**	**4,123**	**3,661**	**3,548**	**3,533**	**4,104**	**4,104**	**4,104**	**4,104**	**4,104**	**4,104**	**4,104**	**4,104**	**4,104**
	Refo in WS	483		7,061				0	0	0	0	128	189	207	189	189	172	172	172	172	172	172	172	172	172	172	154	154	172	154	154	172	154	154	172	154	154	172	154	154	172	154	154	172	154	154	154	154	154	154	154	154	154	154	154
	1610	644		9,209					0	0	0	0	171	252	276	252	252	229	229	229	229	229	229	229	229	229	206	206	229	206	206	229	206	206	229	206	206	229	206	206	229	206	206	229	206	206	206	206	206	206	206	206	206	206	206	206
	ha	483		6,875						0	0	0	0	128	189	207	189	189	172	172	172	172	172	172	172	172	172	172	172	154	154	172	154	154	172	154	154	172	154	154	172	154	154	172	154	154	172	154	154	172	172	172	172	172	172	172	172
	PF	3950		52,486				0	0	0	0	0	1,118	1,118	1,118	1,118	1,579	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,579	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,579	1,118	1,118	1,118	1,118	1,579	1,118	1,118	1,118	1,118	1,579	1,579	1,579	1,579	1,579	1,579	1,579	1,579
	7900	3950		47,682					0	0	0	0	0	1,118	1,118	1,118	1,118	1,579	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,579	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,579	1,118	1,118	1,118	1,118	1,579	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118	1,118
	ha	0		0																																																		
	ANR w/ EP	360		4,761				0	0	0	0	0	108	108	108	108	108	95	108	95	108	95	108	95	108	95	108	121	108	95	135	95	108	121	108	95	148	95	108	135	108	95	148	95	108	95	135	135	135	135	135	135	135	135	135
	1200	480		5,803					0	0	0	0	0	145	145	145	145	145	127	145	127	145	127	145	127	145	127	145	162	145	127	179	127	145	162	145	127	197	127	145	179	145	127	197	127	145	127	127	127	127	127	127	127	127	127	127
	ha	360		4,348						0	0	0	0	0	108	108	108	108	108	95	108	95	108	95	108	95	108	95	108	121	108	95	135	95	108	121	108	95	148	95	108	135	108	95	148	95	108	108	108	108	108	108	108	108	108	108	108
	ANR w/o EP	750		9,756				0	0	0	0	0	226	199	199	226	199	199	226	199	199	226	199	199	226	199	199	280	199	199	280	199	199	308	199	199	308	199	199	308	199	199	308	199	199	226	280	280	280	280	280	280	280	280	280
	1500	750		9,094					0	0	0	0	0	226	199	199	226	199	199	226	199	199	226	199	199	226	199	199	280	199	199	280	199	199	308	199	199	308	199	199	308	199	199	308	199	199	226	226	226	226	226	226	226	226	226	226
	ha	0		0																																																		
	Refo in CS	15		0																																																		
		20		0																																																		
		15		0																																																		
Binh Thuan			**12,367**	**110,656**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**87**	**1,346**	**2,498**	**2,422**	**2,498**	**2,708**	**2,632**	**2,498**	**2,498**	**2,422**	**2,498**	**2,498**	**2,422**	**2,498**	**2,498**	**2,632**	**2,861**	**2,651**	**2,422**	**2,651**	**2,651**	**2,422**	**2,727**	**2,727**	**2,422**	**2,937**	**2,937**	**2,422**	**2,727**	**2,727**	**2,632**	**2,937**	**2,727**	**2,422**	**2,498**	**2,937**	**2,937**	**2,937**	**2,937**	**2,937**	**2,937**	**2,937**	**2,937**
	PF	1800		23,918				0	0	0	0	0	509	509	509	509	719	509	509	509	509	509	509	509	509	509	719	509	509	509	509	509	509	509	509	719	509	509	509	509	719	509	509	509	509	719	719	719	719	719	719	719	719	719	719
	3600	1800		21,729					0	0	0	0	0	509	509	509	509	719	509	509	509	509	509	509	509	509	509	719	509	509	509	509	509	509	509	719	509	509	509	509	719	509	509	509	509	509	509	509	509	509	509	509	509	509
	ha	0		0																																																		
	ANR w/o EP	2100		27,317				0	0	0	0	0	632	556	556	632	556	556	632	556	556	632	556	556	632	556	556	785	556	556	785	556	556	861	556	556	861	556	556	861	556	556	861	556	556	632	785	785	785	785	785	785	785	785	785
	4200	2100		25,463					0	0	0	0	0	632	556	556	632	556	556	632	556	556	632	556	556	632	556	556	785	556	556	785	556	556	861	556	556	861	556	556	861	556	556	861	556	556	632	632	632	632	632	632	632	632	632	632
	ha	0		0																																																		
	Refo in CS	330		3,756				0	0	0	0	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87
	1100	440		4,892					0	0	0	0	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116
	ha	330		3,581						0	0	0	0	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87

Assumptions	Rate	Unit
Acacia mangium planting density	800	seedling/ha
Dipterocarp planting density	800	seedling/ha
Replanting rate of Hopea	10%	seedling/ha
Replanting rate of Acacia	10%	seedling/ha
Price of Acacia seedling	700	VND/seedling
Price of Hopea seedling	2,400	VND/seeding
Price of NPK fertilizer	9,600	VND/kg
Price of firewood (ф ≤ 6cm)	70,000	VND/m^3
Price of acacia chipwood (ф ≥6cm)	558,290	VND/m^3
Price of acacia roundwood (ф ≥15cm)	1,168,290	VND/m^3
Price of Hopea roundwood (16-20cm)	2,178,290	VND/m^3
Price of Hopea roundwood (ф 20-45cm)	4,808,290	VND/m^3
Price of a labour-day	36,000	VND/day
Harvesting and internal transporting cost	41,710	VND/m^3

Attachment I-1: Table 3. Cost -Benefit Analysys of 1 ha of Hopea and Acacia plantation:

1,600 trees/ha, Harvesting of Acacia & Thinning of Hopea

Unit cost	850.3	VND/m3/km	
Average	50.0	km	

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Quantity of Inputs																		
Number of Acacia Seedlings	nos.	800	80															
No. of Hopea seedlings	nos.	800	80															
NPK fertilizer	kg	40																
Site preparation and planting	man-day	137	8															
Tending, weeding, sapling thinning and pruning	man-day	4.7	55.1	32.2	32.2	3.0	3.0	4.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Forest protection	man-day	7.3	7.3	7.3	7.3	3.8	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Clearing for fire break line	man-day	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Tiotal labor requirement	man-day	149.3	71.1	40.0	40.0	7.3	10.8	11.8	10.8	10.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
2. Cost of Production	('000 VND)					**265**	**392**	**428**	**392**	**392**	**356**	**356**	**356**	**356**	**356**	**356**	**356**	**356**
Cost of Acacia seedlings	('000 VND)																	
Cost of Hopea seedlings	('000 VND)																	
Cost of fertilizer	('000 VND)																	
Cost of site prparation & planting	('000 VND)																	
Tending, weeding, sapling thinning and pruning	('000 VND)					108	108	144	108	108	72	72	72	72	72	72	72	72
Clearing for fire break line	('000 VND)					18	18	18	18	18	18	18	18	18	18	18	18	18
Forest protection	('000 VND)					137	262	262	262	262	262	262	262	262	262	262	262	262
Cost for management and administration	('000 VND)					3	4	4	4	4	4	4	4	4	4	4	4	4
3. Yields of Products																		
Firewood (ф ≤ 6cm)	m3							1.1	0.6									
Acacia Chipwood (ф ≥6cm)	m3							4.2	5.1	5.7	5.7	5.6	5.0	4.9	4.7	5.3	6.2	4.7
Acacia Roundwood (ф ≥ 15cm)	m3								0.6	1.4	2.4	2.4	2.2	2.1	3.2	3.5	4.1	4.7
Hopea Roundwood (ф: 12-20cm)	m3																	
Hopea Roundwood (ф: 20-45cm)	m3																	
4. Value of Products (Gross Income)	('000 VND)							**2,437**	**3,660**	**4,851**	**5,991**	**5,939**	**5,315**	**5,167**	**6,319**	**7,041**	**8,246**	**8,119**
Income from firewood (ф ≤ 6cm)	('000 VND)							74	45									
Income from acacia chipwood (ф ≥6cm)	('000 VND)							2,363	2,866	3,185	3,158	3,131	2,802	2,724	2,638	2,940	3,443	2,625
Income from Acacia Roundwood (ф ≥ 15cm)	('000 VND)								750	1,666	2,833	2,808	2,513	2,443	3,680	4,101	4,803	5,494
Income from Hopea Roundwood (ф: 12-20cm)	('000 VND)																	
Income from Hopea Roundwood (ф: 20-45cm)	('000 VND)																	
5. Total Net Profit (4-2)	('000 VND)					**-265**	**-392**	**2,009**	**3,268**	**4,459**	**5,636**	**5,583**	**4,959**	**4,812**	**5,963**	**6,686**	**7,890**	**7,764**
6. CASH FLOW (4 - cash cost)	('000 VND)					**-2,628**	**-3,881**	**-1,804**	**-220**	**971**	**2,470**	**2,418**	**1,794**	**1,647**	**2,798**	**3,521**	**4,725**	**4,598**

Attachment I-1: Table 3. Cost -Benefit Analysys of 1 ha of Hopea and Acacia plantation: 1,600 trees/ha, Harvesting of Acacia & Thinning of Hopea

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
2.0	2.0	2.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0	1.0
7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
9.8	9.8	9.8	8.8	8.8	9.8	8.8	8.8	9.8	8.8	8.8	9.8	8.8	8.8	9.8	8.8	8.8	9.8	8.8	8.8	9.8	8.8	8.8
356	**356**	**356**	**319**	**319**	**356**	**319**	**319**	**356**	**319**	**319**	**356**	**319**	**319**	**356**	**319**	**319**	**356**	**319**	**319**	**356**	**319**	**319**
72	72	72	36	36	72	36	36	72	36	36	72	36	36	72	36	36	72	36	36	72	36	36
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262
4	4	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3
		0.3			0.5			0.7			0.9			1.1			1.0			1.2		
4.8																						
4.8																						
		1.7			2.6			3.6			4.7			5.4			5.1			5.8		
		1.3			2.0			2.8			3.7			4.3			4.1			4.6		
8,280		**10,022**			**15,448**			**21,479**			**28,209**			**32,330**			**30,969**			**35,055**		
		23			36			50			65			75			72			81		
2,677																						
5,603																						
		3,615			5,572			7,748			10,175			11,662			11,171			12,645		
		6,383			9,840			13,681			17,968			20,594			19,726			22,329		
7,925	**-356**	**9,666**	**-319**	**-319**	**15,092**	**-319**	**-319**	**21,123**	**-319**	**-319**	**27,853**	**-319**	**-319**	**31,975**	**-319**	**-319**	**30,613**	**-319**	**-319**	**34,700**	**-319**	**-319**
4,760	**-3,521**	**6,501**	**-3,161**	**-3,161**	**11,927**	**-3,161**	**-3,161**	**17,958**	**-3,161**	**-3,161**	**24,688**	**-3,161**	**-3,161**	**28,810**	**-3,161**	**-3,161**	**27,448**	**-3,161**	**-3,161**	**31,534**	**-3,161**	**-3,161**

Assumptions	Rate	Unit
Indigenous tree planting density	500	seedling/ha
Replanting rate of indigenous tree	10%	seedling/ha
Price of Hopea seedling	2,400	VND/seeding
Price of NPK fertilizer	9,600	VND/kg
Price of firewood (ф ≤ 6cm)	70,000	VND/m^3
Price of Pinus roundwood (16-20cm)	178,290	VND/m^3
Price of Pinus roundwood (ф 20-45cm)	258,290	VND/m^3
Price of Hopea roundwood (16-20cm)	2,178,290	VND/m^3
Price of Hopea roundwood (ф 20-45cm)	4,808,290	VND/m^3
Price of a labour-day	36,000	VND/day
Harvesting and internal transporting cost	41,710	VND/m^3

Unit cost 850.3 VND/m3/km
Average 50.0 km

Attachment I-1: Table 4. Cost -Benefit Analysys of 1 ha of indigenous tree plantation: 500 trees/ha, improvement of plantation

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Quantity of Inputs																		
No. of indigenous tree seedlings	nos.	500	50															
NPK fertilizer	kg	40																
Site preparation and planting	man-day	80	4															
Tending, weeding, sapling thinning and pruning	man-day	5	39	32	32	4	4	4	2	2	2	2	2	2	2	2	2	2
Pinus thinning	man-day						4					4					4	
Forest protection	man-day	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Total labor requirement	man-day	92	51	40	40	11	15	11	9	9	9	13	9	9	9	9	13	9
2. Cost of Production	('000 VND)					**410**	**556**	**410**	**337**	**337**	**337**	**483**	**337**	**337**	**337**	**337**	**483**	**337**
Cost of Indigenous tree seedlings	('000 VND)																	
Cost of fertilizer	('000 VND)																	
Cost of site prparation & planting	('000 VND)																	
Tending, weeding, sapling thinning and pruning	('000 VND)					144	144	144	72	72	72	72	72	72	72	72	72	72
Pimus thinning	('000 VND)						144					144					144	
Forest protection	('000 VND)					262	262	262	262	262	262	262	262	262	262	262	262	262
Cost for management and administration	('000 VND)					4	6	4	3	3	3	5	3	3	3	3	5	3
3. Yields of Products																		
Firewood (ф ≤ 6cm)	m3						0.3					0.5					0.7	
Indigenous tree Roundwood (ф: 12-20cm)	m3						1.4					2.0					2.8	
Indigenous tree Roundwood (ф: 20-45cm)	m3						0.3					2.5					0.7	
4. Value of Products (Gross Income)	('000 VND)						**353**					**1,035**					**728**	
Income from firewood (ф ≤ 6cm)	('000 VND)						24					35					49	
Indigenous tree Roundwood (ф: 12-20cm)	('000 VND)						242					356					499	
Indigenous tree Roundwood (ф: 20-45cm)	('000 VND)						87					644					181	
5. Total Net Profit (4-2)	('000 VND)					**-410**	**-203**	**-410**	**-337**	**-337**	**-337**	**552**	**-337**	**-337**	**-337**	**-337**	**245**	**-337**
6. CASH FLOW (4 - cash cost)	('000 VND)					**-4**	**347**	**-4**	**-3**	**-3**	**-3**	**1,030**	**-3**	**-3**	**-3**	**-3**	**723**	**-3**

Attachment I-1: Table 4. Cost -Benefit Analysys of 1 ha of indigenous tree plantation: 500 trees/ha, improvement of plantation

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
2	2	2	2	2	6	2	2	6	2	2	6	2	2	6	2	2	6	2	2	6	2	2
			4						4				4					4				4
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
9	9	9	13	9	13	9	9	13	13	9	13	9	13	13	9	9	13	13	9	13	9	13
337	**337**	**337**	**483**	**337**	**483**	**337**	**337**	**483**	**483**	**337**	**483**	**337**	**483**	**483**	**337**	**337**	**483**	**483**	**337**	**483**	**337**	**483**
72	72	72	72	72	216	72	72	216	72	72	216	72	72	216	72	72	216	72	72	216	72	72
			144						144				144					144				144
262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262
3	3	3	5	3	5	3	3	5	5	3	5	3	5	5	3	3	5	5	3	5	3	5
		0.3	0.9		0.5			0.7	1.2		0.9		1.4	1.1			1.0	1.7		1.2		
		1.7	3.8		2.6			3.6	4.8		4.7		5.7	5.4			5.1	6.6		5.8		
		1.3	4.7		2.0			2.8	5.9		3.7		7.1	4.3			4.1	8.3		4.6		
		10,022	**1,949**		**15,448**			**21,479**	**2,466**		**28,209**		**2,936**	**32,330**			**30,969**	**3,440**		**35,055**		
		23	66		36			50	83		65		99	75			72	116		81		
		3,615	670		5,572			7,748	848		10,175		1,009	11,662			11,171	1,182		12,645		
		6,383	1,213		9,840			13,681	1,535		17,968		1,828	20,594			19,726	2,141		22,329		
-337	**-337**	**9,684**	**1,466**	**-337**	**14,965**	**-337**	**-337**	**20,996**	**1,983**	**-337**	**27,726**	**-337**	**2,453**	**31,848**	**-337**	**-337**	**30,486**	**2,957**	**-337**	**34,572**	**-337**	**-483**
-3	**-3**	**10,018**	**1,944**	**-3**	**15,443**	**-3**	**-3**	**21,474**	**2,461**	**-3**	**28,204**	**-3**	**2,931**	**32,326**	**-3**	**-3**	**30,964**	**3,435**	**-3**	**35,050**	**-3**	**-5**

Assumptions	Rate	Unit
Price of firewood (ф ≤ 6cm)	94,000	VND/m^3
Price of indigenous tree roundwood (16-20cm)	2,178,290	VND/m^3
Price of indigenous tree roundwood (20-45cm)	4,808,290	VND/m^3
Price of a labour-day	36,000	VND/day
Harvesting and internal transporting cost	41,710	VND/m^3

Attachment I-1: Table 5. Cost -Benefit Analysys of 1 ha of Natural Forest Protection: 400 trees/ha, Selective cutting

Unit cost 850.3 VND/m3/km
Average 50.0 km

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Quantity of Inputs																		
Selective cutting	man-day										3							
Protection	man-day	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Tiotal labor requirement	man-day	7	7	7	7	7	7	7	7	7	10	7	7	7	7	7	7	7
2. Cost of Production	('000 VND)	**0**	**0**	**0**	**0**	**0**	**283**	**283**	**283**	**283**	**400**	**283**	**283**	**283**	**283**	**283**	**283**	**283**
Cost for protection	('000 VND)						262	262	262	262	262	262	262	262	262	262	262	262
Cost for selective cutting	('000 VND)						0	0	0	0	108	0	0	0	0	0	0	0
Cost for management and administration	('000 VND)						21	21	21	21	30	21	21	21	21	21	21	21
3. Yields of Products		**0**	**0**	**0**	**0**	**17**	**0**	**0**	**0**	**0**	**19**	**0**	**0**	**0**	**0**	**21**	**0**	**0**
Firewood (ф ≤ 6cm)	m3					10.1	0.0	0.0	0.0	0.0	11.3	0.0	0.0	0.0	0.0	10.5	0.0	0.0
Indigenous tree Roundwood (ф: 16-20cm)	m3					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0
Indigenous tree Roundwood (ф: 20-45cm)	m3					6.7	0.0	0.0	0.0	0.0	7.6	0.0	0.0	0.0	0.0	9.5	0.0	0.0
4. Value of Products (Gross Income)	('000 VND)	**0**	**0**	**0**	**0**	**945**	**0**	**0**	**0**	**0**	**1,066**	**0**	**0**	**0**	**0**	**8,354**	**0**	**0**
Income from firewood (ф ≤ 6cm)	('000 VND)	0	0	0	0	945	0	0	0	0	1,066	0	0	0	0	991	0	0
Income from indigenous tree Roundwood (ф: 16-20cm)	('000 VND)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,296	0	0
Income from indigenous tree Roundwood (ф: 20-45cm)	('000 VND)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,067	0	0
5. Total Net Profit (4-2)	('000 VND)	**0**	**0**	**0**	**0**	**945**	**-283**	**-283**	**-283**	**-283**	**666**	**-283**	**-283**	**-283**	**-283**	**8,070**	**-283**	**-283**
6. CASH FLOW (4 - cash cost)	('000 VND)	**0**	**0**	**0**	**0**	**945**	**-21**	**-21**	**-21**	**-21**	**1,036**	**-21**	**-21**	**-21**	**-21**	**8,333**	**-21**	**-21**

Attachment I-1: Table 5. Cost -Benefit Analysys of 1 ha of Natural Forest Protection: 400 trees/ha, Selective cutting

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
		3										3					3					3
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
7	7	10	7	7	7	7	7	7	7	7	7	10	7	7	7	7	10	7	7	7	7	10
283	**283**	**400**	**283**	**283**	**283**	**283**	**283**	**283**	**283**	**283**	**283**	**400**	**283**	**283**	**283**	**283**	**400**	**283**	**283**	**283**	**283**	**400**
262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262
0	0	108	0	0	0	0	0	0	0	0	0	108	0	0	0	0	108	0	0	0	0	108
21	21	30	21	21	21	21	21	21	21	21	21	30	21	21	21	21	30	21	21	21	21	30
0	**0**	**23**	**0**	**0**	**0**	**0**	**26**	**0**	**0**	**0**	**0**	**28**	**0**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**0**	**28**
0.0	0.0	10.5	0.0	0.0	0.0	0.0	11.5	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	11.3
0.0	0.0	1.2	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	5.6
0.0	0.0	11.6	0.0	0.0	0.0	0.0	11.5	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	11.3
0	**0**	**9,122**	**0**	**0**	**0**	**0**	**18,914**	**0**	**0**	**0**	**0**	**20,572**	**0**	**0**	**0**	**0**	**22,083**	**0**	**0**	**0**	**0**	**40,477**
0	0	985	0	0	0	0	1,080	0	0	0	0	1,174	0	0	0	0	1,128	0	0	0	0	1,061
0	0	2,537	0	0	0	0	5,560	0	0	0	0	6,048	0	0	0	0	6,533	0	0	0	0	12,289
0	0	5,600	0	0	0	0	12,274	0	0	0	0	13,350	0	0	0	0	14,422	0	0	0	0	27,127
-283	**-283**	**8,723**	**-283**	**-283**	**-283**	**-283**	**18,631**	**-283**	**-283**	**-283**	**-283**	**20,173**	**-283**	**-283**	**-283**	**-283**	**21,683**	**-283**	**-283**	**-283**	**-283**	**40,077**
-21	**-21**	**9,093**	**-21**	**-21**	**-21**	**-21**	**18,893**	**-21**	**-21**	**-21**	**-21**	**20,543**	**-21**	**-21**	**-21**	**-21**	**22,053**	**-21**	**-21**	**-21**	**-21**	**40,447**

Assumptions	Rate	Unit
Hopea planting density	400	seedling/ha
Replanting rate of Hopea	10%	seedling/ha
Price of Hopea seedling	2,400	VND/seeding
Price of NPK fertilizer	9,600	VND/kg
Price of firewood (ϕ ≤ 6cm)	70,000	VND/m^3
Price of Hopea roundwood (ϕ12-20cm)	2,178,290	VND/m^3
Price of Hopea roundwood (ϕ 20-45cm)	4,808,290	VND/m^3
Price of a labour-day	36,000	VND/day
Harvesting and internal transporting cost	41,710	VND/m^3

Attachment I-1: Table 6. Cost -Benefit Analysys of 1 ha of planting *Hopea odorata* :

400 tree/ha (ANR with enrichment planting)

	Average
	1,350 VND/ton/km
	850.5 VND/m3/km
	0.63 weight/volume
	50 km

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Quantity of Inputs																		
No. of Hopea seedlings	nos.	400	40															
NPK fertilizer	kg	20	2															
Clearing climers and insect affedted trees	man-day	12	12	12														
Spots weeding for the regenerating trees	man-day	4	4	4	2	2	1	1	1	1	1		1		1		1	
Hole digging & back filling for indigenous species	man-day	11	1															
Application of fertilizer	man-day	4	4															
Transport & planting of tree seedlings	man-day	2	0.2															
Thinning of Hopea	man-day																	
Protection	man-day	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Tiotal labor requirement	man-day	41	29	24	9	9	8	8	8	8	8	7	8	7	8	7	8	7
2. Cost of Production	('000 VND)						**301**	**301**	**301**	**301**	**301**	**265**	**301**	**265**	**301**	**265**	**301**	**265**
Cost of Hopea seedlings	('000 VND)																	
Cost of fertilizer	('000 VND)																	
Cost of clearing climers and insect affedted trees	('000 VND)																	
Cost for spots weeding for the regenerating trees	('000 VND)						36	36	36	36	36		36		36		36	
Cost for hole digging & back filling for indigenous species	('000 VND)																	
Cost for application of fertilizer	('000 VND)																	
Cost for transport & planting of tree seedlings	('000 VND)																	
Thinning of Hopea	('000 VND)																	
Protection	('000 VND)						262	262	262	262	262	262	262	262	262	262	262	262
Cost for management and administration	('000 VND)						3	3	3	3	3	3	3	3	3	3	3	3
3. Yields of Products																		
Firewood (ϕ ≤ 6cm)	m3																	
Hopea Roundwood (ϕ: 12-20cm)	m3																	
Hopea Roundwood (ϕ: 20-45cm)	m3																	
4. Value of Products (Gross Income)	('000 VND)																	
Income from firewood (ϕ ≤ 6cm)	('000 VND)																	
Income from Hopea Roundwood (ϕ: 12-20cm)	('000 VND)																	
Income from Hopea Roundwood (ϕ: 20-45cm)	('000 VND)																	
5. Total Net Profit (4-2)	('000 VND)						**-301**	**-301**	**-301**	**-301**	**-301**	**-265**	**-301**	**-265**	**-301**	**-265**	**-301**	**-265**
6. CASH FLOW (4 - cash cost)	('000 VND)						**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**

Attachment I-1: Table 6. Cost -Benefit Analysys of 1 ha of planting *Hopea odorata* : 400 tree/ha (ANR with enrichment planting)

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1		1		1		1		1		1		1		1		1		1		1		1
			2			2			2			3			3			3				2
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	7	8	9	8	7	10	7	8	9	8	7	11	7	8	10	8	7	11	7	8	7	10
301	**265**	**301**	**337**	**301**	**265**	**374**	**265**	**301**	**337**	**301**	**265**	**410**	**265**	**301**	**374**	**301**	**265**	**410**	**265**	**301**	**265**	**374**
36		36		36		36		36		36		36		36		36		36		36		36
			72			72			72			108			108			108				72
262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262
3	3	3	3	3	3	4	3	3	3	3	3	4	3	3	4	3	3	4	3	3	3	4
			0.1			0.2			0.2			0.3			0.3			0.4				0.5
			0.3			1.0			0.6			0.8			0.9			1.1				0.9
			0.3			0.8			1.3			1.7			2.2			2.7				3.3
			1,983			**5,981**			**7,641**			**9,774**			**12,677**			**15,362**				**17,875**
			5			14			15			19			22			27				33
			715			2,157			1,408			1,801			2,058			2,493				2,045
			1,263			3,810			6,217			7,953			10,598			12,842				15,797
-301	**-265**	**-301**	**1,646**	**-301**	**-265**	**5,607**	**-265**	**-301**	**7,304**	**-301**	**-265**	**9,364**	**-265**	**-301**	**12,304**	**-301**	**-265**	**14,952**	**-265**	**-301**	**-265**	**17,501**
-3	**-3**	**-3**	**1,980**	**-3**	**-3**	**5,977**	**-3**	**-3**	**7,638**	**-3**	**-3**	**9,770**	**-3**	**-3**	**12,674**	**-3**	**-3**	**15,358**	**-3**	**-3**	**-3**	**17,871**

Assumptions	Rate	Unit
Hopea planting density	400	seedling/ha
Replanting rate of Hopea	10%	seedling/ha
Price of Hopea seedling	2,400	VND/seeding
Price of NPK fertilizer	9,600	VND/kg
Price of firewood (ф ≤ 6cm)	70,000	VND/m^3
Price of roundwood of indigenous tree (ф12-20cm)	2,178,290	VND/m^3
Price of roundwood of indigenous tree (ф20-45cm)	4,808,290	VND/m^3
Price of a labour-day	36,000	VND/day
Harvesting and internal transporting cost	41,710	VND/m^3

Attachment I-1: Table 7. Cost -Benefit Analysys of ANR without enrichment planting (indigenous trees 600 tree/ha): Selective cutting with intensity 300 trees/ha in 40 years

Average	
1,350	VND/ton/km
850.5	VND/m3/km
0.63	weight/volume
50	km

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Quantity of Inputs																		
Clearing climers and insect affedted trees	man-day	12	12	12														
Spots weeding for the regenerating trees	man-day	4	4	4	2	2	1			1			1			1		
Thinning of Hopea	man-day																	
Protection	man-day	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Tiotal labor requirement	man-day	24	24	24	9	9	8	7	7	8	7	7	8	7	7	8	7	7
2. Cost of Production	('000 VND)						**301**	**265**	**265**	**301**	**265**	**265**	**301**	**265**	**265**	**301**	**265**	**265**
Cost of clearing climers and insect affedted trees	('000 VND)																	
Cost for spots weeding for the regenerating trees	('000 VND)						36			36			36			36		
Thinning of Hopea	('000 VND)																	
Protection	('000 VND)						262	262	262	262	262	262	262	262	262	262	262	262
Cost for management and administration	('000 VND)						3	3	3	3	3	3	3	3	3	3	3	3
3. Yields of Products																		
Firewood (ф ≤ 6cm)	m3																	
Hopea Roundwood (ф: 12-20cm)	m3																	
Hopea Roundwood (ф: 20-45cm)	m3																	
4. Value of Products (Gross Income)	('000 VND)																	
Income from firewood (ф ≤ 6cm)	('000 VND)																	
Income from Hopea Roundwood (ф: 12-20cm)	('000 VND)																	
Income from Hopea Roundwood (ф: 20-45cm)	('000 VND)																	
5. Total Net Profit (4-2)	('000 VND)						**-301**	**-265**	**-265**	**-301**	**-265**	**-265**	**-301**	**-265**	**-265**	**-301**	**-265**	**-265**
6. CASH FLOW (4 - cash cost)	('000 VND)						**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**

Attachment I-1: Table 7. Cost -Benefit Analysys of ANR without enrichment planting (indigenous trees 600 tree/ha): Selective cutting with intensity 300 trees/ha in 40 years

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1			1			1			1			1			1			1			1	
			2			2			3			3			3			3				3
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	7	7	10	7	7	10	7	7	11	7	7	11	7	7	11	7	7	11	7	7	8	10
301	**265**	**265**	**374**	**265**	**265**	**374**	**265**	**265**	**410**	**265**	**265**	**410**	**265**	**265**	**410**	**265**	**265**	**410**	**265**	**265**	**301**	**374**
36			36			36			36			36			36			36			36	
			72			72			108			108			108			108				108
262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262
3	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	3	4
			0.2			0.2			0.2			0.3			0.3			0.4				0.6
			0.9			1.2			0.7			0.9			1.0			1.3				1.1
			0.7			1.0			1.5			1.7			2.4			3.0				3.9
			5,520			**7,492**			**8,654**			**10,155**			**13,589**			**17,223**				**20,965**
			13			17			17			20			24			30				39
			1,991			2,702			1,595			1,872			2,206			2,795				2,398
			3,516			4,772			7,041			8,263			11,360			14,397				18,528
-301	**-265**	**-265**	**5,146**	**-265**	**-265**	**7,118**	**-265**	**-265**	**8,243**	**-265**	**-265**	**9,744**	**-265**	**-265**	**13,179**	**-265**	**-265**	**16,812**	**-265**	**-265**	**-301**	**20,591**
-3	**-3**	**-3**	**5,516**	**-3**	**-3**	**7,488**	**-3**	**-3**	**8,649**	**-3**	**-3**	**10,151**	**-3**	**-3**	**13,585**	**-3**	**-3**	**17,219**	**-3**	**-3**	**-3**	**20,961**

Assumptions	Rate	Unit
Casuarina planting density	2,500	seedling/ha
Replanting rate of Casuarina	10%	seedling/ha
Price of Casuarina seedling	2,400	VND/seeding
Price of NPK fertilizer	9,600	VND/kg
Price of firewood (ф ≤ 6cm)	70,000	VND/m^3
Price of Casuarina roundwood (16-20cm)	1,958,290	VND/m^3
Price of a labour-day	36,000	VND/day
Harvesting and internal transporting cost	41,710	VND/m^3

Attachment I-1: Table 8. Cost -Benefit Analysys of 1 ha of Casuarina plantation: 2,500 trees/ha, Harvesting of Casuarina

Unit cost	850.3	VND/m3/km	
Average	50.0	km	

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Quantity of Inputs																		
No. of Casuarina seedlings	nos.	2,500	250															
NPK fertilizer	kg	60																
Site preparation and planting	man-day	110	2															
Tending, weeding, sapling thinning and pruning	man-day	5	49	23	23													
Forest protection	man-day	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Tiotal labor requirement	man-day	122	58	30	30	7	7	7	7	7	7	7	7	7	7	7	7	7
2. Cost of Production	('000 VND)					**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**
Cost of Casuarina seedlings	('000 VND)																	
Cost of fertilizer	('000 VND)																	
Cost of site prparation & planting	('000 VND)																	
Tending, weeding, sapling thinning and pruning	('000 VND)																	
Forest protection	('000 VND)					262	262	262	262	262	262	262	262	262	262	262	262	262
Cost for management and administration	('000 VND)					3	3	3	3	3	3	3	3	3	3	3	3	3
3. Yields of Products																		
Firewood (ф ≤ 6cm)	m3								0.0			0.2			0.5			0.9
Casuarina Roundwood (ф: 16-20cm)	m3																	
4. Value of Products (Gross Income)	('000 VND)								**3**			**14**			**34**			**65**
Income from firewood (ф ≤ 6cm)	('000 VND)								3			14			34			65
Income from Casuarina Roundwood (ф: 16-20cm)	('000 VND)																	
5. Total Net Profit (4-2)	('000 VND)					**-265**	**-265**	**-265**	**-262**	**-265**	**-265**	**-250**	**-265**	**-265**	**-230**	**-265**	**-265**	**-199**
6. CASH FLOW (4 - cash cost)	('000 VND)					**-265**	**-265**	**-265**	**-262**	**-265**	**-265**	**-250**	**-265**	**-265**	**-230**	**-265**	**-265**	**-199**

Attachment I-1: Table 8. Cost -Benefit Analysys of 1 ha of Casuarina plantation: 2,500 trees/ha, Harvesting of Casuarina

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
265	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**	**265**
262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262	262
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
								2.1												2.5		
								0.9												1.6		
								1,895												**3,391**		
								146												173		
								1,749												3,219		
-265	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**1,631**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**3,126**	**-265**	**-265**
-265	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**1,631**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**-265**	**3,126**	**-265**	**-265**

ATTACHMENT I-2: ESTIMATION OF AR-CDM BENEFITS AND COST

1. Methodology Used

There is high possibility to transform reforestation subprojects into small-scale AR-CDM projects under the proposed Project. The benefits of small-scale AR-CDM projects are the value of temporary Certified Emission Reduction (tCER). The amount of tCER was estimated based on the estimation of net anthropogenic GHG removal by sinks, which was calculated applying "Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands (AR-AMS0001 / Version 05)."[1] The project should meet all four applicability conditions listed in the methodology (paragraph 1).

(a) Project activities are implemented on grasslands or croplands;

(b) Project activities are implemented on lands where the area of the cropland within the project boundary displaced due to the project activity is less than 50 per cent of the total project area;

(c) Project activities are implemented on lands where the number of displaced grazing animals is less than 50 per cent of the average grazing capacity of the project area;

(d) Project activities are implemented on lands where ≤10% of the total surface project area is disturbed as result of soil preparation for planting.

2. Land Eligibility and Additionality

Land eligibility and additionality of the small-scale AR-CDM projects under the Project could be justified as follows:

< Land Eligibility> It is judged from the field survey that much of the watershed reforestation area and most of the coastal reforestation area were not forest as of December 1989.

< Additionality> Because of the barriers described below, the area for small-scale AR-CDM projects would not be forested without the proposed Project, thus the small-scale AR-CDM projects under the Project could be considered additional.

Barriers due to local ecological conditions

Due to the soil degradation, the pressure of the human activities and sandy nature of the land (in coastal area), the natural regeneration of forest in the proposed reforestation area is not expected and the area would remain as it is or will be more degraded without tree planting activities under the Project.

[1] http://cdm.unfccc.int/methodologies/SSCmethodologies/SSCAR/approved.html

Investment barriers

The reforestation area has been owned by PFMB but has not been subject of reforestation under 5MHRP mainly due to poor access (in watershed area), insufficient ceiling budget per hectare of reforestation, and severe natural condition (in coastal area) such as strong wind associated with sands. Since 5MHRP will be completed in 2010, it will become more difficult for PFMB to establish plantations in the area.

3. Reforestation Models and Area of Small-scale AR-CDM

To simplify the calculation of the benefits from small-scale AR-CDM projects, reforestation designs of the Project were classified into six models, considering the natural conditions of each province. The areas of small-scale AR-CDM projects were conservatively estimated at 50% of the watershed reforestation area and 90% of the costal reforestation area. **Table 1** shows the reforestation models and estimated area of small-scale AR-CDM projects in each province.

4. Estimation of Net Anthropogenic GHG Removals by Sinks

4.1 Baseline net GHG removals by sinks

(1) Most likely baseline scenario and baseline stratification

Most likely baseline scenario of the project should be considered to be the land-use prior to the implementation of the project activity (paragraph 5 in the methodology).

In the baseline calculation of this project activity, "*the baseline net GHG removals by sinks shall be assumed to be zero.*" In this case, "*the baseline carbon stocks in the carbon pools are constant and equal to existing carbon stocks measured at the start of the project activity.*"

(2) Baseline carbon stock determination

The baseline carbon stock was determined by equation (1) in the methodology as follows:

$$B_{(t)} = \sum_{i=I}^{I} \left(B_{A(t)i} + B_{B(T)i} \right) \times A_i \qquad \textbf{(1)}$$

Where

$B_{(t)}$ = *carbon stocks in the living biomass within the project boundary at time t in the absence of the project activity (t C)*

$BA_{(t)\,i}$ = *carbon stocks in above-ground biomass at time t of stratum i in the absence of the project activity (t C/ha)*

$BB_{(t)\,i}$ = *carbon stocks in below-ground biomass at time t of stratum i in the absence of the project activity (t C/ha)*

A_i = *project area of stratum i (ha)*

i = stratum i (I = total number of strata)

Above-ground biomass was calculated by equation (2) in the methodology as follows;

$$BA_{(t)} = M_{(t)} * 0.5 \qquad (2)$$

Where:

$BA_{(t)}$ *= carbon stocks in above-ground biomass at time t in the absence of the project activity (t C/ha)*

M(t) = above-ground biomass at time t that would have occurred in the absence of the project activity (t d.m./ha)

0.5 = carbon fraction of dry matter (t C/t d.m.)

Below-ground biomass was calculated by equation (6) in the methodology as follows;

$$BB_{(t=0)} = BB_{(t)} = 0.5 * (M_{grass} * R_{grass} + M_{woody\ (t=0)} * R_{woody} \qquad (6)$$

Where:

$BB_{(t)}$ *= carbon stocks in below-ground biomass at time t that would have occurred in the absence of the project activity (t C/ha)*

M_{grass} *= above-ground biomass in grass on grassland at time t that would have occurred in the absence of the project activity (t d.m./ha)*

M_{woody} *(t=0) = above-ground biomass of woody perennials at t=0 that would have occurred in the absence of the project activity (t d.m./ha)*

R_{woody} *= root to shoot ratio of woody perennials (t d.m./t d.m.)*

R_{grass} *= root to shoot ratio for grassland (t d.m./t d.m.)*

The default values of all the parameters were obtained from the IPCC Good Practice Guidance for LULUCF and used in calculation of the baseline carbon stock in biomass as shown in **Table 2**. For simplification of the calculation of AR-CDM benefits and costs, the baseline living biomass of 500 ha of reforestation sites were calculated for each model as follows:

Baseline Carbon Stock in Biomass in Each Models (for 500 ha of Reforestation Area)

Model	Province	Location	Area (ha)	Baseline Carbon (tC)
Model-1	Thanh Hoa Nghe Anh Ha Tinh Quang Binh Quang Tri	Watershed	500	3,752
Model 2	T.T. Hue Quang Nam	Watershed	500	3,752
Model 3	Quang Ngai	Watershed	500	3,752
Model 4	Binh Dinh	Watershed	500	3,207

Model	Province	Location	Area (ha)	Baseline Carbon (tC)
Model 5	Phu Yen Ninh Thuan	Watershed	500	3,207
Model 6	Quang Binh T.T. Hue Binh Thuan	Coastal	500	-

Finally the baseline net GHG removals by sinks were calculated by equation (10) in the methodology as follows:

$$\Delta CBSL,t = (B(t) - B(t-1))*(44/12) \qquad (10)$$

Where:

ΔCBSL,t = baseline net GHG removals by sinks (t CO2-e)

B(t) = carbon stocks in the living biomass pools within the project boundary at time t in the absence of the project activity (t C)

In this project, B(t) is conservatively assumed constant thus, the baseline net GHG removals by sinks (ΔCBSL,t) was calculated to be zero.

4.2 Actual net GHG removals by sinks

The actual net GHG removal by sinks (ex-ante) was calculated according to the paragraph 17 to 26 of the methodology.

(1) Above-ground biomass

Above-ground biomass was calculated by the equation (13) and (14) in the methodology and the parameters and values applied to the calculation are shown in **Tables 2** and **3**.

$$NA(t)\ i = T(t)i * 0.5 \qquad (13)$$

Where:

NA(t) i = carbon stocks in above-ground biomass at time t under the project scenario (t C/ha)

T(t)i = above-ground biomass at time t under the project scenario (t d.m./ha)

0.5 = carbon fraction of dry matter (t C/t d.m.)

$$T(t)i = SV(t)i * BEF * WD \qquad (14)$$

Where:

T(t)i = above-ground biomass at time t under the project scenario (t d.m./ha)

SV(t)i = stem volume at time t for the project scenario (m3 /ha)

BEF = biomass expansion factor (over bark) from stem to total above-ground biomass (dimensionless)

WD = basic wood density (t d.m./ m3)

The parameters (BEF & WD) and stem values of each reforestation model are shown in **Tables 2 and 3**, respectively. **Tables 4 to 9** provides the detail calculation of the stem volumes for each model.

(2) Below-ground biomass

The equation developed by Cairns et al. was used to estimate the below-ground biomass (paragraph 23 and equation 16 in the applied methodology). The result for each model is shown in **Tables 10 to 15**, respectively.

$$NB(t) = \exp(-1.085 + 0.9256 * \ln T(t)) * 0.5 \qquad (16)$$

Where:

NB(t) = carbon stocks in below-ground biomass at time t achieved by the project activity during the monitoring interval (t C/ha)

T(t) = estimate of above-ground biomass at time t achieved by the project activity (t d.m./ha)

0.5 = carbon fraction of dry matter (t C/t d.m.)

(3) Project GHG removals by sinks

Project GHG removal by sinks was calculated by equation (17) in the methodology as follows and the result is shown in **Tables 10 to 15** for each model, respectively.

$$\Delta C_{PROJ,t} = (Nt - Nt\text{-}1)*(44/12)/ \Delta t \qquad (17)$$

Where:

$\Delta C_{PROJ,t}$ *= removal component of actual net GHG removal by sinks per annum (t CO2-e / year)*

N(t) = total carbon stocks in biomass at time t under the project scenario (t C)

Δt *= time increment = 1 (year)*

(4) Project Emissions

According to the applied methodology (AR-AMS0001 version 05), GHG emission from fertilizer application are considered insignificant and hence be neglected.

(5) Actual net GHG removal by sinks

Consequently the actual net GHG removal by sinks (ex-ante) was calculated by the equation (18) in the methodology as follows. The detail results of estimation of the actual net GHG removals by sinks (ex-ante) are shown in **Tables 10 to 15**.

$$\Delta C_{ACTUAL,t} = \Delta C_{PROJ,t} - GHG_{PROJ,t} \qquad (18)$$

Where:

$\Delta C_{ACTUAL,t}$ = *ex-ante actual net greenhouse gas removals by sinks in year t (t* CO_2*-e / year)*

$\Delta C_{PROJ,t}$ = *project GHG removals by sinks (t CO2-e / year)*

$GHG_{PROJ,t}$ = *project emissions (t CO2-e / year)*

4.3 Leakage

The methodology provides three cases of leakage calculation based on the value of following indicators:

Indicators	Value	Leakage
a) the area of the cropland within the project boundary displaced due to the project activities	Lower than 10%	It is **zero** if all values of the indicators are lower than 10%.
b) the number of domesticated grazing animals displaced compared with the average grazing capacity	< 10% and less than or equal to 50%	It is **15%** of the ex-ante actual net GHG removals by sinks if the value of one of the indicators is within this range.
c) time average number of domesticated roaming animals displaced	Higher than 50%	The simplified methodology cannot be used if the value of any indicators is higher than 50%.

It is considered that the values of above three indicators are not high due to remoteness of the project area. For conservative calculation of the net anthropogenic GHG removals by sinks, however, the leakage was calculated equal to 15 % of the *ex-ante* actual net GHG removals by sinks achieved during the first crediting period (paragraph 31 of the methodology).

$$L_t = \Delta C_{ACTUAL,t} * 0.15 \qquad (20)$$

Where:

L_t = *average annual leakage attributable to the project activity at time t (t* CO_2*-e / year)*

$\Delta C_{ACTUAL,t}$ = *ex-ante* actual net greenhouse gas removals by sinks in year t (t CO_2-e / year)

4.4 Net anthropogenic GHG removal by sinks

The net anthropogenic GHG removal by sinks for each year during the crediting period is calculated as follows (paragraph 31 and equation (21) of the methodology) and the results are shown in the table below:

$$ER_{AR\,CDM,\,t} = \Delta C_{PROJ,\,t} - \Delta C_{BSL,\,t} - GHG_{PROJ,\,t} - L_t \qquad (21)$$

Where:

$ER_{AR\,CDM,\,t}$ = net anthropogenic GHG removals by sinks (t CO_2-e / year)

$\Delta C_{PROJ,\,t}$ = project GHG removal by sinks at time t (t CO_2-e / year)

$\Delta C_{BSL,t}$ = baseline net GHG removal by sinks (t CO_2-e / year)

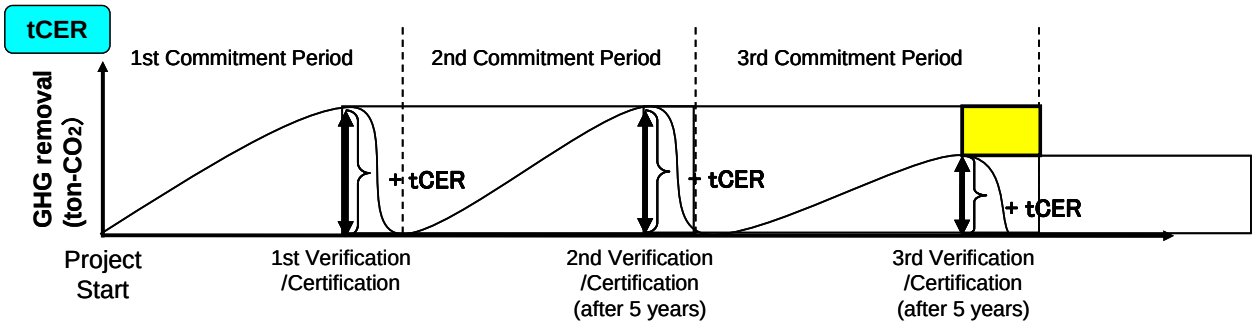
$GHG_{PROJ,\,t}$ = project emissions (t CO_2-e / year)

L_t = leakage attributable to the project activity at time t (t CO_2-e / year)

The results of each model are shown in **Tables 10 to 15**.

5. Benefits and Costs of AR-CDM Projects

tCER will be issued through the process of verification and certification by DOE of the net anthropogenic GHG removals by the project activities since the project start date. The timing of the first verification can be decided by the project proponent. Subsequent verification shall be conducted every five years after the first verification, as shown below:



Issuance of tCER

Table 16 summarizes the amount of tCER calculated for each model of AR-CDM projects (500ha each). Here, the first verification is set at project year 11 when cumulative net anthropogenic GHG removals become positive. The subsequent verifications are scheduled at project year 16, 21, 26, and 31 within 30 years of the credit period. tCER of some models exceed the ceiling of 16,000 per year or 80,000 per five years at project year 21 and later. However, tCER obtained is limited to 80,000 per verification according to the rule of AR-CDM.

Table 17 shows the estimated amount and value of tCER obtained in each province as well as validation and verification costs based on the assumptions below:

a) Out of watershed reforestation area in each province, 50% of that can be developed as small-scale AR-CDM projects.

b) For coastal reforestation, 90% of the area can be developed as small-scale AR-CDM projects.

c) Amount of tCER obtained in each province was roughly calculated based on the estimated area of AR-CDM projects in each province and tCER of corresponding model (per 500ha).

d) The size of a small-scale AR-CDM is set at 500ha. The number of small-scale AR-CDM projects in each province is calculated based on the size and the area for AR-CDM projects.

e) The price of tCER is set at US$3.5 based on the price offered by the BioCarbon Fund of the World Bank.

f) The cost for validation and verification is set at US$30,000 at a time per project. Bundling was not considered.

g) The cost of developing AR-CDM project was not calculated separately since it would be included in the cost of the consulting services of the Project.

h) The monitoring of AR-CDM projects would be carried out as a part of ordinary monitoring of the Project. Hence, the monitoring cost of AR-CDM projects was not calculated.

The estimated amount of tCER obtained is 6.8 millions in total in 30 years of the credit period with the total value of US$ 23.7 million or VND 402 billions (the present value of US$ 2,639 and VND 44.7 billions). On the other hand, the total cost of validations and verifications is VND 78.8 billions or the present value of VND 20.9 billion).

Attachment I-2: Table 1. Plantation Models for Estimation of Benefits from AR-CDM Projects

Model	Location	Plantation Design				Total (trees/ha)	Province	Reforestation area (ha)	AR-CDM area (ha)	Wood Density (WD)		
		Main species	trees/ha	Sub species	trees/ha					Main species	Sub species	Weighted ave.
Model-1	Watershed	*Hopea odorata*	800	*Acacia mangium*	800	1,600	Thanh Hoa	600	300	0.64	0.50	0.57
							Nghe An	2,800	1,400			
							Ha Tinh	1,500	750			
							Quang Binh	1,800	900			
							Quang Tri	2,900	1,450			
Model-2	Watershed	*Hopea odorata*	444	*Acacia mangium*	1,111	1,555	T.T.Hue	3,000	1,500	0.64	0.50	0.54
							Quang Nam	1,000	500			
Model-3	Watershed	*Dipterocarpus alatas*	800	*Acacia mangium*	800	1,600	Quang Ngai	3,500	1,750	0.61	0.50	0.56
Model-4	Watershed	*Pinus spp.*	555	*Acacia auriculiformis*	1,060	1,615	Binh Dinh	2,600	1,300	0.50	0.52	0.51
Model-5	Watershed	*Dipterocarpus alatas*	545	*Acacia auriculiformis*	1,085	1,630	Phu Yen	2,400	1,200	0.61	0.52	0.55
							Ninh Thuan	1,600	800			
Model-6	Coastal	*Casuarina equisetifolia*	2,500			2,500	Quang Binh	400	360	0.83		0.83
							T.T.Hue	600	540			
							Binh Thuan	1,100	990			

Attachment I-2: Table 2. Calculation of Baseline Carbon Stock in Biomass in 500ha and BEF and WD for Each Model

Model	Province	Location	Calculation of Baseline Carbon Stock in Biomass using default values (in 500ha)									BEF	WD
			Area (ha) a	M_{grass} (d.m. t/ha) b	M_{woody} (d.m. t/ha) c	R_{grass} d	R_{woody} e	M(t) (d.m. t/ha) f=b+c	BA(t) (tC/ha) g=f*0.5	BB(t) (tC/ha) h=(b*d+c*e)*0.5	Baseline Carbon (tC) i=(g+h)*a	Biomass expansion factor	Wood density #
1	Thanh Hoa Nghe Anh Ha Tinh Quang Binh Quang Tri	Watershed	500	2.70	2.10	1.58	2.83	4.80	2.40	5.10	3,752	1.40	0.57
2	T.T. Hue Quang Nam	Watershed	500	2.70	2.10	1.58	2.83	4.80	2.40	5.10	3,752	1.40	0.54
3	Quang Ngai	Watershed	500	2.70	2.10	1.58	2.83	4.80	2.40	5.10	3,752	1.40	0.56
4	Binh Dinh	Watershed	500	2.30	1.80	1.58	2.83	4.10	2.05	4.36	3,207	1.40	0.51
5	Phu Yen Ninh Thuan	Watershed	500	2.30	1.80	1.58	2.83	4.10	2.05	4.36	3,207	1.40	0.55
6	Quang Binh T.T. Hue Binh Thuan	Coastal	500	0.00	0.00			0.00	0.00	0.00	-	1.30	0.83

Note: M_{grass} above-ground biomass in grass on grassland at time t that would have occurred in the absence of the project activity

- 2.70 Warm Temperate - Wet (Source: IPCC GPG for LULUCF Table 3.4.2)
- 2.30 Tropical - Dry (Source: IPCC GPG for LULUCF Table 3.4.2)

#: Weighted average of main and sub species

M_{woody} above-ground biomass of woody perennials at t=0 that would have occurred in the absence of the project activity

- 2.10 Temperate (all moisture regime) (Source: IPCC GPG for LULUCF Table 3.3.2)
- 1.80 Tropical - Dry (Source: IPCC GPG for LULUCF Table 3.3.2)

R_{grass} root to shoot ratio for grassland

- 1.58 Temperate/sub-tropical/tropical (Source: IPCC GPG for LULUCF Table 3A.1.8)

R_{woody} root to shoot ratio of woody perennials

- 2.83 Shrubland (Source: IPCC GPG for LULUCF Table 3A.1.8)

M(t) above-ground biomass at time t that would have occurred in the absence of the project activity

BA(t) carbon stocks in above-ground biomass at time t in the absence of the project activity

BB(t) carbon stocks in below-ground biomass at time t that would have occurred in the absence of the project activity

BEF

- 1.40 Temperate broadleaf (Source: IPCC GPG for LULUCF Table 3A.1.10)
- 1.30 Temperate pines (Source: IPCC GPG for LULUCF Table 3A.1.10)
- 1.30 Tropical pines (Source: IPCC GPG for LULUCF Table 3A.1.10)
- 3.40 Tropical broadleaf (Source: IPCC GPG for LULUCF Table 3A.1.10)

WD

- 0.50 Acacia mangium (Source: Nguyen Dinh Hung et al. (1995))
- 0.52 Acacia auriculiformis (Source: Nguyen Dinh Hung et al. (1995))
- 0.61 Dipterocarpus spp. (Source: IPCC GPG for LULUCF Table 3A.1.9-2)
- 0.64 Hopea spp. (Source: IPCC GPG for LULUCF Table 3A.1.9-2)
- 0.83 Casuarina equisetifolia (Source: IPCC GPG for LULUCF Table 3A.1.9-2)

Attachment I-2: Table 3. Stem Volume at time t for Each Model (Summary)

Growth age	Model-1 WS	Model-2 WS	Model-3 WS	Model-4 WS	Model-5 WS	Model-6 Coastal
1	-	-	-	-	-	-
2	0.1	0.2	0.3	0.4	0.3	-
3	1.0	1.4	1.4	1.6	1.6	-
4	3.6	5.0	4.3	4.7	5.4	-
5	9.9	12.3	9.9	10.5	12.2	-
6	17.2	21.9	17.2	21.0	21.7	-
7	25.3	35.5	25.3	34.1	35.1	5.0
8	31.6	48.6	31.6	53.1	48.0	9.3
9	35.3	59.3	35.3	62.2	58.5	15.2
10	43.2	77.4	43.2	74.3	76.6	22.1
11	47.7	88.5	47.7	96.0	88.0	31.1
12	51.9	95.9	51.9	107.9	96.5	40.4
13	58.2	107.2	58.2	115.2	108.9	50.2
14	64.8	118.6	64.8	124.4	122.0	60.2
15	67.1	127.8	67.1	128.3	132.6	73.4
16	68.1	135.6	68.1	136.5	142.1	75.1
17	74.1	143.6	74.1	145.6	152.8	77.4
18	79.9	149.1	79.9	153.0	161.4	79.1
19	94.4	150.9	94.4	154.3	166.9	80.5
20	99.6	145.3	99.6	151.6	163.2	81.9
21	118.3	140.0	118.3	148.5	162.7	83.3
22	138.2	132.8	138.2	139.3	157.7	84.5
23	142.5	121.9	142.5	129.2	147.2	85.7
24	162.1	111.9	162.1	117.2	140.5	86.9
25	180.2	108.9	180.2	127.7	128.4	88.0
26	187.5	115.8	187.5	139.4	133.3	89.1
27	206.6	127.6	206.6	150.2	146.9	90.1
28	226.8	140.1	226.8	158.7	161.3	91.1
29	232.6	147.8	232.6	160.6	166.3	91.9
30	247.0	157.0	247.0	170.3	176.7	92.9
31	260.7	165.7	260.7	181.4	186.4	92.9
32	252.5	164.0	258.1	182.6	181.5	92.9
33	264.5	171.9	270.4	192.9	190.1	92.9
34	286.8	186.3	293.1	202.5	206.1	92.9
35	234.5	152.1	239.4	167.2	165.4	92.9
36	246.1	159.6	251.3	176.1	173.6	92.9
37	256.8	166.5	262.2	177.0	181.2	92.9
38	257.5	167.2	264.0	175.4	178.2	92.9
39	273.9	177.8	280.7	177.2	189.6	92.9
40	290.7	188.7	298.0	177.2	201.2	92.9

Model-1: Refer to Table A5-4
Model-2: Refer to Table A5-5
Model-3: Refer to Table A5-6
Model-4: Refer to Table A5-7
Model-5: Refer to Table A5-8
Model-6: Refer to Table A5-9

Attachment I-2: Table 4. Stem Volume of Model-1 (Applied to Thanh Hoa, Nghe An, Ha Tinh, Quang Binh and Quang Tri provinces)

Growth age	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees			Total volume (m^3/ha)	Volume of thinning (m^3/ha)	After thinning(m^3/ha)	Year	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees			Total volume (m^3/ha)	Volume of thining (m^3/ha)	After thinning (m^3/ha)	Percentage of thinnng volume (%)	Total Volume (m^3/ha)
				Diametter (cm)	Height (m)	Coefficient								Diametter (cm)	Heigh (m)	Coefficient					
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)		(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(i+r)
Sub-ordinate Species: *Acacia mangium* (800 trees/ha)										**Indigenous Species: *Hopea odorata* (800 trees/ha)**											
1	800			0.5	0.5					1	800			1.0	0.8						
2	760			2.0	1.2	0.5	0.1		0.1	2	760			2.0	1.0						0
3	737			4.0	2.2	0.5	1.0		1.0	3	737			3.0	1.5						1
4	722			6.0	3.5	0.5	3.6		3.6	4	722			3.5	2.2						4
5	722			8.0	4.5	0.5	8.2		8.2	5	722			4.5	3.0	0.5	1.7		1.7		10
6	722			10.0	5.2	0.5	14.7		14.7	6	722			5.0	3.5	0.5	2.5		2.5		17
7	722	144	20%	12.0	6.5	0.5	26.5	5.3	21.3	7	722			6.0	4.0	0.5	4.1		4.1	17%	25
8	578	115	20%	13.5	7.8	0.5	32.3	6.4	25.9	8	722			6.5	4.8	0.5	5.8		5.8	17%	32
9	463	95	20%	15.0	8.5	0.5	34.8	7.1	27.7	9	722			7.0	5.5	0.5	7.6		7.6	17%	35
10	368	75	20%	17.0	9.5	0.5	39.7	8.1	31.6	10	722			8.0	6.4	0.5	11.6		11.6	16%	43
11	293	60	20%	18.0	10.5	0.5	39.2	8.0	31.2	11	722			9.0	7.2	0.5	16.5		16.5	14%	48
12	233	46	20%	19.0	11.0	0.5	36.4	7.2	29.2	12	722			10.0	8.0	0.5	22.7		22.7	12%	52
13	187	37	20%	20.0	12.0	0.5	35.3	7.0	28.3	13	722			11.0	8.7	0.5	29.9		29.9	11%	58
14	150	35	23%	21.0	13.0	0.5	33.9	7.9	26.0	14	722			12.0	9.5	0.5	38.8		38.8	11%	65
15	115	33	29%	22.0	14.0	0.5	30.7	8.8	21.9	15	722			12.5	10.2	0.5	45.2	-	45.2	12%	67
16	82	33	40%	23.0	15.0	0.5	25.7	10.3	15.4	16	722			13.0	11.0	0.5	52.7	-	52.7	13%	68
17	49	26	53%	24.0	16.0	0.5	17.9	9.4	8.5	17	722			14.0	11.8	0.5	65.6	-	65.6	11%	74
18	23	23	98%	25.0	17.0	0.5	9.8	9.6	0.2	18	722			15.0	12.5	0.5	79.8	-	79.8	11%	80
19										19	722			16.0	13.0	0.5	94.4	-	94.4		94
20										20	722	72	10%	17.0	13.5	0.5	110.6	11.0	99.6	10%	100
21										21	650			18.0	14.3	0.5	118.3	-	118.3		118
22										22	650			19.0	15.0	0.5	138.2	-	138.2		138
23										23	650	65	10%	20.0	15.5	0.5	158.3	15.8	142.5	10%	142
24										24	585			21.0	16.0	0.5	162.1	-	162.1		162
25										25	585			22.0	16.2	0.5	180.2	-	180.2		180
26										26	585	48	8%	23.0	16.8	0.5	204.2	16.7	187.5	8%	187
27										27	537			24.0	17.0	0.5	206.6	-	206.6		207
28										28	537			25.0	17.2	0.5	226.8	-	226.8		227
29										29	537	45	8%	26.0	17.8	0.5	253.8	21.3	232.6	8%	233
30										30	492			26.5	18.2	0.5	247.0	-	247.0		247
31										31	492			27.0	18.5	0.5	260.7	-	260.7		261
32										32	492	40	8%	27.5	18.8	0.5	274.8	22.3	252.5	8%	252
33										33	452			28.0	19.0	0.5	264.5	-	264.5		265
34										34	452			29.0	19.2	0.5	286.8	-	286.8		287
35										35	452	27	6%	30.0	19.5	0.4	249.3	14.9	234.5	6%	234
36										36	425			30.5	19.8	0.4	246.1		246.1		246
37										37	425			31.0	20.0	0.4	256.8		256.8		257
38										38	425	25	6%	32.0	20.0	0.4	273.6	16.1	257.5	6%	258
39										39	400			33.0	20.0	0.4	273.9		273.9		274
40										40	400			34.0	20.0	0.4	290.7		290.7		291
						Total		**95.0**										**118.1**			

Note: It is assumed that the tree density would be decreased at the rate of 5%, 3%, 2% annually during Year 1-2, 2-3, and 3-4 due to mortality.

Attachment I-2: Table 5. Stem Volume of Model-2 (Applied to Thua Thien Hue, Quang Nam provinces)

Growth age	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees			Total volume (m^3/ha)	Volume of thinning (m^3/ha)	After thinning(m^3/ha)
				Diametter (cm)	Height (m)	Coefficient			
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
Sub-ordinate Species: *Acacia mangium* (1,111 trees/ha)									
1	1,111			0.5	0.5				
2	1,055			2.0	1.2	0.5	0.2		0.2
3	1,024			4.0	2.2	0.5	1.4		1.4
4	1,003			6.0	3.5	0.5	5.0		5.0
5	1,003			8.0	4.5	0.5	11.3		11.3
6	1,003			10.0	5.2	0.5	20.5		20.5
7	1,003	100	10%	12.0	6.5	0.5	36.9	3.7	33.2
8	903	90	10%	13.5	7.8	0.5	50.4	5.0	45.4
9	813	80	10%	15.0	8.5	0.5	61.1	6.0	55.0
10	733	75	10%	17.0	9.5	0.5	79.0	8.1	70.9
11	658	64	10%	18.0	10.5	0.5	87.9	8.5	79.4
12	594	60	10%	19.0	11.0	0.5	92.6	9.4	83.3
13	534	53	10%	20.0	12.0	0.5	100.7	10.0	90.7
14	481	50	10%	21.0	13.0	0.5	108.3	11.3	97.1
15	431	45	10%	22.0	14.0	0.5	114.7	12.0	102.7
16	386	45	12%	23.0	15.0	0.5	120.3	14.0	106.3
17	341	45	13%	24.0	16.0	0.5	123.5	16.3	107.2
18	296	45	15%	25.0	17.0	0.5	123.6	18.8	104.8
19	251	45	18%	26.0	18.0	0.5	120.0	21.5	98.5
20	206	45	22%	27.0	19.0	0.5	112.2	24.5	87.7
21	161	45	28%	28.0	20.0	0.5	99.3	27.7	71.6
22	116	40	34%	29.0	21.0	0.5	80.6	27.7	52.9
23	76	30	39%	30.0	22.0	0.5	59.3	23.3	36.0
24	46	30	65%	31.0	23.0	0.5	40.2	26.0	14.2
25	16	16	98%	32.0	24.0	0.5	15.7	15.4	0.3
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
						Total		**289.1**	

Year	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees			Total volume (m^3/ha)	Volume of thining(m^3/ha)	After thinning(m^3/ha)	Percentage of thinnng volume (%)	Total Volume (m^3/ha)
				Diametter (cm)	Heigh (m)	Coefficient					
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(i+r)
Indigenous Species: *Hopea odorata* (444 trees/ha)											
1	444			1.0	0.8						
2	422			2.0	1.0	0.5	0.1				0
3	409			3.0	1.5	0.5	0.2				1
4	401			3.5	2.2	0.5	0.4				5
5	401			4.5	3.0	0.5	1.0		1.0		12
6	401			5.0	3.5	0.5	1.4		1.4		22
7	401			6.0	4.0	0.5	2.3		2.3	9%	35
8	401			6.5	4.8	0.5	3.2		3.2	9%	49
9	401			7.0	5.5	0.5	4.2		4.2	9%	59
10	401			8.0	6.4	0.5	6.4		6.4	9%	77
11	401			9.0	7.2	0.5	9.2		9.2	9%	89
12	401			10.0	8.0	0.5	12.6		12.6	9%	96
13	401			11.0	8.7	0.5	16.6		16.6	9%	107
14	401			12.0	9.5	0.5	21.5		21.5	9%	119
15	401			12.5	10.2	0.5	25.1	-	25.1	9%	128
16	401			13.0	11.0	0.5	29.3	-	29.3	9%	136
17	401			14.0	11.8	0.5	36.4	-	36.4	10%	144
18	401			15.0	12.5	0.5	44.3	-	44.3	11%	149
19	401			16.0	13.0	0.5	52.4	-	52.4	12%	151
20	401	25	6%	17.0	13.5	0.5	61.4	3.8	57.6	16%	145
21	376			18.0	14.3	0.5	68.4	-	68.4	17%	140
22	376			19.0	15.0	0.5	79.9	-	79.9	17%	133
23	376	23	6%	20.0	15.5	0.5	91.5	5.6	85.9	19%	122
24	353			21.0	16.0	0.5	97.8	-	97.8	19%	112
25	353			22.0	16.2	0.5	108.6	-	108.6	12%	109
26	353	21	6%	23.0	16.8	0.5	123.1	7.3	115.8	6%	116
27	332			24.0	17.0	0.5	127.6	-	127.6		128
28	332			25.0	17.2	0.5	140.1	-	140.1		140
29	332	19	6%	26.0	17.8	0.5	156.8	9.0	147.8	6%	148
30	313			26.5	18.2	0.5	157.0	-	157.0		157
31	313			27.0	18.5	0.5	165.7	-	165.7		166
32	313	19	6%	27.5	18.8	0.5	174.6	10.6	164.0	6%	164
33	294			28.0	19.0	0.5	171.9	-	171.9		172
34	294			29.0	19.2	0.5	186.3	-	186.3		186
35	294	18	6%	30.0	19.5	0.4	162.0	9.9	152.1	6%	152
36	276			30.5	19.8	0.4	159.6		159.6		160
37	276			31.0	20.0	0.4	166.5		166.5		167
38	276	16	6%	32.0	20.0	0.4	177.5	10.3	167.2	6%	167
39	260			33.0	20.0	0.4	177.8		177.8		178
40	260			34.0	20.0	0.4	188.7		188.7		189
								56.5			

Note: It is assumed that the tree density would be decreased at the rate of 5%, 3%, 2% annually during Year 1-2, 2-3, and 3-4 due to mortality.

Attachment I-2: Table 6. Stem Volume of Model-3 (Applied to Quang Ngai province)

Growth age	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees			Total volume (m^3/ha)	Volume of thinning (m^3/ha)	After thinning(m^3/ha)
				Diametter (cm)	Height (m)	Coefficient			
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
Sub-ordinate Species: *Acacia mangium* (800 trees/ha)									
1	800			0.5	0.5				
2	760			2.0	1.2	0.5	0.1		0.1
3	737			4.0	2.2	0.5	1.0		1.0
4	722			6.0	3.5	0.5	3.6		3.6
5	722			8.0	4.5	0.5	8.2		8.2
6	722			10.0	5.2	0.5	14.7		14.7
7	722	144	20%	12.0	6.5	0.5	26.5	5.3	21.3
8	578	115	20%	13.5	7.8	0.5	32.3	6.4	25.9
9	463	95	20%	15.0	8.5	0.5	34.8	7.1	27.7
10	368	75	20%	17.0	9.5	0.5	39.7	8.1	31.6
11	293	60	20%	18.0	10.5	0.5	39.2	8.0	31.2
12	233	46	20%	19.0	11.0	0.5	36.4	7.2	29.2
13	187	37	20%	20.0	12.0	0.5	35.3	7.0	28.3
14	150	35	23%	21.0	13.0	0.5	33.9	7.9	26.0
15	115	33	29%	22.0	14.0	0.5	30.7	8.8	21.9
16	82	33	40%	23.0	15.0	0.5	25.7	10.3	15.4
17	49	26	53%	24.0	16.0	0.5	17.9	9.4	8.5
18	23	23	98%	25.0	17.0	0.5	9.8	9.6	0.2
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
						Total		**95.0**	

Year	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees			Total volume (m^3/ha)	Volume of thining(m^3/ha)	After thinning(m^3/ha)	Percentage of thinnng volume (%)	Total Volume (m^3/ha)
				Diametter (cm)	Heigh (m)	Coefficient					
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(i+r)
Main Species: *Dipterocarpus alatas* (800 trees/ha)											
1	800			1.0	0.8						
2	760			2.0	1.0	0.5	0.1		0.1		0
3	737			3.0	1.5	0.5	0.4		0.4		1
4	722			3.5	2.2	0.5	0.8		0.8		4
5	722			4.5	3.0	0.5	1.7		1.7		10
6	722			5.0	3.5	0.5	2.5		2.5		17
7	722			6.0	4.0	0.5	4.1		4.1	17%	25
8	722			6.5	4.8	0.5	5.8		5.8	17%	32
9	722			7.0	5.5	0.5	7.6		7.6	17%	35
10	722			8.0	6.4	0.5	11.6		11.6	16%	43
11	722			9.0	7.2	0.5	16.5		16.5	14%	48
12	722			10.0	8.0	0.5	22.7		22.7	12%	52
13	722			11.0	8.7	0.5	29.9		29.9	11%	58
14	722			12.0	9.5	0.5	38.8		38.8	11%	65
15	722			12.5	10.2	0.5	45.2	-	45.2	12%	67
16	722			13.0	11.0	0.5	52.7	-	52.7	13%	68
17	722			14.0	11.8	0.5	65.6	-	65.6	11%	74
18	722			15.0	12.5	0.5	79.8	-	79.8	11%	80
19	722			16.0	13.0	0.5	94.4	-	94.4		94
20	722	72	10%	17.0	13.5	0.5	110.6	11.0	99.6	10%	100
21	650			18.0	14.3	0.5	118.3	-	118.3		118
22	650			19.0	15.0	0.5	138.2	-	138.2		138
23	650	65	10%	20.0	15.5	0.5	158.3	15.8	142.5	10%	142
24	585			21.0	16.0	0.5	162.1	-	162.1		162
25	585			22.0	16.2	0.5	180.2	-	180.2		180
26	585	48	8%	23.0	16.8	0.5	204.2	16.7	187.5	8%	187
27	537			24.0	17.0	0.5	206.6	-	206.6		207
28	537			25.0	17.2	0.5	226.8	-	226.8		227
29	537	45	8%	26.0	17.8	0.5	253.8	21.3	232.6	8%	233
30	492			26.5	18.2	0.5	247.0	-	247.0		247
31	492			27.0	18.5	0.5	260.7	-	260.7		261
32	492	30	6%	27.5	18.8	0.5	274.8	16.7	258.1	6%	258
33	462			28.0	19.0	0.5	270.4	-	270.4		270
34	462			29.0	19.2	0.5	293.1	-	293.1		293
35	462	28	6%	30.0	19.5	0.4	254.8	15.4	239.4	6%	239
36	434			30.5	19.8	0.4	251.3		251.3		251
37	434			31.0	20.0	0.4	262.2		262.2		262
38	434	24	6%	32.0	20.0	0.4	279.4	15.4	264.0	6%	264
39	410			33.0	20.0	0.4	280.7		280.7		281
40	410			34.0	20.0	0.4	298.0		298.0		298
								112.4			

Note: It is assumed that the tree density would be decreased at the rate of 5%, 3%, 2% annually during Year 1-2, 2-3, and 3-4 due to mortality.

Attachment I-2: Table 7. Stem Volume of Model-4 (Applied to Binh Dinh province)

Growth age	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees			Total volume (m^3/ha)	Volume of thinning (m^3/ha)	After thinning(m^3/ha)	Year	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees			Total volume (m^3/ha)	Volume of thining(m^3/ha)	After thinning(m^3/ha)	Percentage of thinnng volume (%)	Total Volume (m^3/ha)
				Diametter (cm)	Height (m)	Coefficient								Diametter (cm)	Heigh (m)	Coefficient					
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)		(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(i+r)
Sub-ordinate Species: *Acacia auriculiformis* (1,060 trees/ha)										**Main Species: *Pinus spp.* (555 trees/ha)**											
1	1,060			1.0	1.0					1	555			1.0	0.4						
2	1,007			2.0	2.0	0.5	0.3		0.3	2	527			2.0	0.8	0.5	0.1		0.1		0
3	977			3.0	4.0	0.5	1.4		1.4	3	511			3.0	1.2	0.5	0.2		0.2		2
4	957			4.5	5.5	0.5	4.2		4.2	4	501			4.0	1.6	0.5	0.5		0.5		5
5	957			6.0	7.0	0.5	9.5		9.5	5	501			5.0	2.0	0.5	1.0		1.0		10
6	957			8.0	8.0	0.5	19.2		19.2	6	501			6.0	2.5	0.5	1.8		1.8		21
7	957	100	10%	10.0	9.0	0.5	33.8	3.5	30.3	7	501			8.0	3.0	0.5	3.8		3.8	9%	34
8	857	90	10%	12.0	11.0	0.5	53.3	5.6	47.7	8	501			9.0	3.4	0.5	5.4		5.4	10%	53
9	767	80	10%	13.0	12.0	0.5	61.1	6.4	54.7	9	501			10.0	3.8	0.5	7.5		7.5	9%	62
10	687	72	10%	14.0	13.0	0.5	68.7	7.2	61.5	10	501			12.0	4.5	0.5	12.7		12.7	9%	74
11	615	63	10%	16.0	14.0	0.5	86.5	8.9	77.7	11	501			13.0	5.5	0.5	18.3		18.3	8%	96
12	552	55	10%	17.0	15.0	0.5	94.0	9.4	84.6	12	501			13.5	6.5	0.5	23.3		23.3	8%	108
13	497	50	10%	18.0	15.5	0.5	98.0	9.9	88.2	13	501			14.0	7.0	0.5	27.0		27.0	8%	115
14	447	45	10%	19.0	16.0	0.5	101.4	10.2	91.2	14	501			15.0	7.5	0.5	33.2		33.2	8%	124
15	402	42	10%	20.0	16.0	0.5	101.0	10.6	90.5	15	501			15.5	8.0	0.5	37.8	-	37.8	8%	128
16	360	42	12%	21.0	17.0	0.5	106.0	12.4	93.6	16	501			16.0	8.5	0.5	42.8	-	42.8	8%	136
17	318	42	13%	22.0	18.0	0.5	108.8	14.4	94.5	17	501			17.0	9.0	0.5	51.2	-	51.2	9%	146
18	276	42	15%	23.0	19.0	0.5	109.0	16.6	92.4	18	501			18.0	9.5	0.5	60.6	-	60.6	10%	153
19	234	42	18%	24.0	20.0	0.5	105.9	19.0	86.9	19	501			18.5	10.0	0.5	67.3	-	67.3	11%	154
20	192	42	22%	25.0	21.0	0.5	99.0	21.6	77.4	20	501	25	5%	19.0	11.0	0.5	78.1	3.9	74.2	14%	152
21	150	42	28%	26.0	22.0	0.5	87.7	24.5	63.2	21	476			19.5	12.0	0.5	85.3	-	85.3	14%	148
22	108	42	39%	27.0	23.0	0.5	71.2	27.6	43.6	22	476			20.0	12.8	0.5	95.7	-	95.7	17%	139
23	66	35	53%	28.0	24.0	0.5	48.9	25.8	23.1	23	476	22	5%	21.0	13.5	0.5	111.3	5.1	106.1	19%	129
24	31	31	99%	29.0	25.0	0.5	25.8	25.6	0.2	24	454			21.5	14.2	0.5	117.0	-	117.0	18%	117
25										25	454			22.0	14.8	0.5	127.7	-	127.7		128
26										26	454	21	5%	23.0	15.5	0.5	146.2	6.8	139.4	5%	139
27										27	433			23.5	16.0	0.5	150.2	-	150.2		150
28										28	433			24.0	16.2	0.5	158.7	-	158.7		159
29										29	433	20	5%	24.5	16.5	0.5	168.4	7.8	160.6	5%	161
30										30	413			25.0	16.8	0.5	170.3	-	170.3		170
31										31	413			25.5	17.2	0.5	181.4	-	181.4		181
32										32	413	20	5%	26.0	17.5	0.5	191.9	9.3	182.6	5%	183
33										33	393			26.5	17.8	0.5	192.9	-	192.9		193
34										34	393			27.0	18.0	0.5	202.5	-	202.5		203
35										35	393	20	5%	28.0	18.2	0.4	176.2	9.0	167.2	5%	167
36										36	373			28.5	18.5	0.4	176.1		176.1		176
37										37	373			28.5	18.6	0.4	177.0		177.0		177
38										38	373	20	5%	29.0	18.8	0.4	185.3	9.9	175.4	5%	175
39										39	353			29.0	19.0	0.4	177.2		177.2		177
40										40	353			29.0	19.0	0.4	177.2		177.2		177
						Total		**259.0**										**51.7**			

Note: It is assumed that the tree density would be decreased at the rate of 5%, 3%, 2% annually during Year 1-2, 2-3, and 3-4 due to mortality.

Attachment I-2: Table 8. Stem Volume of Model-5 (Applied to Phu Yen, Ninh Thuan and Binh Thuan)

Growth age	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees: Diametter (cm)	Measures of trees: Height (m)	Measures of trees: Coefficient	Total volume (m^3/ha)	Volume of thinning (m^3/ha)	After thinning(m^3/ha)
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
Sub-ordinate Species: *Acacia auriculiformis* (1,085 trees/ha)									
1	1,085			0.5	0.5				
2	1,031			2.0	1.2	0.5	0.2		0.2
3	1,000			4.0	2.2	0.5	1.4		1.4
4	980			6.0	3.5	0.5	4.8		4.8
5	980			8.0	4.5	0.5	11.1		11.1
6	980			10.0	5.2	0.5	20.0		20.0
7	980	100	10%	12.0	6.5	0.5	36.0	3.7	32.3
8	880	90	10%	13.5	7.8	0.5	49.1	5.0	44.1
9	790	80	10%	15.0	8.5	0.5	59.3	6.0	53.3
10	710	72	10%	17.0	9.5	0.5	76.5	7.8	68.7
11	638	63	10%	18.0	10.5	0.5	85.2	8.4	76.8
12	575	55	10%	19.0	11.0	0.5	89.6	8.6	81.0
13	520	50	10%	20.0	12.0	0.5	97.9	9.4	88.5
14	470	45	10%	21.0	13.0	0.5	105.7	10.1	95.6
15	425	42	10%	22.0	14.0	0.5	113.0	11.2	101.8
16	383	42	11%	23.0	15.0	0.5	119.2	13.1	106.2
17	341	42	12%	24.0	16.0	0.5	123.3	15.2	108.1
18	299	42	14%	25.0	17.0	0.5	124.6	17.5	107.1
19	257	42	16%	26.0	18.0	0.5	122.7	20.1	102.6
20	215	42	20%	27.0	19.0	0.5	116.8	22.8	94.0
21	173	42	24%	28.0	20.0	0.5	106.4	25.8	80.5
22	131	42	32%	29.0	21.0	0.5	90.7	29.1	61.6
23	89	30	34%	30.0	22.0	0.5	69.0	23.3	45.7
24	59	30	51%	31.0	23.0	0.5	51.0	26.0	25.0
25	29	29	100%	32.0	24.0	0.5	27.8	27.8	
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
						Total		**291.0**	

Year	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees: Diametter (cm)	Measures of trees: Heigh (m)	Measures of trees: Coefficient	Total volume (m^3/ha)	Volume of thining(m^3/ha)	After thinning(m^3/ha)	Percentage of thinnng volume (%)	Total Volume (m^3/ha)
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(i+r)
Main Species: *Dipterocarpus alatas* (545 trees/ha)											
1	545			1.0	0.8						
2	518			2.0	1.0	0.5	0.1		0.1		0
3	502			3.0	1.5	0.5	0.3		0.3		2
4	492			3.5	2.2	0.5	0.5		0.5		5
5	492			4.5	3.0	0.5	1.2		1.2		12
6	492			5.0	3.5	0.5	1.7		1.7		22
7	492			6.0	4.0	0.5	2.8		2.8	9%	35
8	492			6.5	4.8	0.5	3.9		3.9	9%	48
9	492			7.0	5.5	0.5	5.2		5.2	9%	58
10	492			8.0	6.4	0.5	7.9		7.9	9%	77
11	492			9.0	7.2	0.5	11.3		11.3	9%	88
12	492			10.0	8.0	0.5	15.5		15.5	8%	96
13	492			11.0	8.7	0.5	20.3		20.3	8%	109
14	492			12.0	9.5	0.5	26.4		26.4	8%	122
15	492			12.5	10.2	0.5	30.8	-	30.8	8%	133
16	492			13.0	11.0	0.5	35.9	-	35.9	8%	142
17	492			14.0	11.8	0.5	44.7	-	44.7	9%	153
18	492			15.0	12.5	0.5	54.3	-	54.3	10%	161
19	492			16.0	13.0	0.5	64.3	-	64.3	11%	167
20	492	40	8%	17.0	13.5	0.5	75.4	6.1	69.2	15%	163
21	452			18.0	14.3	0.5	82.2	-	82.2	14%	163
22	452			19.0	15.0	0.5	96.1	-	96.1	16%	158
23	452	35	8%	20.0	15.5	0.5	110.0	8.5	101.5	18%	147
24	417			21.0	16.0	0.5	115.5	-	115.5	16%	141
25	417			22.0	16.2	0.5	128.4	-	128.4	18%	128
26	417	35	8%	23.0	16.8	0.5	145.5	12.2	133.3	8%	133
27	382			24.0	17.0	0.5	146.9	-	146.9		147
28	382			25.0	17.2	0.5	161.3	-	161.3		161
29	382	30	8%	26.0	17.8	0.5	180.5	14.2	166.3	8%	166
30	352			26.5	18.2	0.5	176.7	-	176.7		177
31	352			27.0	18.5	0.5	186.4	-	186.4		186
32	352	27	8%	27.5	18.8	0.5	196.5	15.1	181.5	8%	181
33	325			28.0	19.0	0.5	190.1	-	190.1		190
34	325			29.0	19.2	0.5	206.1	-	206.1		206
35	325	25	8%	30.0	19.5	0.4	179.2	13.8	165.4	8%	165
36	300			30.5	19.8	0.4	173.6		173.6		174
37	300			31.0	20.0	0.4	181.2		181.2		181
38	300	23	8%	32.0	20.0	0.4	193.0	14.8	178.2	8%	178
39	277			33.0	20.0	0.4	189.6		189.6		190
40	277			34.0	20.0	0.4	201.2		201.2		201
								84.7			

Note: It is assumed that the tree density would be decreased at the rate of 5%, 3%, 2% annually during Year 1-2, 2-3, and 3-4 due to mortality.

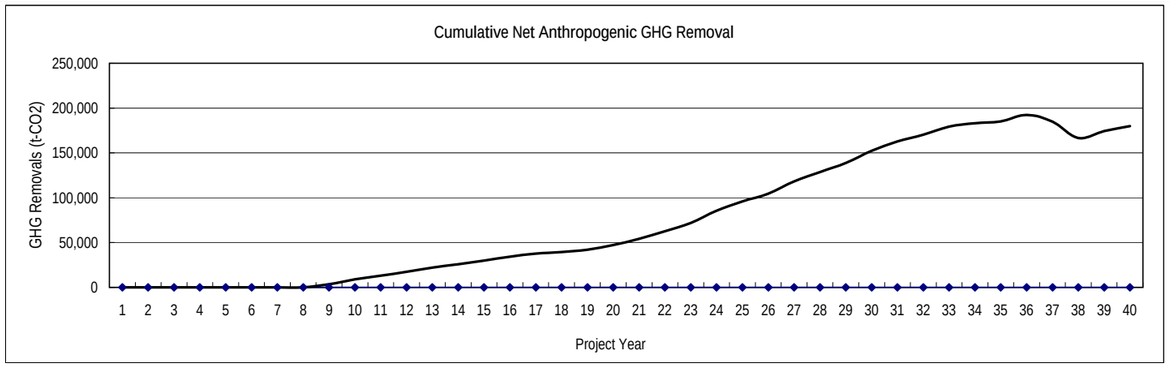
Attachment I-2: Table 9. Stem Volume of Model-6 (Applied to Coastal Reforestation)

Growth age	Density seedling/ha	Thinning seedling/ha	Thinning rate (%)	Measures of trees		Total volume (m^3/ha)	Volume of thinning (m^3/ha)	After thinning(m^3/ha)
				Diametter (cm)	Height (m)			
	(a)	(b)	(c)	(d)	(e)	(g)	(h)	(i)
Main Species: *Casuarina equisetifolia* (2,500 trees/ha)								
1	2,500							
2	2,250							
3	2,115							
4	2,052							
5	2,011							
6	2,011							
7	2,011			3.5	1.9	5.0		5.0
8	2,011			4.6	2.5	9.3		9.3
9	2,011			5.6	3.2	15.2		15.2
10	2,011			6.6	3.8	22.1		22.1
11	2,011			7.6	4.5	31.1		31.1
12	2,011			8.5	5.1	40.4		40.4
13	2,011			9.4	5.6	50.2		50.2
14	2,011			10.1	6.2	60.2		60.2
15	2,011	174	9%	11.0	6.8	77.2	3.8	73.4
16	1,837	265	14%	11.6	7.2	82.1	7.0	75.1
17	1,572	169	11%	12.5	7.8	82.5	5.1	77.4
18	1,403	119	8%	13.3	8.4	83.1	4.0	79.1
19	1,284	115	9%	13.9	8.8	84.8	4.3	80.5
20	1,169	100	9%	14.5	9.3	86.1	4.2	81.9
21	1,069	79	7%	15.2	9.8	86.9	3.6	83.3
22	990	70	7%	15.8	10.2	88.0	3.5	84.5
23	920	63	7%	16.4	10.7	89.1	3.4	85.7
24	857	57	7%	17.0	11.1	90.2	3.3	86.9
25	800	51	6%	17.6	11.6	91.3	3.3	88.0
26	749	41	5%	18.2	12.1	91.9	2.8	89.1
27	708	42	6%	18.8	12.5	93.2	3.1	90.1
28	666	30	5%	19.4	12.9	93.5	2.4	91.1
29	636	36	6%	19.9	13.3	94.9	3.0	91.9
30	600			20.5	13.7	92.9		92.9
31	600			20.5	13.7	92.9		92.9
32	600			20.5	13.7	92.9		92.9
33	600			20.5	13.7	92.9		92.9
34	600			20.5	13.7	92.9		92.9
35	600			20.5	13.7	92.9		92.9
36	600			20.5	13.7	92.9		92.9
37	600			20.5	13.7	92.9		92.9
38	600			20.5	13.7	92.9		92.9
39	600			20.5	13.7	92.9		92.9
40	600			20.5	13.7	92.9		92.9
							56.8	

Note: It is assumed that the tree density would be decreased at the rate of 5%, 3%, 2% annually during Year 1-2, 2-3, and 3-4 due to mortality.

Attachment I-2: Table 10. Estimation of Temporary CER Generated from the Project <Model-1: Reforestation in Watershed Area>

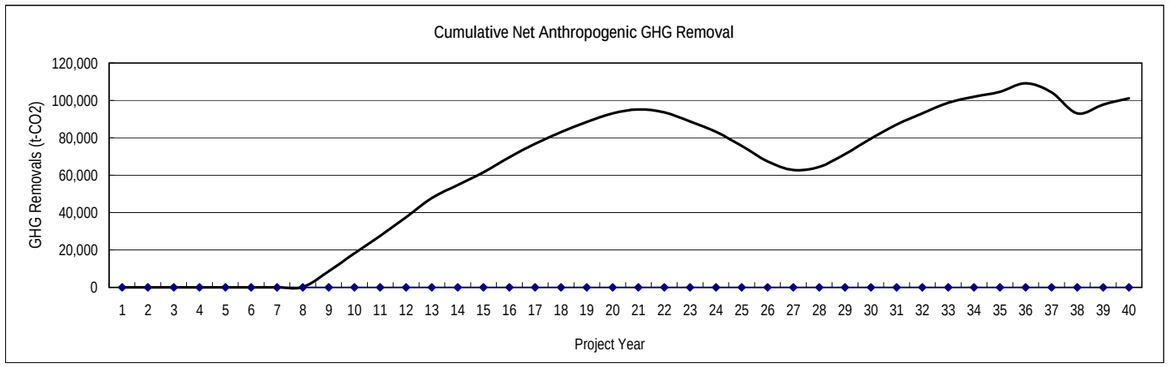
		1			2			3			4			5			6			7	8	9	10	11	12	13	14	15
Items		Area 500 ha			Stem volume at time t for the project scenario Model-1			Above-ground biomass at time t under the project scenario WD 0.57 BEF 1.40			Carbon stocks in above-ground biomass at time t under the project scenario			Carbon stocks in below-ground biomass at time t under the project scenario			Total carbon stocks in biomass in each strata at time t under the project scenario			Total carbon stocks in biomass at time t under the project scenario	Removal component of actual net GHG removals by sinks per annum	Project emissions	Actual net GHG removals by sinks in year t	Leakage attributable to the project activity at time t	Carbon stocks in biomass at time 0 that would have occurred in the absence of the project activity	Baseline net GHG removals by sinks	Net anthropogenic GHG removals by sinks	Net anthropogenic GHG removals by sinks (Cumulative)
Simbol		Ai			SV(t)i			T(t)i			NA(t)i			NB(t)i			N(t)i			N(t)	ΔCproj,t	GHGproj,t	ΔCactual,t	*Lt*	B (t C)	ΔCbsl,t	*ERarcdm,t*	*∑ERarcdm,t*
Formula					-			SV(t)i x BEF x WD			T(t)i x 0.5			Exp(-1.085+0.9256*lnT(t))*0.5			{NA(t)i+NB(t)i} x Ai			Sum of N(t)i	N(t)-N(t-1)		ΔCpoj,t - GHGproj,t	*ΔCactual,t x 0.15 (If Lt <0, 0)*	B (t C)	B(t C),t -B(t C),t-1 x 44/12	ΔCproj,t - GHGproj,t - Lt - ΔCbsl,t	
Unit		ha						t d.m./ha			t C/ha			t C/ha			t C			t C	t CO2-e/year	t CO2-e/year	t CO2-e/year	t CO2-e/year	t C	t CO2-e/ year	t CO2-e/year	t CO2-e
Project year	Growth age	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch									
3	0	50																		3,752	0	0	0	0	3,752	0	*0*	*0*
4	1	50	200		0.0			0.0			0.0			0.0			0			0	-13,758	0	-13,758	0	3,752	0	*-13,758*	*-13,758*
5	2	50	200	250	0.1	0.0		0.1	0.0		0.1	0.0		0.0	0.0		4	0		4	15	0	15	2	3,752	0	*12*	*-13,746*
6	3	50	200	250	1.0	0.1	0.0	0.8	0.1	0.0	0.4	0.1	0.0	0.1	0.0	0.0	27	16	0	43	144	0	144	22	3,752	0	*122*	*-13,623*
7	4	50	200	250	3.6	1.0	0.1	2.9	0.8	0.1	1.4	0.4	0.1	0.4	0.1	0.0	94	109	20	223	658	0	658	99	3,752	0	*559*	*-13,064*
8	5	50	200	250	9.9	3.6	1.0	7.9	2.9	0.8	3.9	1.4	0.4	1.1	0.4	0.1	254	374	136	765	1,989	0	1,989	298	3,752	0	*1,691*	*-11,374*
9	6	50	200	250	17.2	9.9	3.6	13.7	7.9	2.9	6.9	3.9	1.4	1.9	1.1	0.4	439	1,018	468	1,925	4,252	0	4,252	638	3,752	0	*3,614*	*-7,759*
10	7	50	200	250	25.3	17.2	9.9	20.2	13.7	7.9	10.1	6.9	3.9	2.7	1.9	1.1	642	1,757	1,272	3,671	6,403	0	6,403	960	3,752	0	*5,443*	*-2,316*
11	8	50	200	250	31.6	25.3	17.2	25.2	20.2	13.7	12.6	10.1	6.9	3.4	2.7	1.9	798	2,568	2,196	5,562	6,934	0	6,934	1,040	3,752	0	*5,894*	*3,577*
12	9	50	200	250	35.3	31.6	25.3	28.2	25.2	20.2	14.1	12.6	10.1	3.7	3.4	2.7	890	3,193	3,210	7,293	6,345	0	6,345	952	3,752	0	*5,393*	*8,970*
13	10	50	200	250	43.2	35.3	31.6	34.5	28.2	25.2	17.3	14.1	12.6	4.5	3.7	3.4	1,087	3,559	3,991	8,637	4,930	0	4,930	739	3,752	0	*4,190*	*13,161*
14	11	50	200	250	47.7	43.2	35.3	38.1	34.5	28.2	19.0	17.3	14.1	4.9	4.5	3.7	1,197	4,346	4,449	9,993	4,971	0	4,971	746	3,752	0	*4,225*	*17,386*
15	12	50	200	250	51.9	47.7	43.2	41.4	38.1	34.5	20.7	19.0	17.3	5.3	4.9	4.5	1,301	4,789	5,433	11,522	5,608	0	5,608	841	3,752	0	*4,766*	*22,152*
16	13	50	200	250	58.2	51.9	47.7	46.4	41.4	38.1	23.2	20.7	19.0	5.9	5.3	4.9	1,456	5,203	5,986	12,644	4,115	0	4,115	617	3,752	0	*3,498*	*25,650*
17	14	50	200	250	64.8	58.2	51.9	51.7	46.4	41.4	25.8	23.2	20.7	6.5	5.9	5.3	1,618	5,824	6,503	13,945	4,768	0	4,768	715	3,752	0	*4,053*	*29,703*
18	15	50	200	250	67.1	64.8	58.2	53.6	51.7	46.4	26.8	25.8	23.2	6.7	6.5	5.9	1,676	6,471	7,279	15,426	5,432	0	5,432	815	3,752	0	*4,617*	*34,320*
19	16	50	200	250	68.1	67.1	64.8	54.4	53.6	51.7	27.2	26.8	25.8	6.8	6.7	6.5	1,700	6,702	8,089	16,491	3,906	0	3,906	586	3,752	0	*3,320*	*37,639*
20	17	50	200	250	74.1	68.1	67.1	59.1	54.4	53.6	29.6	27.2	26.8	7.4	6.8	6.7	1,846	6,800	8,378	17,024	1,955	0	1,955	293	3,752	0	*1,662*	*39,301*
21	18	50	200	250	79.9	74.1	68.1	63.8	59.1	54.4	31.9	29.6	27.2	7.9	7.4	6.8	1,990	7,385	8,500	17,876	3,121	0	3,121	468	3,752	0	*2,653*	*41,954*
22	19	50	200	250	94.4	79.9	74.1	75.3	63.8	59.1	37.7	31.9	29.6	9.2	7.9	7.4	2,344	7,962	9,231	19,537	6,091	0	6,091	914	3,752	0	*5,177*	*47,132*
23	20	50	200	250	99.6	94.4	79.9	79.5	75.3	63.8	39.7	37.7	31.9	9.7	9.2	7.9	2,472	9,376	9,952	21,800	8,298	0	8,298	1,245	3,752	0	*7,053*	*54,185*
24	21	50	200	250	118.3	99.6	94.4	94.4	79.5	75.3	47.2	39.7	37.7	11.4	9.7	9.2	2,928	9,888	11,720	24,536	10,033	0	10,033	1,505	3,752	0	*8,528*	*62,713*
25	22	50	200	250	138.2	118.3	99.6	110.3	94.4	79.5	55.2	47.2	39.7	13.1	11.4	9.7	3,415	11,713	12,360	27,488	10,825	0	10,825	1,624	3,752	0	*9,201*	*71,914*
26	23	50	200	250	142.5	138.2	118.3	113.7	110.3	94.4	56.8	55.2	47.2	13.5	13.1	11.4	3,518	13,659	14,642	31,819	15,877	0	15,877	2,382	3,752	0	*13,496*	*85,410*
27	24	50	200	250	162.1	142.5	138.2	129.4	113.7	110.3	64.7	56.8	55.2	15.2	13.5	13.1	3,996	14,070	17,074	35,140	12,180	0	12,180	1,827	3,752	0	*10,353*	*95,763*
28	25	50	200	250	180.2	162.1	142.5	143.8	129.4	113.7	71.9	64.7	56.8	16.8	15.2	13.5	4,434	15,984	17,588	38,005	10,505	0	10,505	1,576	3,752	0	*8,930*	*104,692*
29	26	50	200	250	187.5	180.2	162.1	149.6	143.8	129.4	74.8	71.9	64.7	17.4	16.8	15.2	4,611	17,735	19,980	42,325	15,840	0	15,840	2,376	3,752	0	*13,464*	*118,156*
30	27	50	200	250	206.6	187.5	180.2	164.8	149.6	143.8	82.4	74.8	71.9	19.0	17.4	16.8	5,073	18,443	22,169	45,686	12,320	0	12,320	1,848	3,752	0	*10,472*	*128,628*
31	28	50	200	250	226.8	206.6	187.5	181.0	164.8	149.6	90.5	82.4	74.8	20.8	19.0	17.4	5,563	20,294	23,054	48,910	11,824	0	11,824	1,774	3,752	0	*10,051*	*138,679*
32	29	50	200	250	232.6	226.8	206.6	185.6	181.0	164.8	92.8	90.5	82.4	21.3	20.8	19.0	5,703	22,250	25,367	53,320	16,169	0	16,169	2,425	3,752	0	*13,743*	*152,422*
33	30	50	200	250	247.0	232.6	226.8	197.1	185.6	181.0	98.6	92.8	90.5	22.5	21.3	20.8	6,052	22,812	27,813	56,677	12,309	0	12,309	1,846	3,752	0	*10,463*	*162,885*
34	31	50	200	250	260.7	247.0	232.6	208.0	197.1	185.6	104.0	98.6	92.8	23.6	22.5	21.3	6,382	24,210	28,515	59,107	8,909	0	8,909	1,336	3,752	0	*7,573*	*170,458*
35	32	50	200	250	252.5	260.7	247.0	201.5	208.0	197.1	100.7	104.0	98.6	22.9	23.6	22.5	6,184	25,528	30,262	61,974	10,514	0	10,514	1,577	3,752	0	*8,937*	*179,394*
36	33	50	200	250	264.5	252.5	260.7	211.1	201.5	208.0	105.6	100.7	104.0	24.0	22.9	23.6	6,475	24,736	31,909	63,121	4,204	0	4,204	631	3,752	0	*3,573*	*182,968*
37	34	50	200	250	286.8	264.5	252.5	228.8	211.1	201.5	114.4	105.6	100.7	25.8	24.0	22.9	7,011	25,900	30,920	63,831	2,606	0	2,606	391	3,752	0	*2,215*	*185,183*
38	35	50	200	250	234.5	286.8	264.5	187.1	228.8	211.1	93.5	114.4	105.6	21.4	25.8	24.0	5,748	28,044	32,375	66,168	8,567	0	8,567	1,285	3,752	0	*7,282*	*192,465*
39	36	50	200	250	246.1	234.5	286.8	196.4	187.1	228.8	98.2	93.5	114.4	22.4	21.4	25.8	6,029	22,993	35,056	64,078	-7,664	0	-7,664	0	3,752	0	*-7,664*	*184,801*
40	37	50	200	250	256.8	246.1	234.5	204.9	196.4	187.1	102.4	98.2	93.5	23.3	22.4	21.4	6,287	24,116	28,742	59,144	-18,088	0	-18,088	0	3,752	0	*-18,088*	*166,713*
41	38	50	200	250	257.5	256.8	246.1	205.5	204.9	196.4	102.8	102.4	98.2	23.4	23.3	22.4	6,306	25,150	30,144	61,600	9,002	0	9,002	1,350	3,752	0	*7,652*	*174,365*
42	39	50	200	250	273.9	257.5	256.8	218.5	205.5	204.9	109.3	102.8	102.4	24.7	23.4	23.3	6,700	25,223	31,437	63,360	6,454	0	6,454	968	3,752	0	*5,486*	*179,850*
																											179,850	



Attachment I-2: Table 11. Estimation of Temporary CER Generated from the Project <Model-2: Reforestation in Watershed Area>

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Items	Area 500 ha	Stem volume at time t for the project scenario Model-2	Above-ground biomass at time t under the project scenario WD 0.54 BEF 1.40	Carbon stocks in above-ground biomass at time t under the project scenario	Carbon stocks in below-ground biomass at time t under the project scenario	Total carbon stocks in biomass in each strata at time t under the project scenario	Total carbon stocks in biomass at time t under the project scenario	Removal component of actual net GHG removals by sinks per annum	Project emissions	Actual net GHG removals by sinks in year t	Leakage attributable to the project activity at time t	Carbon stocks in biomass at time 0 that would have occurred in the absence of the project activity	Baseline net GHG removals by sinks	Net anthropogenic GHG removals by sinks	Net anthropogenic GHG removals by sinks (Cumulative)
Simbol	Ai	SV(t)i	T(t)i	NA(t)i	NB(t)i	N(t)i	N(t)	ΔCproj,t	GHGproj,t	ΔCactual,t	*Lt*	B (t C)	ΔCbsl,t	*ERarcdm,t*	∑*ERarcdm,t*
Formula		-	SV(t)i x BEF x WD	T(t)i x 0.5	Exp(-1.085+0.9256*lnT(t))*0.5	{NA(t)i+NB(t)i} x Ai	Sum of N(t)i	N(t)-N(t-1)		ΔCpoj,t - GHGproj,t	*ΔCactual,t x 0.15 (If Lt <0, 0)*	B (t C)	B(t C),t -B(t C),t-1 x 44/12	ΔCproj,t - GHGproj,t - Lt - ΔCbsl,t	
Unit	ha		t d.m./ha	t C/ha	t C/ha	t C	t C	t CO2-e/year	t CO2-e/year	t CO2-e/year	t CO2-e/year	t C	t CO2-e/ year	t CO2-e/year	t CO2-e

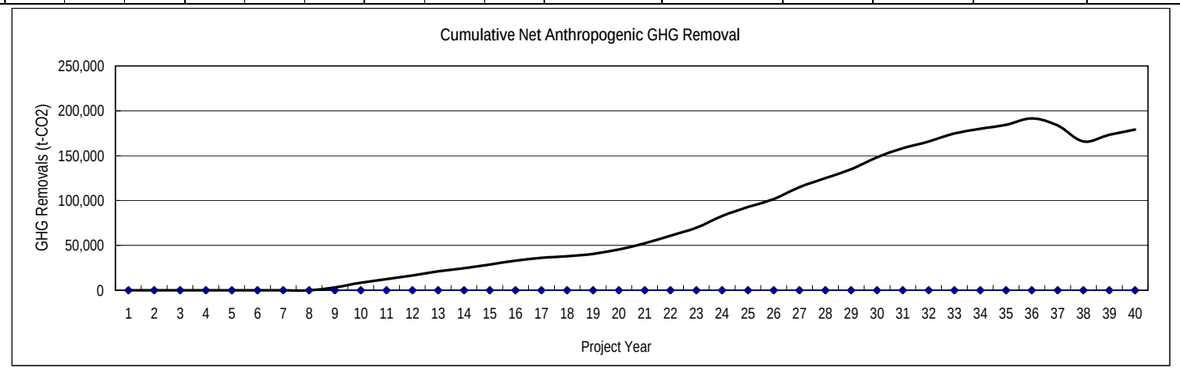
Project year	Growth age	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch									
3	0	50																		3,752	0	0	0	0	3,752	0	*0*	*0*
4	1	50	200		0.0			0.0			0.0			0.0			0			0	-13,758	0	-13,758	0	3,752	0	*-13,758*	*-13,758*
5	2	50	200	250	0.2	0.0		0.2	0.0		0.1	0.0		0.0	0.0		5	0		5	19	0	19	3	3,752	0	*16*	*-13,742*
6	3	50	200	250	1.4	0.2	0.0	1.1	0.2	0.0	0.5	0.1	0.0	0.2	0.0	0.0	36	21	0	57	188	0	188	28	3,752	0	*160*	*-13,582*
7	4	50	200	250	5.0	1.4	0.2	3.8	1.1	0.2	1.9	0.5	0.1	0.6	0.2	0.0	122	143	26	291	861	0	861	129	3,752	0	*732*	*-12,850*
8	5	50	200	250	12.3	5.0	1.4	9.3	3.8	1.1	4.6	1.9	0.5	1.3	0.6	0.2	299	490	179	968	2,479	0	2,479	372	3,752	0	*2,107*	*-10,743*
9	6	50	200	250	21.9	12.3	5.0	16.5	9.3	3.8	8.3	4.6	1.9	2.3	1.3	0.6	526	1,196	612	2,335	5,012	0	5,012	752	3,752	0	*4,261*	*-6,482*
10	7	50	200	250	35.5	21.9	12.3	26.8	16.5	9.3	13.4	8.3	4.6	3.5	2.3	1.3	847	2,105	1,495	4,447	7,747	0	7,747	1,162	3,752	0	*6,585*	*102*
11	8	50	200	250	48.6	35.5	21.9	36.7	26.8	16.5	18.4	13.4	8.3	4.7	3.5	2.3	1,155	3,389	2,632	7,176	10,005	0	10,005	1,501	3,752	0	*8,504*	*8,606*
12	9	50	200	250	59.3	48.6	35.5	44.8	36.7	26.8	22.4	18.4	13.4	5.7	4.7	3.5	1,406	4,621	4,236	10,263	11,319	0	11,319	1,698	3,752	0	*9,621*	*18,228*
13	10	50	200	250	77.4	59.3	48.6	58.5	44.8	36.7	29.3	22.4	18.4	7.3	5.7	4.7	1,828	5,623	5,776	13,227	10,867	0	10,867	1,630	3,752	0	*9,237*	*27,465*
14	11	50	200	250	88.5	77.4	59.3	66.9	58.5	44.8	33.5	29.3	22.4	8.3	7.3	5.7	2,087	7,311	7,029	16,426	11,732	0	11,732	1,760	3,752	0	*9,972*	*37,437*
15	12	50	200	250	95.9	88.5	77.4	72.5	66.9	58.5	36.2	33.5	29.3	8.9	8.3	7.3	2,257	8,347	9,138	19,742	12,159	0	12,159	1,824	3,752	0	*10,335*	*47,772*
16	13	50	200	250	107.2	95.9	88.5	81.1	72.5	66.9	40.5	36.2	33.5	9.9	8.9	8.3	2,521	9,028	10,434	21,983	8,214	0	8,214	1,232	3,752	0	*6,982*	*54,754*
17	14	50	200	250	118.6	107.2	95.9	89.6	81.1	72.5	44.8	40.5	36.2	10.8	9.9	8.9	2,783	10,083	11,285	24,151	7,950	0	7,950	1,193	3,752	0	*6,758*	*61,512*
18	15	50	200	250	127.8	118.6	107.2	96.6	89.6	81.1	48.3	44.8	40.5	11.6	10.8	9.9	2,997	11,132	12,604	26,733	9,467	0	9,467	1,420	3,752	0	*8,047*	*69,558*
19	16	50	200	250	135.6	127.8	118.6	102.5	96.6	89.6	51.2	48.3	44.8	12.3	11.6	10.8	3,175	11,987	13,915	29,078	8,599	0	8,599	1,290	3,752	0	*7,309*	*76,867*
20	17	50	200	250	143.6	135.6	127.8	108.5	102.5	96.6	54.3	51.2	48.3	12.9	12.3	11.6	3,361	12,701	14,984	31,046	7,215	0	7,215	1,082	3,752	0	*6,133*	*83,001*
21	18	50	200	250	149.1	143.6	135.6	112.7	108.5	102.5	56.3	54.3	51.2	13.4	12.9	12.3	3,487	13,442	15,877	32,806	6,455	0	6,455	968	3,752	0	*5,486*	*88,487*
22	19	50	200	250	150.9	149.1	143.6	114.1	112.7	108.5	57.0	56.3	54.3	13.5	13.4	12.9	3,529	13,948	16,803	34,280	5,406	0	5,406	811	3,752	0	*4,595*	*93,082*
23	20	50	200	250	145.3	150.9	149.1	109.8	114.1	112.7	54.9	57.0	56.3	13.1	13.5	13.4	3,399	14,118	17,435	34,953	2,465	0	2,465	370	3,752	0	*2,095*	*95,178*
24	21	50	200	250	140.0	145.3	150.9	105.8	109.8	114.1	52.9	54.9	57.0	12.6	13.1	13.5	3,277	13,598	17,647	34,522	-1,579	0	-1,579	0	3,752	0	*-1,579*	*93,599*
25	22	50	200	250	132.8	140.0	145.3	100.4	105.8	109.8	50.2	52.9	54.9	12.0	12.6	13.1	3,112	13,107	16,997	33,216	-4,788	0	-4,788	0	3,752	0	*-4,788*	*88,811*
26	23	50	200	250	121.9	132.8	140.0	92.1	100.4	105.8	46.1	50.2	52.9	11.1	12.0	12.6	2,859	12,447	16,384	31,691	-5,594	0	-5,594	0	3,752	0	*-5,594*	*83,216*
27	24	50	200	250	111.9	121.9	132.8	84.6	92.1	100.4	42.3	46.1	50.2	10.3	11.1	12.0	2,629	11,438	15,559	29,625	-7,573	0	-7,573	0	3,752	0	*-7,573*	*75,643*
28	25	50	200	250	108.9	111.9	121.9	82.3	84.6	92.1	41.2	42.3	46.1	10.0	10.3	11.1	2,560	10,514	14,297	27,371	-8,266	0	-8,266	0	3,752	0	*-8,266*	*67,377*
29	26	50	200	250	115.8	108.9	111.9	87.5	82.3	84.6	43.8	41.2	42.3	10.6	10.0	10.3	2,719	10,238	13,143	26,100	-4,661	0	-4,661	0	3,752	0	*-4,661*	*62,716*
30	27	50	200	250	127.6	115.8	108.9	96.4	87.5	82.3	48.2	43.8	41.2	11.6	10.6	10.0	2,991	10,875	12,798	26,664	2,068	0	2,068	310	3,752	0	*1,758*	*64,474*
31	28	50	200	250	140.1	127.6	115.8	105.9	96.4	87.5	52.9	48.2	43.8	12.6	11.6	10.6	3,279	11,965	13,593	28,837	7,971	0	7,971	1,196	3,752	0	*6,775*	*71,249*
32	29	50	200	250	147.8	140.1	127.6	111.7	105.9	96.4	55.9	52.9	48.2	13.3	12.6	11.6	3,458	13,118	14,956	31,532	9,880	0	9,880	1,482	3,752	0	*8,398*	*79,647*
33	30	50	200	250	157.0	147.8	140.1	118.7	111.7	105.9	59.3	55.9	52.9	14.1	13.3	12.6	3,670	13,832	16,397	33,899	8,680	0	8,680	1,302	3,752	0	*7,378*	*87,025*
34	31	50	200	250	165.7	157.0	147.8	125.2	118.7	111.7	62.6	59.3	55.9	14.8	14.1	13.3	3,869	14,679	17,290	35,839	7,113	0	7,113	1,067	3,752	0	*6,046*	*93,071*
35	32	50	200	250	164.0	165.7	157.0	124.0	125.2	118.7	62.0	62.6	59.3	14.6	14.8	14.1	3,832	15,478	18,349	37,659	6,675	0	6,675	1,001	3,752	0	*5,673*	*98,745*
36	33	50	200	250	171.9	164.0	165.7	129.9	124.0	125.2	65.0	62.0	62.6	15.3	14.6	14.8	4,012	15,328	19,347	38,688	3,772	0	3,772	566	3,752	0	*3,207*	*101,951*
37	34	50	200	250	186.3	171.9	164.0	140.8	129.9	124.0	70.4	65.0	62.0	16.5	15.3	14.6	4,344	16,049	19,161	39,554	3,176	0	3,176	476	3,752	0	*2,699*	*104,650*
38	35	50	200	250	152.1	186.3	171.9	115.0	140.8	129.9	57.5	70.4	65.0	13.6	16.5	15.3	3,556	17,378	20,062	40,996	5,285	0	5,285	793	3,752	0	*4,492*	*109,143*
39	36	50	200	250	159.6	152.1	186.3	120.7	115.0	140.8	60.3	57.5	70.4	14.3	13.6	16.5	3,730	14,226	21,722	39,678	-4,834	0	-4,834	0	3,752	0	*-4,834*	*104,309*
40	37	50	200	250	166.5	159.6	152.1	125.9	120.7	115.0	63.0	60.3	57.5	14.8	14.3	13.6	3,890	14,920	17,782	36,591	-11,316	0	-11,316	0	3,752	0	*-11,316*	*92,993*
41	38	50	200	250	167.2	166.5	159.6	126.4	125.9	120.7	63.2	63.0	60.3	14.9	14.8	14.3	3,904	15,559	18,650	38,113	5,579	0	5,579	837	3,752	0	*4,742*	*97,735*
42	39	50	200	250	177.8	167.2	166.5	134.4	126.4	125.9	67.2	63.2	63.0	15.8	14.9	14.8	4,148	15,617	19,449	39,214	4,039	0	4,039	606	3,752	0	*3,433*	*101,168*
																											101,168	



Attachment I-2: Table 12. Estimation of Temporary CER Generated from the Project <Model-3: Reforestation in Watershed Area>

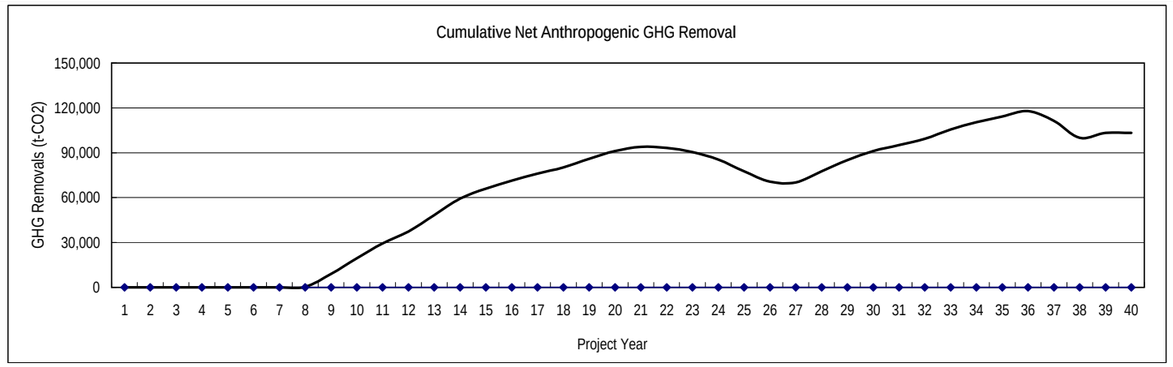
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Items	Area 500 ha	Stem volume at time t for the project scenario Model-3	Above-ground biomass at time t under the project scenario WD 0.56 BEF 1.40	Carbon stocks in above-ground biomass at time t under the project scenario	Carbon stocks in below-ground biomass at time t under the project scenario	Total carbon stocks in biomass in each strata at time t under the project scenario	Total carbon stocks in biomass at time t under the project scenario	Removal component of actual net GHG removals by sinks per annum	Project emissions	Actual net GHG removals by sinks in year t	Leakage attributable to the project activity at time t	Carbon stocks in biomass at time 0 that would have occurred in the absence of the project activity	Baseline net GHG removals by sinks	Net anthropogenic GHG removals by sinks	Net anthropogenic GHG removals by sinks (Cumulative)
Simbol	Ai	SV(t)i	T(t)i	NA(t)i	NB(t)i	N(t)i	N(t)	ΔCproj,t	GHGproj,t	ΔCactual,t	*Lt*	B (t C)	ΔCbsl,t	*ERarcdm,t*	∑*ERarcdm,t*
Formula		-	SV(t)i x BEF x WD	T(t)i x 0.5	Exp(-1.085+0.9256*lnT(t))*0.5	{NA(t)i+NB(t)i} x Ai	Sum of N(t)i	N(t)-N(t-1)		ΔCpoj,t - GHGproj,t	*ΔCactual,t x 0.15 (If Lt <0, 0)*	B (t C)	B(t C),t -B(t C),t-1 x 44/12	ΔCproj,t - GHGproj,t - Lt - ΔCbsl,t	
Unit	ha		t d.m./ha	t C/ha	t C/ha	t C	t C	t CO2-e/year	t CO2-e/year	t CO2-e/year	t CO2-e/year	t C	t CO2-e/ year	t CO2-e/year	t CO2-e

Project year	Growth age	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch									
3	0	50																		3,752	0	0	0	0	3,752	0	*0*	*0*
4	1	50	200		0.0			0.0			0.0			0.0			0			0	-13,758	0	-13,758	0	3,752	0	*-13,758*	*-13,758*
5	2	50	200	250	0.3	0.0		0.2	0.0		0.1	0.0		0.0	0.0		7	0		7	26	0	26	4	3,752	0	*22*	*-13,736*
6	3	50	200	250	1.4	0.3	0.0	1.1	0.2	0.0	0.5	0.1	0.0	0.2	0.0	0.0	37	28	0	65	211	0	211	32	3,752	0	*180*	*-13,557*
7	4	50	200	250	4.3	1.4	0.3	3.4	1.1	0.2	1.7	0.5	0.1	0.5	0.2	0.0	110	146	35	292	832	0	832	125	3,752	0	*707*	*-12,849*
8	5	50	200	250	9.9	4.3	1.4	7.7	3.4	1.1	3.8	1.7	0.5	1.1	0.5	0.2	248	441	183	872	2,127	0	2,127	319	3,752	0	*1,808*	*-11,041*
9	6	50	200	250	17.2	9.9	4.3	13.4	7.7	3.4	6.7	3.8	1.7	1.9	1.1	0.5	428	991	551	1,971	4,029	0	4,029	604	3,752	0	*3,425*	*-7,616*
10	7	50	200	250	25.3	17.2	9.9	19.7	13.4	7.7	9.8	6.7	3.8	2.7	1.9	1.1	625	1,711	1,239	3,576	5,887	0	5,887	883	3,752	0	*5,004*	*-2,613*
11	8	50	200	250	31.6	25.3	17.2	24.6	19.7	13.4	12.3	9.8	6.7	3.3	2.7	1.9	778	2,501	2,139	5,418	6,754	0	6,754	1,013	3,752	0	*5,741*	*3,128*
12	9	50	200	250	35.3	31.6	25.3	27.4	24.6	19.7	13.7	12.3	9.8	3.6	3.3	2.7	867	3,110	3,127	7,104	6,180	0	6,180	927	3,752	0	*5,253*	*8,381*
13	10	50	200	250	43.2	35.3	31.6	33.6	27.4	24.6	16.8	13.7	12.3	4.4	3.6	3.3	1,058	3,467	3,888	8,413	4,802	0	4,802	720	3,752	0	*4,082*	*12,463*
14	11	50	200	250	47.7	43.2	35.3	37.1	33.6	27.4	18.5	16.8	13.7	4.8	4.4	3.6	1,166	4,234	4,334	9,734	4,842	0	4,842	726	3,752	0	*4,116*	*16,579*
15	12	50	200	250	51.9	47.7	43.2	40.3	37.1	33.6	20.2	18.5	16.8	5.2	4.8	4.4	1,267	4,664	5,292	11,223	5,462	0	5,462	819	3,752	0	*4,643*	*21,221*
16	13	50	200	250	58.2	51.9	47.7	45.2	40.3	37.1	22.6	20.2	18.5	5.8	5.2	4.8	1,418	5,068	5,831	12,317	4,008	0	4,008	601	3,752	0	*3,407*	*24,628*
17	14	50	200	250	64.8	58.2	51.9	50.3	45.2	40.3	25.2	22.6	20.2	6.4	5.8	5.2	1,576	5,673	6,335	13,583	4,644	0	4,644	697	3,752	0	*3,947*	*28,576*
18	15	50	200	250	67.1	64.8	58.2	52.2	50.3	45.2	26.1	25.2	22.6	6.6	6.4	5.8	1,632	6,303	7,091	15,026	5,291	0	5,291	794	3,752	0	*4,497*	*33,073*
19	16	50	200	250	68.1	67.1	64.8	52.9	52.2	50.3	26.5	26.1	25.2	6.7	6.6	6.4	1,656	6,529	7,879	16,064	3,804	0	3,804	571	3,752	0	*3,234*	*36,307*
20	17	50	200	250	74.1	68.1	67.1	57.6	52.9	52.2	28.8	26.5	26.1	7.2	6.7	6.6	1,798	6,624	8,161	16,583	1,904	0	1,904	286	3,752	0	*1,619*	*37,925*
21	18	50	200	250	79.9	74.1	68.1	62.1	57.6	52.9	31.1	28.8	26.5	7.7	7.2	6.7	1,939	7,193	8,280	17,412	3,040	0	3,040	456	3,752	0	*2,584*	*40,510*
22	19	50	200	250	94.4	79.9	74.1	73.3	62.1	57.6	36.7	31.1	28.8	9.0	7.7	7.2	2,283	7,755	8,992	19,030	5,933	0	5,933	890	3,752	0	*5,043*	*45,553*
23	20	50	200	250	99.6	94.4	79.9	77.4	73.3	62.1	38.7	36.7	31.1	9.5	9.0	7.7	2,408	9,133	9,694	21,235	8,083	0	8,083	1,212	3,752	0	*6,870*	*52,423*
24	21	50	200	250	118.3	99.6	94.4	91.9	77.4	73.3	46.0	38.7	36.7	11.1	9.5	9.0	2,852	9,632	11,416	23,900	9,772	0	9,772	1,466	3,752	0	*8,307*	*60,729*
25	22	50	200	250	138.2	118.3	99.6	107.4	91.9	77.4	53.7	46.0	38.7	12.8	11.1	9.5	3,326	11,410	12,040	26,775	10,544	0	10,544	1,582	3,752	0	*8,962*	*69,692*
26	23	50	200	250	142.5	138.2	118.3	110.7	107.4	91.9	55.3	53.7	46.0	13.2	12.8	11.1	3,426	13,305	14,262	30,993	15,465	0	15,465	2,320	3,752	0	*13,145*	*82,837*
27	24	50	200	250	162.1	142.5	138.2	126.0	110.7	107.4	63.0	55.3	53.7	14.9	13.2	12.8	3,892	13,705	16,631	34,229	11,864	0	11,864	1,780	3,752	0	*10,084*	*92,921*
28	25	50	200	250	180.2	162.1	142.5	140.0	126.0	110.7	70.0	63.0	55.3	16.4	14.9	13.2	4,319	15,569	17,132	37,019	10,233	0	10,233	1,535	3,752	0	*8,698*	*101,619*
29	26	50	200	250	187.5	180.2	162.1	145.7	140.0	126.0	72.8	70.0	63.0	17.0	16.4	14.9	4,491	17,275	19,461	41,227	15,428	0	15,428	2,314	3,752	0	*13,114*	*114,733*
30	27	50	200	250	206.6	187.5	180.2	160.5	145.7	140.0	80.2	72.8	70.0	18.6	17.0	16.4	4,942	17,965	21,593	44,500	12,000	0	12,000	1,800	3,752	0	*10,200*	*124,933*
31	28	50	200	250	226.8	206.6	187.5	176.2	160.5	145.7	88.1	80.2	72.8	20.3	18.6	17.0	5,418	19,767	22,456	47,641	11,517	0	11,517	1,728	3,752	0	*9,790*	*134,723*
32	29	50	200	250	232.6	226.8	206.6	180.7	176.2	160.5	90.4	88.1	80.2	20.7	20.3	18.6	5,555	21,673	24,709	51,936	15,749	0	15,749	2,362	3,752	0	*13,386*	*148,109*
33	30	50	200	250	247.0	232.6	226.8	192.0	180.7	176.2	96.0	90.4	88.1	21.9	20.7	20.3	5,895	22,220	27,091	55,206	11,989	0	11,989	1,798	3,752	0	*10,191*	*158,300*
34	31	50	200	250	260.7	247.0	232.6	202.5	192.0	180.7	101.3	96.0	90.4	23.1	21.9	20.7	6,216	23,582	27,775	57,573	8,678	0	8,678	1,302	3,752	0	*7,376*	*165,676*
35	32	50	200	250	258.1	260.7	247.0	200.5	202.5	192.0	100.3	101.3	96.0	22.8	23.1	21.9	6,155	24,865	29,477	60,497	10,722	0	10,722	1,608	3,752	0	*9,114*	*174,790*
36	33	50	200	250	270.4	258.1	260.7	210.1	200.5	202.5	105.0	100.3	101.3	23.8	22.8	23.1	6,444	24,619	31,081	62,145	6,043	0	6,043	906	3,752	0	*5,136*	*179,926*
37	34	50	200	250	293.1	270.4	258.1	227.7	210.1	200.5	113.9	105.0	100.3	25.7	23.8	22.8	6,978	25,778	30,774	63,529	5,078	0	5,078	762	3,752	0	*4,316*	*184,242*
38	35	50	200	250	239.4	293.1	270.4	186.0	227.7	210.1	93.0	113.9	105.0	21.3	25.7	23.8	5,716	27,912	32,222	65,850	8,507	0	8,507	1,276	3,752	0	*7,231*	*191,473*
39	36	50	200	250	251.3	239.4	293.1	195.2	186.0	227.7	97.6	93.0	113.9	22.3	21.3	25.7	5,995	22,864	34,890	63,748	-7,705	0	-7,705	0	3,752	0	*-7,705*	*183,768*
40	37	50	200	250	262.2	251.3	239.4	203.7	195.2	186.0	101.9	97.6	93.0	23.2	22.3	21.3	6,252	23,980	28,579	58,811	-18,103	0	-18,103	0	3,752	0	*-18,103*	*165,665*
41	38	50	200	250	264.0	262.2	251.3	205.1	203.7	195.2	102.5	101.9	97.6	23.3	23.2	22.3	6,293	25,008	29,974	61,275	9,036	0	9,036	1,355	3,752	0	*7,681*	*173,345*
42	39	50	200	250	280.7	264.0	262.2	218.1	205.1	203.7	109.1	102.5	101.9	24.7	23.3	23.2	6,687	25,173	31,260	63,119	6,762	0	6,762	1,014	3,752	0	*5,747*	*179,093*
																											179,093	



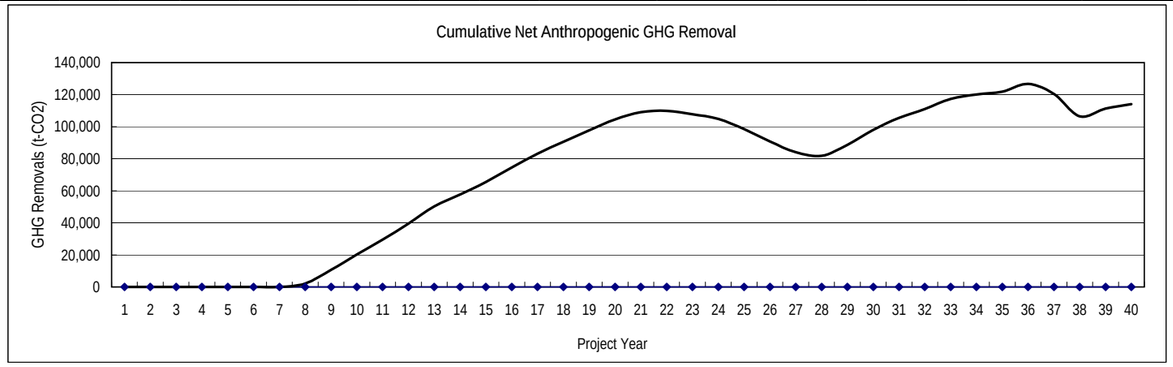
Attachment I-2: Table 13. Estimation of Temporary CER Generated from the Project <Model-4: Reforestation in Watershed Area>

		1			2			3			4			5			6			7	8	9	10	11	12	13	14	15
Items		Area 500 ha			Stem volume at time t for the project scenario Model-4			Above-ground biomass at time t under the project scenario WD 0.51 BEF 1.40			Carbon stocks in above-ground biomass at time t under the project scenario			Carbon stocks in below-ground biomass at time t under the project scenario			Total carbon stocks in biomass in each strata at time t under the project scenario			Total carbon stocks in biomass at time t under the project scenario	Removal component of actual net GHG removals by sinks per annum	Project emissions	Actual net GHG removals by sinks in year t	Leakage attributable to the project activity at time t	Carbon stocks in biomass at time 0 that would have occurred in the absence of the project activity	Baseline net GHG removals by sinks	Net anthropogenic GHG removals by sinks	Net anthropogenic GHG removals by sinks (Cumulative)
Simbol		Ai			SV(t)i			T(t)i			NA(t)i			NB(t)i			N(t)i			N(t)	ΔCproj,t	GHGproj,t	ΔCactual,t	*Lt*	B (t C)	ΔCbsl,t	*ERarcdm,t*	*∑ERarcdm,t*
Formula					-			SV(t)i x BEF x WD			T(t)i x 0.5			Exp(-1.085+0.9256*lnT(t))*0.5			{NA(t)i+NB(t)i} x Ai			Sum of N(t)i	N(t)-N(t-1)		ΔCpoj,t - GHGproj,t	*ΔCactual,t x 0.15 (If Lt <0, 0)*	B (t C)	B(t C),t -B(t C),t-1 x 44/12	ΔCproj,t - GHGproj,t - Lt - ΔCbsl,t	
Unit		ha						t d.m./ha			t C/ha			t C/ha			t C			t C	t CO2-e/year	t CO2-e/year	t CO2-e/year	t CO2-e/year	t C	t CO2-e/ year	t CO2-e/year	t CO2-e
Project year	Growth age	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch									
3	0	50																		3,207	0	0	0	0	3,207	0	*0*	*0*
4	1	50	200		0.0			0.0			0.0			0.0			0			0	-11,759	0	-11,759	0	3,207	0	*-11,759*	*-11,759*
5	2	50	200	250	0.4	0.0		0.3	0.0		0.1	0.0		0.1	0.0		9	0		9	34	0	34	5	3,207	0	*29*	*-11,730*
6	3	50	200	250	1.6	0.4	0.0	1.1	0.3	0.0	0.6	0.1	0.0	0.2	0.1	0.0	38	37	0	75	242	0	242	36	3,207	0	*206*	*-11,524*
7	4	50	200	250	4.7	1.6	0.4	3.3	1.1	0.3	1.7	0.6	0.1	0.5	0.2	0.1	109	152	47	308	854	0	854	128	3,207	0	*726*	*-10,798*
8	5	50	200	250	10.5	4.7	1.6	7.5	3.3	1.1	3.7	1.7	0.6	1.1	0.5	0.2	241	438	190	869	2,055	0	2,055	308	3,207	0	*1,747*	*-9,051*
9	6	50	200	250	21.0	10.5	4.7	15.0	7.5	3.3	7.5	3.7	1.7	2.1	1.1	0.5	478	963	547	1,989	4,107	0	4,107	616	3,207	0	*3,491*	*-5,560*
10	7	50	200	250	34.1	21.0	10.5	24.3	15.0	7.5	12.2	7.5	3.7	3.2	2.1	1.1	770	1,914	1,204	3,887	6,960	0	6,960	1,044	3,207	0	*5,916*	*357*
11	8	50	200	250	53.1	34.1	21.0	37.9	24.3	15.0	19.0	12.2	7.5	4.9	3.2	2.1	1,192	3,079	2,392	6,663	10,179	0	10,179	1,527	3,207	0	*8,652*	*9,009*
12	9	50	200	250	62.2	53.1	34.1	44.4	37.9	24.3	22.2	19.0	12.2	5.7	4.9	3.2	1,392	4,769	3,849	10,010	12,272	0	12,272	1,841	3,207	0	*10,431*	*19,439*
13	10	50	200	250	74.3	62.2	53.1	53.0	44.4	37.9	26.5	22.2	19.0	6.7	5.7	4.9	1,659	5,569	5,961	13,190	11,657	0	11,657	1,749	3,207	0	*9,909*	*29,348*
14	11	50	200	250	96.0	74.3	62.2	68.5	53.0	44.4	34.3	26.5	22.2	8.5	6.7	5.7	2,135	6,635	6,962	15,732	9,322	0	9,322	1,398	3,207	0	*7,924*	*37,272*
15	12	50	200	250	107.9	96.0	74.3	77.0	68.5	53.0	38.5	34.3	26.5	9.4	8.5	6.7	2,397	8,540	8,294	19,231	12,830	0	12,830	1,925	3,207	0	*10,906*	*48,178*
16	13	50	200	250	115.2	107.9	96.0	82.2	77.0	68.5	41.1	38.5	34.3	10.0	9.4	8.5	2,555	9,586	10,676	22,817	13,148	0	13,148	1,972	3,207	0	*11,176*	*59,354*
17	14	50	200	250	124.4	115.2	107.9	88.8	82.2	77.0	44.4	41.1	38.5	10.7	10.0	9.4	2,757	10,220	11,983	24,960	7,857	0	7,857	1,179	3,207	0	*6,678*	*66,032*
18	15	50	200	250	128.3	124.4	115.2	91.6	88.8	82.2	45.8	44.4	41.1	11.1	10.7	10.0	2,842	11,028	12,775	26,645	6,178	0	6,178	927	3,207	0	*5,252*	*71,284*
19	16	50	200	250	136.5	128.3	124.4	97.4	91.6	88.8	48.7	45.8	44.4	11.7	11.1	10.7	3,020	11,370	13,784	28,174	5,608	0	5,608	841	3,207	0	*4,767*	*76,051*
20	17	50	200	250	145.6	136.5	128.3	103.9	97.4	91.6	52.0	48.7	45.8	12.4	11.7	11.1	3,220	12,081	14,212	29,513	4,909	0	4,909	736	3,207	0	*4,173*	*80,224*
21	18	50	200	250	153.0	145.6	136.5	109.2	103.9	97.4	54.6	52.0	48.7	13.0	12.4	11.7	3,380	12,881	15,101	31,363	6,781	0	6,781	1,017	3,207	0	*5,764*	*85,988*
22	19	50	200	250	154.3	153.0	145.6	110.1	109.2	103.9	55.1	54.6	52.0	13.1	13.0	12.4	3,408	13,520	16,102	33,030	6,115	0	6,115	917	3,207	0	*5,198*	*91,185*
23	20	50	200	250	151.6	154.3	153.0	108.2	110.1	109.2	54.1	55.1	54.6	12.9	13.1	13.0	3,351	13,633	16,900	33,884	3,132	0	3,132	470	3,207	0	*2,662*	*93,848*
24	21	50	200	250	148.5	151.6	154.3	106.0	108.2	110.1	53.0	54.1	55.1	12.7	12.9	13.1	3,282	13,404	17,041	33,727	-576	0	-576	0	3,207	0	*-576*	*93,272*
25	22	50	200	250	139.3	148.5	151.6	99.4	106.0	108.2	49.7	53.0	54.1	11.9	12.7	12.9	3,082	13,129	16,755	32,966	-2,790	0	-2,790	0	3,207	0	*-2,790*	*90,481*
26	23	50	200	250	129.2	139.3	148.5	92.2	99.4	106.0	46.1	49.7	53.0	11.1	11.9	12.7	2,862	12,329	16,412	31,603	-4,998	0	-4,998	0	3,207	0	*-4,998*	*85,483*
27	24	50	200	250	117.2	129.2	139.3	83.7	92.2	99.4	41.8	46.1	49.7	10.2	11.1	11.9	2,600	11,449	15,411	29,461	-7,855	0	-7,855	0	3,207	0	*-7,855*	*77,628*
28	25	50	200	250	127.7	117.2	129.2	91.2	83.7	92.2	45.6	41.8	46.1	11.0	10.2	11.1	2,829	10,402	14,312	27,542	-7,035	0	-7,035	0	3,207	0	*-7,035*	*70,593*
29	26	50	200	250	139.4	127.7	117.2	99.5	91.2	83.7	49.8	45.6	41.8	11.9	11.0	10.2	3,085	11,317	13,002	27,404	-508	0	-508	0	3,207	0	*-508*	*70,084*
30	27	50	200	250	150.2	139.4	127.7	107.2	99.5	91.2	53.6	49.8	45.6	12.8	11.9	11.0	3,321	12,339	14,146	29,806	8,809	0	8,809	1,321	3,207	0	*7,488*	*77,572*
31	28	50	200	250	158.7	150.2	139.4	113.2	107.2	99.5	56.6	53.6	49.8	13.5	12.8	11.9	3,504	13,283	15,424	32,211	8,819	0	8,819	1,323	3,207	0	*7,496*	*85,069*
32	29	50	200	250	160.6	158.7	150.2	114.7	113.2	107.2	57.3	56.6	53.6	13.6	13.5	12.8	3,547	14,017	16,604	34,167	7,171	0	7,171	1,076	3,207	0	*6,096*	*91,164*
33	30	50	200	250	170.3	160.6	158.7	121.6	114.7	113.2	60.8	57.3	56.6	14.4	13.6	13.5	3,757	14,188	17,521	35,466	4,761	0	4,761	714	3,207	0	*4,047*	*95,211*
34	31	50	200	250	181.4	170.3	160.6	129.5	121.6	114.7	64.7	60.8	57.3	15.2	14.4	13.6	3,998	15,029	17,735	36,762	4,754	0	4,754	713	3,207	0	*4,041*	*99,252*
35	32	50	200	250	182.6	181.4	170.3	130.3	129.5	121.6	65.2	64.7	60.8	15.3	15.2	14.4	4,024	15,994	18,786	38,804	7,488	0	7,488	1,123	3,207	0	*6,365*	*105,617*
36	33	50	200	250	192.9	182.6	181.4	137.7	130.3	129.5	68.9	65.2	64.7	16.1	15.3	15.2	4,249	16,097	19,992	40,338	5,625	0	5,625	844	3,207	0	*4,781*	*110,398*
37	34	50	200	250	202.5	192.9	182.6	144.6	137.7	130.3	72.3	68.9	65.2	16.9	16.1	15.3	4,457	16,995	20,121	41,574	4,531	0	4,531	680	3,207	0	*3,851*	*114,249*
38	35	50	200	250	167.2	202.5	192.9	119.4	144.6	137.7	59.7	72.3	68.9	14.1	16.9	16.1	3,690	17,829	21,244	42,763	4,361	0	4,361	654	3,207	0	*3,707*	*117,956*
39	36	50	200	250	176.1	167.2	202.5	125.7	119.4	144.6	62.8	59.7	72.3	14.8	14.1	16.9	3,883	14,761	22,286	40,930	-6,722	0	-6,722	0	3,207	0	*-6,722*	*111,234*
40	37	50	200	250	177.0	176.1	167.2	126.4	125.7	119.4	63.2	62.8	59.7	14.9	14.8	14.1	3,904	15,533	18,451	37,888	-11,154	0	-11,154	0	3,207	0	*-11,154*	*100,080*
41	38	50	200	250	175.4	177.0	176.1	125.2	126.4	125.7	62.6	63.2	62.8	14.8	14.9	14.8	3,867	15,616	19,417	38,900	3,709	0	3,709	556	3,207	0	*3,153*	*103,233*
42	39	50	200	250	177.2	175.4	177.0	126.5	125.2	126.4	63.2	62.6	63.2	14.9	14.8	14.9	3,908	15,469	19,520	38,897	-11	0	-11	0	3,207	0	*-11*	*103,222*
																											103,222	



Attachment I-2: Table 14. Estimation of Temporary CER Generated from the Project <Model-5: Reforestation in Watershed Area>

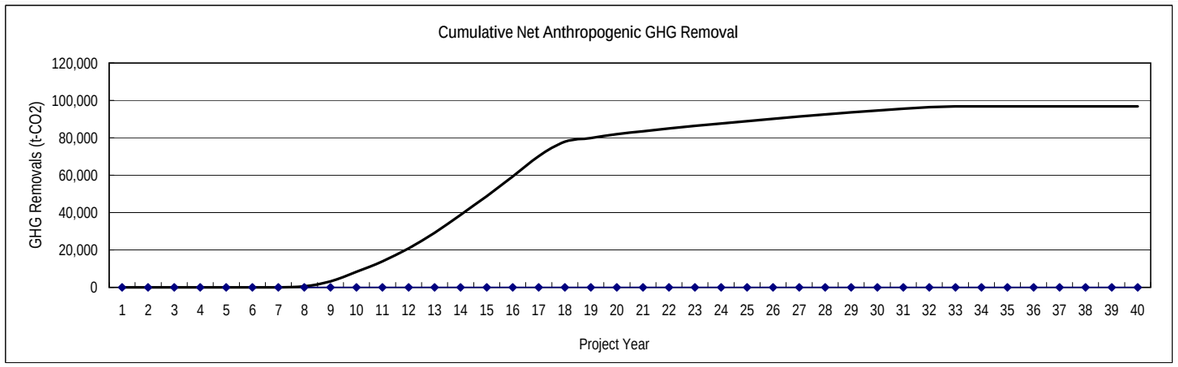
		1			2			3			4			5			6			7	8	9	10	11	12	13	14	15
Items		Area 500 ha			Stem volume at time t for the project scenario Model-5			Above-ground biomass at time t under the project scenario WD 0.55 BEF 1.40			Carbon stocks in above-ground biomass at time t under the project scenario			Carbon stocks in below-ground biomass at time t under the project scenario			Total carbon stocks in biomass in each strata at time t under the project scenario			Total carbon stocks in biomass at time t under the project scenario	Removal component of actual net GHG removals by sinks per annum	Project emissions	Actual net GHG removals by sinks in year t	Leakage attributable to the project activity at time t	Carbon stocks in biomass at time 0 that would have occurred in the absence of the project activity	Baseline net GHG removals by sinks	Net anthropogenic GHG removals by sinks	Net anthropogenic GHG removals by sinks (Cumulative)
Simbol		Ai			SV(t)i			T(t)i			NA(t)i			NB(t)i			N(t)i			N(t)	ΔCproj,t	GHGproj,t	ΔCactual,t	*Lt*	B (t C)	ΔCbsl,t	*ERarcdm,t*	∑*ERarcdm,t*
Formula					-			SV(t)i x BEF x WD			T(t)i x 0.5			Exp(-1.085+0.9256*lnT(t))*0.5			{NA(t)i+NB(t)i} x Ai			Sum of N(t)i	N(t)-N(t-1)		ΔCproj,t - GHGproj,t	*ΔCactual,t x 0.15 (If Lt <0, 0)*	B (t C)	B(t C),t -B(t C),t-1 x 44/12	ΔCproj,t - GHGproj,t - Lt - ΔCbsl,t	
Unit		ha						t d.m./ha			t C/ha			t C/ha			t C			t C	t CO2-e/year	t CO2-e/year	t CO2-e/year	t CO2-e/year	t C	t CO2-e/ year	t CO2-e/year	t CO2-e
Project year	Growth age	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch									
3	0	50																		3,207	0	0	0	0	3,207	0	*0*	*0*
4	1	50	200		0.0			0.0			0.0			0.0			0			0	-11,759	0	-11,759	0	3,207	0	*-11,759*	*-11,759*
5	2	50	200	250	0.3	0.0		0.2	0.0		0.1	0.0		0.0	0.0		7	0		7	27	0	27	4	3,207	0	*23*	*-11,736*
6	3	50	200	250	1.6	0.3	0.0	1.3	0.2	0.0	0.6	0.1	0.0	0.2	0.0	0.0	42	29	0	71	234	0	234	35	3,207	0	*199*	*-11,537*
7	4	50	200	250	5.4	1.6	0.3	4.1	1.3	0.2	2.1	0.6	0.1	0.6	0.2	0.0	134	168	36	338	980	0	980	147	3,207	0	*833*	*-10,705*
8	5	50	200	250	12.2	5.4	1.6	9.4	4.1	1.3	4.7	2.1	0.6	1.3	0.6	0.2	301	536	210	1,047	2,599	0	2,599	390	3,207	0	*2,209*	*-8,495*
9	6	50	200	250	21.7	12.2	5.4	16.6	9.4	4.1	8.3	4.7	2.1	2.3	1.3	0.6	529	1,206	670	2,404	4,976	0	4,976	746	3,207	0	*4,230*	*-4,265*
10	7	50	200	250	35.1	21.7	12.2	26.9	16.6	9.4	13.4	8.3	4.7	3.6	2.3	1.3	849	2,115	1,507	4,472	7,582	0	7,582	1,137	3,207	0	*6,445*	*2,179*
11	8	50	200	250	48.0	35.1	21.7	36.7	26.9	16.6	18.4	13.4	8.3	4.7	3.6	2.3	1,156	3,398	2,644	7,198	9,994	0	9,994	1,499	3,207	0	*8,495*	*10,674*
12	9	50	200	250	58.5	48.0	35.1	44.8	36.7	26.9	22.4	18.4	13.4	5.7	4.7	3.6	1,404	4,623	4,247	10,274	11,281	0	11,281	1,692	3,207	0	*9,589*	*20,263*
13	10	50	200	250	76.6	58.5	48.0	58.7	44.8	36.7	29.3	22.4	18.4	7.3	5.7	4.7	1,833	5,617	5,778	13,228	10,831	0	10,831	1,625	3,207	0	*9,207*	*29,470*
14	11	50	200	250	88.0	76.6	58.5	67.4	58.7	44.8	33.7	29.3	22.4	8.3	7.3	5.7	2,101	7,331	7,022	16,454	11,826	0	11,826	1,774	3,207	0	*10,052*	*39,521*
15	12	50	200	250	96.5	88.0	76.6	73.8	67.4	58.7	36.9	33.7	29.3	9.1	8.3	7.3	2,299	8,402	9,164	19,866	12,511	0	12,511	1,877	3,207	0	*10,634*	*50,156*
16	13	50	200	250	108.9	96.5	88.0	83.3	73.8	67.4	41.7	36.9	33.7	10.1	9.1	8.3	2,590	9,197	10,503	22,289	8,887	0	8,887	1,333	3,207	0	*7,554*	*57,709*
17	14	50	200	250	122.0	108.9	96.5	93.4	83.3	73.8	46.7	41.7	36.9	11.3	10.1	9.1	2,898	10,358	11,496	24,752	9,032	0	9,032	1,355	3,207	0	*7,677*	*65,386*
18	15	50	200	250	132.6	122.0	108.9	101.5	93.4	83.3	50.8	46.7	41.7	12.2	11.3	10.1	3,146	11,592	12,948	27,686	10,756	0	10,756	1,613	3,207	0	*9,143*	*74,529*
19	16	50	200	250	142.1	132.6	122.0	108.7	101.5	93.4	54.4	50.8	46.7	13.0	12.2	11.3	3,367	12,583	14,491	30,440	10,098	0	10,098	1,515	3,207	0	*8,583*	*83,112*
20	17	50	200	250	152.8	142.1	132.6	116.9	108.7	101.5	58.5	54.4	50.8	13.9	13.0	12.2	3,617	13,467	15,728	32,812	8,698	0	8,698	1,305	3,207	0	*7,393*	*90,505*
21	18	50	200	250	161.4	152.8	142.1	123.6	116.9	108.7	61.8	58.5	54.4	14.6	13.9	13.0	3,819	14,467	16,834	35,120	8,461	0	8,461	1,269	3,207	0	*7,192*	*97,697*
22	19	50	200	250	166.9	161.4	152.8	127.8	123.6	116.9	63.9	61.8	58.5	15.0	14.6	13.9	3,946	15,276	18,084	37,305	8,015	0	8,015	1,202	3,207	0	*6,813*	*104,510*
23	20	50	200	250	163.2	166.9	161.4	124.9	127.8	123.6	62.5	63.9	61.8	14.7	15.0	14.6	3,860	15,784	19,094	38,739	5,255	0	5,255	788	3,207	0	*4,467*	*108,976*
24	21	50	200	250	162.7	163.2	166.9	124.6	124.9	127.8	62.3	62.5	63.9	14.7	14.7	15.0	3,849	15,440	19,730	39,020	1,031	0	1,031	155	3,207	0	*876*	*109,853*
25	22	50	200	250	157.7	162.7	163.2	120.7	124.6	124.9	60.4	62.3	62.5	14.3	14.7	14.7	3,731	15,398	19,300	38,429	-2,165	0	-2,165	0	3,207	0	*-2,165*	*107,687*
26	23	50	200	250	147.2	157.7	162.7	112.7	120.7	124.6	56.4	60.4	62.3	13.4	14.3	14.7	3,488	14,925	19,247	37,660	-2,821	0	-2,821	0	3,207	0	*-2,821*	*104,866*
27	24	50	200	250	140.5	147.2	157.7	107.6	112.7	120.7	53.8	56.4	60.4	12.8	13.4	14.3	3,331	13,950	18,656	35,938	-6,313	0	-6,313	0	3,207	0	*-6,313*	*98,553*
28	25	50	200	250	128.4	140.5	147.2	98.3	107.6	112.7	49.1	53.8	56.4	11.8	12.8	13.4	3,047	13,325	17,438	33,810	-7,802	0	-7,802	0	3,207	0	*-7,802*	*90,751*
29	26	50	200	250	133.3	128.4	140.5	102.0	98.3	107.6	51.0	49.1	53.8	12.2	11.8	12.8	3,162	12,188	16,656	32,007	-6,613	0	-6,613	0	3,207	0	*-6,613*	*84,138*
30	27	50	200	250	146.9	133.3	128.4	112.4	102.0	98.3	56.2	51.0	49.1	13.4	12.2	11.8	3,479	12,649	15,235	31,363	-2,360	0	-2,360	0	3,207	0	*-2,360*	*81,777*
31	28	50	200	250	161.3	146.9	133.3	123.4	112.4	102.0	61.7	56.2	51.0	14.6	13.4	12.2	3,815	13,917	15,811	33,543	7,992	0	7,992	1,199	3,207	0	*6,793*	*88,571*
32	29	50	200	250	166.3	161.3	146.9	127.3	123.4	112.4	63.7	61.7	56.2	15.0	14.6	13.4	3,933	15,258	17,396	36,588	11,165	0	11,165	1,675	3,207	0	*9,490*	*98,061*
33	30	50	200	250	176.7	166.3	161.3	135.2	127.3	123.4	67.6	63.7	61.7	15.9	15.0	14.6	4,174	15,732	19,073	38,978	8,766	0	8,766	1,315	3,207	0	*7,451*	*105,512*
34	31	50	200	250	186.4	176.7	166.3	142.7	135.2	127.3	71.3	67.6	63.7	16.7	15.9	15.0	4,401	16,695	19,664	40,761	6,535	0	6,535	980	3,207	0	*5,555*	*111,067*
35	32	50	200	250	181.5	186.4	176.7	138.9	142.7	135.2	69.5	71.3	67.6	16.3	16.7	15.9	4,285	17,604	20,869	42,758	7,324	0	7,324	1,099	3,207	0	*6,226*	*117,293*
36	33	50	200	250	190.1	181.5	186.4	145.5	138.9	142.7	72.8	69.5	71.3	17.0	16.3	16.7	4,487	17,142	22,005	43,633	3,208	0	3,208	481	3,207	0	*2,727*	*120,019*
37	34	50	200	250	206.1	190.1	181.5	157.8	145.5	138.9	78.9	72.8	69.5	18.3	17.0	16.3	4,858	17,948	21,427	44,233	2,200	0	2,200	330	3,207	0	*1,870*	*121,890*
38	35	50	200	250	165.4	206.1	190.1	126.6	157.8	145.5	63.3	78.9	72.8	14.9	18.3	17.0	3,912	19,433	22,435	45,780	5,671	0	5,671	851	3,207	0	*4,820*	*126,710*
39	36	50	200	250	173.6	165.4	206.1	132.9	126.6	157.8	66.4	63.3	78.9	15.6	14.9	18.3	4,103	15,647	24,292	44,041	-6,376	0	-6,376	0	3,207	0	*-6,376*	*120,334*
40	37	50	200	250	181.2	173.6	165.4	138.7	132.9	126.6	69.3	66.4	63.3	16.2	15.6	14.9	4,278	16,410	19,558	40,247	-13,912	0	-13,912	0	3,207	0	*-13,912*	*106,422*
41	38	50	200	250	178.2	181.2	173.6	136.4	138.7	132.9	68.2	69.3	66.4	16.0	16.2	15.6	4,210	17,113	20,513	41,837	5,829	0	5,829	874	3,207	0	*4,955*	*111,377*
42	39	50	200	250	189.6	178.2	181.2	145.1	136.4	138.7	72.5	68.2	69.3	16.9	16.0	16.2	4,474	16,842	21,392	42,708	3,194	0	3,194	479	3,207	0	*2,715*	*114,092*
																											114,092	



Attachment I-2: Table 15. Estimation of Temporary CER Generated from the Project <Model-6: Reforestation in Coastal Area>

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Items	Area 500 ha	Stem volume at time t for the project scenario Model-6 (Coastal)	Above-ground biomass at time t under the project scenario WD 0.83 BEF 1.30	Carbon stocks in above-ground biomass at time t under the project scenario	Carbon stocks in below-ground biomass at time t under the project scenario	Total carbon stocks in biomass in each strata at time t under the project scenario	Total carbon stocks in biomass at time t under the project scenario	Removal component of actual net GHG removals by sinks per annum	Project emissions	Actual net GHG removals by sinks in year t	Leakage attributable to the project activity at time t	Carbon stocks in biomass at time 0 that would have occurred in the absence of the project activity	Baseline net GHG removals by sinks	Net anthropogenic GHG removals by sinks	Net anthropogenic GHG removals by sinks (Cumulative)
Simbol	Ai	SV(t)i	T(t)i	NA(t)i	NB(t)i	N(t)i	N(t)	ΔCproj,t	GHGproj,t	ΔCactual,t	*Lt*	B (t C)	ΔCbsl,t	*ERarcdm,t*	*∑ERarcdm,t*
Formula		-	SV(t)i x BEF x WD	T(t)i x 0.5	Exp(-1.085+0.9256*lnT(t))*0.5	{NA(t)i+NB(t)i} x Ai	Sum of N(t)i	N(t)-N(t-1)		ΔCpoj,t - GHGproj,t	*ΔCactual,t x 0.15 (If Lt <0, 0)*	B (t C)	B(t C),t -B(t C),t-1 x 44/12	ΔCproj,t - GHGproj,t - Lt - ΔCbsl,t	
Unit	ha		t d.m./ha	t C/ha	t C/ha	t C	t C	t CO2-e/year	t CO2-e/year	t CO2-e/year	t CO2-e/year	t C	t CO2-e/ year	t CO2-e/year	t CO2-e

Project year	Growth age	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch	1st batch	2nd batch	3rd batch								
3	0	50																		0	0	0	0	0	0	0	*0*	*0*
4	1	50	200		0.0			0.0			0.0			0.0			0			0	0	0	0	0	0	0	*0*	*0*
5	2	50	200	250	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0	0		0	0	0	0	0	0	0	*0*	*0*
6	3	50	200	250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	*0*	*0*
7	4	50	200	250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	*0*	*0*
8	5	50	200	250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	*0*	*0*
9	6	50	200	250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	*0*	*0*
10	7	50	200	250	5.0	0.0	0.0	5.4	0.0	0.0	2.7	0.0	0.0	0.8	0.0	0.0	175	0	0	175	642	0	642	96	0	0	*546*	*546*
11	8	50	200	250	9.3	5.0	0.0	10.0	5.4	0.0	5.0	2.7	0.0	1.4	0.8	0.0	322	700	0	1,023	3,108	0	3,108	466	0	0	*2,641*	*3,187*
12	9	50	200	250	15.2	9.3	5.0	16.4	10.0	5.4	8.2	5.0	2.7	2.3	1.4	0.8	523	1,289	875	2,687	6,103	0	6,103	915	0	0	*5,187*	*8,375*
13	10	50	200	250	22.1	15.2	9.3	23.8	16.4	10.0	11.9	8.2	5.0	3.2	2.3	1.4	755	2,090	1,611	4,457	6,489	0	6,489	973	0	0	*5,516*	*13,890*
14	11	50	200	250	31.1	22.1	15.2	33.6	23.8	16.4	16.8	11.9	8.2	4.4	3.2	2.3	1,057	3,021	2,613	6,691	8,192	0	8,192	1,229	0	0	*6,963*	*20,853*
15	12	50	200	250	40.4	31.1	22.1	43.6	33.6	23.8	21.8	16.8	11.9	5.6	4.4	3.2	1,368	4,229	3,776	9,373	9,834	0	9,834	1,475	0	0	*8,359*	*29,212*
16	13	50	200	250	50.2	40.4	31.1	54.2	43.6	33.6	27.1	21.8	16.8	6.8	5.6	4.4	1,694	5,471	5,286	12,452	11,289	0	11,289	1,693	0	0	*9,595*	*38,807*
17	14	50	200	250	60.2	50.2	40.4	65.0	54.2	43.6	32.5	27.1	21.8	8.0	6.8	5.6	2,026	6,777	6,839	15,642	11,698	0	11,698	1,755	0	0	*9,944*	*48,751*
18	15	50	200	250	73.4	60.2	50.2	79.2	65.0	54.2	39.6	32.5	27.1	9.7	8.0	6.8	2,463	8,105	8,471	19,038	12,454	0	12,454	1,868	0	0	*10,586*	*59,337*
19	16	50	200	250	75.1	73.4	60.2	81.0	79.2	65.0	40.5	39.6	32.5	9.9	9.7	8.0	2,519	9,853	10,131	22,503	12,703	0	12,703	1,906	0	0	*10,798*	*70,134*
20	17	50	200	250	77.4	75.1	73.4	83.5	81.0	79.2	41.8	40.5	39.6	10.2	9.9	9.7	2,595	10,078	12,316	24,989	9,116	0	9,116	1,367	0	0	*7,749*	*77,883*
21	18	50	200	250	79.1	77.4	75.1	85.3	83.5	81.0	42.7	41.8	40.5	10.4	10.2	9.9	2,652	10,382	12,597	25,631	2,351	0	2,351	353	0	0	*1,999*	*79,882*
22	19	50	200	250	80.5	79.1	77.4	86.9	85.3	83.5	43.4	42.7	41.8	10.5	10.4	10.2	2,698	10,606	12,977	26,282	2,387	0	2,387	358	0	0	*2,029*	*81,911*
23	20	50	200	250	81.9	80.5	79.1	88.4	86.9	85.3	44.2	43.4	42.7	10.7	10.5	10.4	2,744	10,791	13,258	26,794	1,878	0	1,878	282	0	0	*1,596*	*83,507*
24	21	50	200	250	83.3	81.9	80.5	89.9	88.4	86.9	44.9	44.2	43.4	10.9	10.7	10.5	2,790	10,976	13,489	27,256	1,695	0	1,695	254	0	0	*1,441*	*84,948*
25	22	50	200	250	84.5	83.3	81.9	91.2	89.9	88.4	45.6	44.9	44.2	11.0	10.9	10.7	2,830	11,161	13,721	27,712	1,671	0	1,671	251	0	0	*1,420*	*86,368*
26	23	50	200	250	85.7	84.5	83.3	92.5	91.2	89.9	46.2	45.6	44.9	11.2	11.0	10.9	2,870	11,320	13,952	28,141	1,574	0	1,574	236	0	0	*1,338*	*87,706*
27	24	50	200	250	86.9	85.7	84.5	93.8	92.5	91.2	46.9	46.2	45.6	11.3	11.2	11.0	2,909	11,478	14,150	28,537	1,452	0	1,452	218	0	0	*1,234*	*88,940*
28	25	50	200	250	88.0	86.9	85.7	95.0	93.8	92.5	47.5	46.9	46.2	11.4	11.3	11.2	2,945	11,637	14,348	28,930	1,440	0	1,440	216	0	0	*1,224*	*90,164*
29	26	50	200	250	89.1	88.0	86.9	96.1	95.0	93.8	48.1	47.5	46.9	11.6	11.4	11.3	2,982	11,782	14,546	29,309	1,391	0	1,391	209	0	0	*1,183*	*91,347*
30	27	50	200	250	90.1	89.1	88.0	97.2	96.1	95.0	48.6	48.1	47.5	11.7	11.6	11.4	3,015	11,927	14,727	29,669	1,318	0	1,318	198	0	0	*1,121*	*92,467*
31	28	50	200	250	91.1	90.1	89.1	98.3	97.2	96.1	49.1	48.6	48.1	11.8	11.7	11.6	3,048	12,059	14,909	30,015	1,270	0	1,270	190	0	0	*1,079*	*93,546*
32	29	50	200	250	91.9	91.1	90.1	99.2	98.3	97.2	49.6	49.1	48.6	11.9	11.8	11.7	3,074	12,191	15,073	30,338	1,185	0	1,185	178	0	0	*1,007*	*94,554*
33	30	50	200	250	92.9	91.9	91.1	100.2	99.2	98.3	50.1	49.6	49.1	12.0	11.9	11.8	3,107	12,296	15,238	30,641	1,112	0	1,112	167	0	0	*945*	*95,499*
34	31	50	200	250	92.9	92.9	91.9	100.2	100.2	99.2	50.1	50.1	49.6	12.0	12.0	11.9	3,107	12,428	15,370	30,905	967	0	967	145	0	0	*822*	*96,321*
35	32	50	200	250	92.9	92.9	92.9	100.2	100.2	100.2	50.1	50.1	50.1	12.0	12.0	12.0	3,107	12,428	15,535	31,070	604	0	604	91	0	0	*514*	*96,835*
36	33	50	200	250	92.9	92.9	92.9	100.2	100.2	100.2	50.1	50.1	50.1	12.0	12.0	12.0	3,107	12,428	15,535	31,070	0	0	0	0	0	0	*0*	*96,835*
37	34	50	200	250	92.9	92.9	92.9	100.2	100.2	100.2	50.1	50.1	50.1	12.0	12.0	12.0	3,107	12,428	15,535	31,070	0	0	0	0	0	0	*0*	*96,835*
38	35	50	200	250	92.9	92.9	92.9	100.2	100.2	100.2	50.1	50.1	50.1	12.0	12.0	12.0	3,107	12,428	15,535	31,070	0	0	0	0	0	0	*0*	*96,835*
39	36	50	200	250	92.9	92.9	92.9	100.2	100.2	100.2	50.1	50.1	50.1	12.0	12.0	12.0	3,107	12,428	15,535	31,070	0	0	0	0	0	0	*0*	*96,835*
40	37	50	200	250	92.9	92.9	92.9	100.2	100.2	100.2	50.1	50.1	50.1	12.0	12.0	12.0	3,107	12,428	15,535	31,070	0	0	0	0	0	0	*0*	*96,835*
41	38	50	200	250	92.9	92.9	92.9	100.2	100.2	100.2	50.1	50.1	50.1	12.0	12.0	12.0	3,107	12,428	15,535	31,070	0	0	0	0	0	0	*0*	*96,835*
42	39	50	200	250	92.9	92.9	92.9	100.2	100.2	100.2	50.1	50.1	50.1	12.0	12.0	12.0	3,107	12,428	15,535	31,070	0	0	0	0	0	0	*0*	*96,835*
																											96,835



Attachment I-2: Table 16. Estimation of tCER obtained per 500 ha of AR-CDM Project by Model

Project Year	Growth Age	CDM credit period	Reforestation in Watershed										Refo in Coastal	
			Model-1		Model-2		Model-3		Model-4		Model-5		Model-6	
			#	Credit (tCER)	#	Credit (tCER)	#	Credit (tCER)	#	Credit (tCER)	#	Credit (tCER)	#	Credit (tCER)
1														
2														
3	0	1	-		-		-		-		-		-	
4	1	2	(13,758)		(13,758)		(13,758)		(11,759)		(11,759)		-	
5	2	3	(13,746)		(13,742)		(13,736)		(11,730)		(11,736)		-	
6	3	4	(13,623)		(13,582)		(13,557)		(11,524)		(11,537)		-	
7	4	5	(13,064)		(12,850)		(12,849)		(10,798)		(10,705)		-	
8	5	6	(11,374)		(10,743)		(11,041)		(9,051)		(8,495)		-	
9	6	7	(7,759)		(6,482)		(7,616)		(5,560)		(4,265)		-	
10	7	8	(2,316)		102		(2,613)		357		2,179		546	
11	8	9	3,577	3,577	8,606	8,606	3,128	3,128	9,009	9,009	10,674	10,674	3,187	3,187
12	9	10	8,970		18,228		8,381		19,439		20,263		8,375	
13	10	11	13,161		27,465		12,463		29,348		29,470		13,890	
14	11	12	17,386		37,437		16,579		37,272		39,521		20,853	
15	12	13	22,152		47,772		21,221		48,178		50,156		29,212	
16	13	14	25,650	25,650	54,754	54,754	24,628	24,628	59,354	59,354	57,709	57,709	38,807	38,807
17	14	15	29,703		61,512		28,576		66,032		65,386		48,751	
18	15	16	34,320		69,558		33,073		71,284		74,529		59,337	
19	16	17	37,639		76,867		36,307		76,051		83,112		70,134	
20	17	18	39,301		83,001		37,925		80,224		90,505		77,883	
21	18	19	41,954	41,954	88,487	80,000	40,510	40,510	85,988	80,000	97,697	80,000	79,882	79,882
22	19	20	47,132		93,082		45,553		91,185		104,510		81,911	
23	20	21	54,185		95,178		52,423		93,848		108,976		83,507	
24	21	22	62,713		93,599		60,729		93,272		109,853		84,948	
25	22	23	71,914		88,811		69,692		90,481		107,687		86,368	
26	23	24	85,410	80,000	83,216	80,000	82,837	80,000	85,483	80,000	104,866	80,000	87,706	80,000
27	24	25	95,763		75,643		92,921		77,628		98,553		88,940	
28	25	26	104,692		67,377		101,619		70,593		90,751		90,164	
29	26	27	118,156		62,716		114,733		70,084		84,138		91,347	
30	27	28	128,628		64,474		124,933		77,572		81,777		92,467	
31	28	29	138,679	80,000	71,249	71,249	134,723	80,000	85,069	80,000	88,571	80,000	93,546	80,000
32	29	30	152,422		79,647		148,109		91,164		98,061		94,554	
33	30		162,885		87,025		158,300		95,211		105,512		95,499	
34	31		170,458		93,071		165,676		99,252		111,067		96,321	
35	32		179,394		98,745		174,790		105,617		117,293		96,835	
36	33		182,968		101,951		179,926		110,398		120,019		96,835	
37	34		185,183		104,650		184,242		114,249		121,890		96,835	
38	35		192,465		109,143		191,473		117,956		126,710		96,835	
39	36		184,801		104,309		183,768		111,234		120,334		96,835	
40	37		166,713		92,993		165,665		100,080		106,422		96,835	
41	38		174,365		97,735		173,345		103,233		111,377		96,835	
42	39		179,850		101,168		179,093		103,222		114,092		96,835	
TOTAL				231,181		294,610		228,266		308,363		308,384		281,877

Note: Refer to Tables A5-10 to A5-15 for detailed calculation of the net anthoropogenic GHG removals by the project activities for each models

#: Cumulative net anthropogenic GHG removals by sinks (t CO2-e)

tCER: It is ZERO, if Net anthropogenic GHG removals by sinks (Cumulative) is negative,. Max.=80,000 (16,000 /year x 5 years

The limit of Net anthropogenic GHG removals by sink of a small-scale AR-CDM project is 16,000 t CO2-e per year

4159 tCER obtained.

The credit period is assumed for 30 years.

Attachment I-2: Table 17. Estimation of the Amount and Value of tCER from AR-CDM and the Cost for Validation and Verification

Project Year	CDM credit period	tCER per 500 ha of AR-CDM						Estimation of tCER from AR-CDM																tCER Value		Validation/ Verification
		Model-1 WS (a)	Model-2 WS (b)	Model-3 WS (c)	Model-4 WS (d)	Model-5 WS (e)	Model-6 Coastal (f)	Location	Watershed										Coastal			Total	1,000 US$	million VND	Cost mil VND
								Province	Thanh Hoa	Nghe Anh	Ha Tinh	Quang Binh	Quang Tri	T.T. Hue	Quang Nam	Quang Ngai	Binh Dinh	Phu Yen	Ninh Thuan	Quang Binh	T.T. Hue	Binh Thuan				
		TH, NA HT, QB QT	HUE, QN	QNg	BD	PY NT	QB HUE BT	G. H. I. tCER	1,270 635 1.3 a * I	2,300 1,150 2.3 a * I	1,960 980 2.0 a * I	1,600 800 1.6 a * I	2,900 1,450 2.9 a * I	3,000 1,500 3.0 b * I	970 485 1.0 b * I	3,500 1,750 3.5 c * I	2,480 1,240 2.5 d * I	1,500 750 1.5 e * I	1,610 805 1.6 e * I	400 360 0.7 f * I	- - f * I	1,100 990 2.0 f * I	24,590 12,895 25.8	tCER price = $3.5	Exchange rate ($1.0)= VND16,968	$30,000 per project at a time
1																							0	0	-
2																							0	0	-
3	1																						0	0	13,128
4	2																						0	0	-
5	3																						0	0	-
6	4																						0	0	-
7	5																						0	0	-
8	6																						0	0	-
9	7																						0	0	-
10	8																						0	0	-
11	9	3,577	8,606	3,128	9,009	10,674	3,187		4,543	8,228	7,012	5,724	10,374	25,819	8,348	10,949	22,341	16,011	17,185	2,295	-	6,310	145,142	508	8,620	13,128
12	10																						0	0	-
13	11																						0	0	-
14	12																						0	0	-
15	13																						0	0	-
16	14	25,650	54,754	24,628	59,354	57,709	38,807		32,575	58,995	50,274	41,040	74,385	164,263	53,112	86,199	147,198	86,564	92,912	27,941	-	76,839	992,296	3,473	58,930	13,128
17	15																						0	0	-
18	16																						0	0	-
19	17																						0	0	-
20	18																						0	0	-
21	19	41,954	80,000	40,510	80,000	80,000	79,882		53,282	96,495	82,230	67,127	121,667	240,000	77,600	141,784	198,400	120,000	128,800	57,515	-	158,167	1,543,066	5,401	91,640	13,128
22	20																						0	0	-
23	21																						0	0	-
24	22																						0	0	-
25	23																						0	0	-
26	24	80,000	80,000	80,000	80,000	80,000	80,000		101,600	184,000	156,800	128,000	232,000	240,000	77,600	280,000	198,400	120,000	128,800	57,600	-	158,400	2,063,200	7,221	122,529	13,128
27	25																						0	0	-
28	26																						0	0	-
29	27																						0	0	-
30	28																						0	0	-
31	29	80,000	71,249	80,000	80,000	80,000	80,000		101,600	184,000	156,800	128,000	232,000	213,748	69,112	280,000	198,400	120,000	128,800	57,600	-	158,400	2,028,459	7,100	120,466	13,128
32	30																						0	0	-
33																							0	0	-
34																							0	0	-
35																							0	0	-
36																							0	0	-
37																							0	0	-
38																							0	0	-
39																							0	0	-
40																							0	0	-
Total		231,181	294,610	228,266	308,363	308,384	281,877		293,600	531,717	453,116	369,890	670,426	883,830	285,772	798,932	764,739	462,575	496,497	202,951	-	558,116	6,772,163	23,703	402,185	78,769
																						NPV@10%	2,639	44,786	20,881

G.: Reforestation area (ha)

H: Area for AR-CDM = G*50% for watershed and = G*90% for coastal (assuming that 50% of watershed and 90% of coastal reforestation areas would be AR-CDM projects).

I.: No. of AR-CDM = H/500ha

ATTACHMENT I-3: BENEFITS FROM SUSTAINABLE MANAGEMENT OF PROTECTION FORESTS

Background of REDD

Deforestation and forest degradation are the second leading cause of global warming, responsible for about 20% of global greenhouse gas emissions, which makes the depletion and loss of forests a major issue for climate change. Currently, there appears to be a consensus that the issue of deforestation and forest degradation must be effectively tackled as it would otherwise limit the options available to reduce greenhouse gas emissions, greenhouse gas concentrations and increases in temperature to acceptable levels.

The conference of the partiers (COP) of the UNFCCC in December 2007 in Bali provided a 'Road map' to include measures for emission reductions from deforestation and forest degradation (REDD) in the climate change mitigation framework from 2012 on[1]. Recent scientific and policy analyses paint an optimistic picture on the feasibility of such REDD scheme.

It is expected that countries will agree at Copenhagen to include reduced emissions from deforestation and forest degradation in a post-2012 climate regime. The UN has established a Collaborative Program on Reduced Emissions from Deforestation and Forest Degradation in Developing Countries. The UN-REDD Program (involving UNEP, UNDP and FAO) will support in designing national strategies to reduce carbon emissions resulting from forest loss. It will establish system for monitoring and verification. The WB has established the Forest Carbon Partnership Facility (PCPF).

Vietnam meets the legal requirements to involve in the REDD initiative(e.g. approved the Kyoto Protocol, others). MARD in cooperation with MoNRE and other authorities will take the leading role in implementation of REDD in Vietnam.[2]

After the first session of UN-REDD Policy making council held in March 2009 in Panama, Vietnam will be provided with initial budget of 4,38 m USD by UN-REDD to improve national and sub-national capacities on preparation of REDD implementation.

In July 2008 Vietnam was selected as a participant country by the Forest Carbon Partnership Facility (FCPF) of the WB.

Still, before larger-scale payments can be expected to occur, Vietnam will need to adopt a number of policy reforms.

Suitability for assessment of benefits from sustainable forest management by REDD

Initially the attention of REDD method was paid only to deforestation. However, recent research results showed that prevention of forest degradation also contributes to reduction of GhG emissions, relatively comparably to the measures for deforestation. There is an increasing global interest in placing cash value on the maintenance of forests, and forest have the potential to deliver new income streams.

Moreover, the UNFCCC argues that the participation in REDD should not be restricted to countries with historically high rates of deforestation and it is recognized that those forests that are being under the sustainable management should be allowed to make a part of future REDD financing mechanism.[3]

[1] UNFCCC: Views on issues related to further steps under the Convention related to reducing emissions from deforestation in developing countries: approaches to stimulate action. SBSTA; Bali, Indonesia; 2007.
[2] Decree No. 1/2008/ND-CP of the Government and Decision No. 158/2008/QD-TTg of 2 December 2008 of Prime Minister.

Assumptions:

(i) Scope

Considering the above, REDD is proposed as a suitable approach to assess the Project economic benefits from forest sustainable management. Specifically the benefits from sustainable management of "forest land remaining forest land" from the following Project activities will be assessed as outlined in the table below.

The Project time is assumed to be 50 years.

Project Activities Included in Scope of Assessment by REDD

Subcategory	Project activities of Forest Development/ Improvement to be evaluated by REDD	Area
Forest Land Remaining Forest Land	Improvement of Existing Plantations	4,100ha
	Forest Protection	63,970ha
	Watershed ANR + Enrichment	4,700ha
	Watershed ANR	21,250ha
	Coastal Forest ANR/ Enrichment planting	1,600ha

(ii) Baseline scenario, additionality and leakage

REDD involves estimating a reference scenario that projects the amount of deforestation that would have occurred in the absence of the payment (the amount of emission reduction that would have occurred without the project). The baseline scenario is a scenario that would have happened if a project was not undertaken ("without-Project" scenario). In the baseline scenario the condition of forest vegetation in the Project area might be degraded by uncontrolled human activities and forest fires, but the data on the degree of the change is not available. It is therefore assumed that the baseline scenario is equivalent to present vegetation condition and that any increase in carbon stock is thanks to the sustainable management of the Project.

Additionality is demonstrated by showing that the greenhouse gases removed by the project are in fact greater than what would have occurred if the Project was not implemented (i.e. the baseline scenario). Proving "additionality" means showing that deforestation has been reduced and that such reductions would not have happened in the absence of the Project.

Leakage occurs when there is an increase in greenhouse gas emissions by an activity occuring outside a project but is nonetheless attributable to the project. It is assumed that leakage in the Project is 0%.

Methodology applied

The existing methodologies for REDD, for measuring carbon stocks and agreeing baseline data which need to be solved when establishing REDD project, were reviewed.[4]

Most of countries will not have the necessary capacity and data to use advanced deforestation baseline techniques from the start of a post-2012 REDD scheme, it is likely that countries might be allowed to choose the deforestation baseline methodology according to their respective situation.

Since there is a limited number of the practical application of REDD to date it is proposed to use a simple methodology, and it appears that the adoption of the IPCC[5] Good Practice Guideline offers a simple approach.

[3] Countries with low deforestation rates in the past could increase their deforestation rates in response to changing economic conditions and incentives.
[4] http://unfccc.int/methods_science/redd/methodologies/items/4538.php

The IPCC Guidance and Good Practice Guidelines provide methodologies for estimating changes in forest carbon stock due to deforestation and forest degradation. The IPCC Guidelines[6] Tier 1 methods[7] are designed to be the simplest to use: provide with set of simple default methods, the equations and default parameter values.

Specifically, CO_2 emissions and removals resulting from C stock changes in biomass, dead organic matter and mineral soils, for managed lands are evaluated. It is assumed that the Project areas included in the evaluation by REDD (as mentioned in Scope section) belong to the subcategory "forest land remaining forest land". "Forest land remaining forest land" IPCC subcategory includes the lands that have been forest land for more than 20 years (transition period to reach new soil carbon levels).

The table below summarizes the PICC Guidelines Tier 1 method approach to evaluate C stock changes in biomass, dead organic matter and mineral soils for "forest land remaining forest land" land use subcategory.

It should be noted that all estimates of changes in carbon stocks, i.e. growth, internal transfers and emissions, are in units of carbon to make all calculations consistent. Data on biomass stocks, increments, harvests, etc. can initially be in units of dry matter that need to be converted to tones of carbon for all subsequent calculations. For reporting purposes, changes in C stock categories are converted to units of CO_2 emissions by multiplying the C stock change by -44/12. The conversion to CO_2 from C is based on the ratio of molecular weights (44/12). The change of sign (-) is due to the convention that increases in C stocks, i.e. positive (+) stock changes, represent a removal from atmosphere, while decreases in C stocks, i.e. negative (-) stock changes, represent a positive CO_2 emission to the atmosphere.

IPCC Tier 1 Method for Estimation of C Stock Changes

Land Use Subcategory	Carbon Pool	Tier 1 Method Approach
Forest Land Remaining Forest Land	Biomass	Biomass gains and losses. Gains (ΔC_G) include total (above-ground and below-ground) biomass growth. Losses are from (a) roundwood removal/ harvest ($L_{wood\text{-}removals}$), (b) fuelwood removal/ harvest/ gathering ($L_{fuelwood}$), and (c) other disturbances ($L_{disturbances}$) (e.g. fire). Note: Tier 1 method works when changes of the carbon pool in biomass are relatively small. The method requires the biomass carbon loss to be subtracted from the biomass carbon gain. The following equations are used: $\mathbf{\Delta C_G = A * G_{TOTAL} * CF}$, where ΔC_G annual increase in biomass carbon stocks due to biomass growth [t C yr^{-1}] A is area of forest land remaining forest land G_{TOTAL} is average annual biomass growth (derived from IPCC parameters) CF is carbon fraction of dry matter (IPCC parameters) $\mathbf{L_{wood\text{-}removals} = H * BCEF_R * (1+R) * CF}$ $L_{wood\text{-}removals}$ is annual carbon loss due to biomass removals, [t C yr^{-1}] H is annual wood removal

[5] Intergovernmental Panel on Climate Change Guidance
[6] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use
[7] Tier 1 (next to Tier 2 and Tier 3 methods); Tier 2 can use the same methodological approach as Tier 1 but applies emission and stock change factors that are based on country- or region-specific data. At Tier 3 higher order methods are used, including models and inventory measurement systems tailored to address national circumstances, repeated over time, and driven by high-resolution activity data and disaggregated at sub-national level. These higher order methods provide estimates of greater certainty than lower tires

Land Use Subcategory	Carbon Pool	Tier 1 Method Approach
		$BCEF_R$ is biomass conversion and expansion factor (IPCC parameters) R is ratio of below-ground biomass to above-ground biomass (IPCC paramet.) CF is carbon fraction of dry matter (IPCC parameters) **$L_{fuelwood} = [FG_{trees} * BCEF_R * (1+R) + FG_{part} * D] * CF$** $L_{fuelwood}$ is annual carbon loss due to fuelwood removal, [t C yr^{-1}] FG_{trees} is annual volume of fuelwood removal of whole trees $BCEF_R$ is biomass conversion and expansion factor (IPCC parameters) R is ratio of below- to above-ground biomass (IPCC parameters) FG_{part} is annual volume of fuelwood removal as tree parts D is basic wood density (IPCC parameters) CF is carbon fraction of dry matter (IPCC parameters) **$L_{disturbances} = A * B_W * (1+R) * CF * fd$** $L_{disturbances}$ is annual other losses of carbon $A_{disturbance}$ is area affected by disturbances B_W is average above-ground biomass of areas affected (IPCC parameters) R is ratio of below- to above-ground biomass (IPCC parameters) CF is carbon fraction of dry matter (IPCC parameters) **$\Delta C = \Delta C_G – (L_{wood\text{-}removals} + L_{fuelwood} + L_{disturbances})$**
	Dead organic matter (DOM)	The Tier 1 method assumes that the dead wood and litter carbon stocks are in equilibrium so that the changes in carbon stock in the DOM pools are assumed to be 0.
	Soil carbon	Mineral soils: Due to incomplete scientific basis and resulting uncertainty, it is assumed in the Tier 1 method that forest soil C stocks do not change with management, and it is not necessary to compute C stock for mineral soils. Organic soils: Currently, only C emissions due to drainage of forest organic soils are addressed in the Tier 1 method due to the lack of a more precise methodology. Drained organic soils are stratified by climate type, and then multiplied by a climate-specific emission factor to derive an estimate of annual C emissions. It is assumed that there are no drained organic soils in the Project.

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use, Chapter 4: Forest Land.

Valuation

The REDD carbon credits are traded currently only in the voluntary market, through private sponsors or a donor funds.

The voluntary market for carbon credits[8] is small compared to the ETS (the EU Emission Trading Scheme), and the prices paid for carbon credits on voluntary markets trade at an 80-90% discount compared to EU allowances (EUA). Trade in forestry Voluntary Emission Reductions (VERs) is not new, but it has been particularly difficult to verify that such projects genuinely result in overall emission reductions, without 'leakage' in the form of displaced activity.

For the valuation of the REDD carbon credits, the following options were considered:

[8] The voluntary market is not governed by the Kyoto Protocol. Demand generated by environmentally concerned companies and individuals. Voluntary Emission Reductions (VER) price is variable depending on the quality of the end product and verification.

Options for Valuation of REDD carbon credits

Option	Comment	Value
Voluntary pessimistic	Assumption: REDD traded in voluntary markets In 2009 the realistic outlook on the valuation of the REDD remains rather pessimistic. The value of 0.25 USD/tone ofCO_2 e of the Chicago Climate Exchange (August 2009 level)[9] is taken as the reference and is assumed to last for the next 50 years. It is highly probable that REDD will be more widely adopted[10] and so the values of forest carbon would be considerably higher than at present.	0.25 USD/ tone ofCO_2 e
Voluntary optimistic	Assumption: REDD traded in voluntary markets The value of 2 USD/ tone ofCO_2 e of the Chicago Climate Exchange (June 2009 level) is taken as the reference. The annual appreciation of the Carbon Financial Instrument (CFI) is assumed at 10%, a result of an increase in trading volume for the next 50 years.	2 USD/ tone ofCO_2 e and annual appreciation of 10%
JI compliance	Assumption: REDD compliance with the Joint Implementation (JI), after 2012, in case REDD is decided to be a post-Kyoto regime.	12 USD/ tone ofCO_2 e
CER compliance	Assumption: REDD compliance with Certified Emissions Reductions (CER)[11], after 2012, in case REDD is decided to be a post-Kyoto regime. AR/CDM projects offer good value credits ranging between $25 and $45 per tonne CO_2-e.[12]	38 USD/ tone ofCO_2 e
EUA compliance	Assumption: REDD compliance with the UE Allowances (EUA)[13], after 2012, in case REDD is decided to be a post-Kyoto regime. The EU Emissions Trading Scheme (ETS) is proposing to exclude forestry credits until 2020, regardless of the UNFCCC far reaching approval for the REDD programs.[14]	47 USD/ tone ofCO_2 e

Investors are able to maximize the carbon value of their forest portfolio by carefully selecting forests with as many benefits as possible. Evidencing additionality, avoiding leakage, demonstrating high biodiversity value and strong community participation will translate into higher prices.[15] As shown by experience investors will reject high-risk VERs with poor credibility.

There are some additional possible financing mechanisms for the future REDD. One solution is a direct bilateral agreement for REDD compliance, with a buyer country signing an agreement with a host country. There is also a possibility of independently managed international fund for REDD, where

[9] http://www.chicagoclimatex.com/. In Australia, the Sydney Futures Exchange has already established a carbon credit trading market and some carbon emitters are buying credits from forest growers.
[10] If REDD becomes recognized by the UNFCCC as an official emissions reduction scheme, during the UNFCCC upcoming Conference of Parties in Copenhagen in December 2009
[11] Certified Emission Reductions (CER) are generated from Clean Development Mechanism (CDM) projects in the form of futures and options contracts.
[12] The regulated market involves national and international emissions trading schemes, to formally trade carbon credits to meet national targets. This includes the Clean Development Mechanism, which recognized afforestation and reforestation as a source of carbon credits.
[13] EU Allowances (EUA) are issued under the EU Emissions Trading Scheme. One EUA equals one tone of CO_2 right-to-emit. The inclusion of forestry projects under the Kyoto Protocol was controversial, and AR/CDM was allowed only providing that forestry CERs would be distinguished from all others on the market. Forestry CER have been valued about 20% of the value of other CERs.
[14] Concerned that easy REDD credits would undermine efforts to reduce its own industrial emissions, since the endless stream of deforestation credits would allow companies to pay a little extra without otherwise changing their policies
[15] Prices achieved in the voluntary market vary greatly even up 75 USD per tonne CO_2-e, according to some sources.

the payments of buyer countries would be pooled. Of course another option may be development assistance funding for REDD project.

Verification and validation

The above approach is used to evaluate the positive externality of the Project's sustainable forest management. However, in case the real effort was taken to raise the funds from REDD in voluntary markets, the verification and validation of the Project would be necessary.

Emissions reductions valuated through REDD should be verified independently. There is a degree of choice in verification providers, and some examples can be:

(i) VCS (Voluntary Carbon Standard)

VCS[16] was developed for approval of voluntary offset. It has high levels of support and will likely become the defining standard for voluntary markets. Until 2009, VCS has had about 100 approved projects, including: Afforestation, Reforestation and Revegetation (ARR), Agriculture Land Management (ALM), Improved Forest Management (IFM), Reducing Emissions from Deforestation (RED).

The VCS includes sections with respect to: (1) Project description, (2) Baseline, (3) Additionality, (4) Monitoring, (5) Validation and verification, (5) Request for issuance.

(ii) CCB (Community, Conservation & Biodiversity)

CCB[17] is a design standard rather than a carbon verification standard, but it is meant to ensure that any carbon project brings high co-benefits to local people and to biodiversity.

There is criteria checklist including: (1) Original conditions in the project area; (2) Baseline projections; (3) Project design and goals; (4) Management capacity and best practices; (5) Legal status and property rights; (6) Net positive climate impacts; (7) Offsite climate impacts; (8) Climate impact monitoring; (9) Net positive community impacts; (10) Offsite stakeholder impacts; (11) Community impact monitoring; (12) Net positive biodiversity impacts; (13) Offsite biodiversity impacts; (14) Biodiversity impact monitoring.

The costs of the VCS implemented verification and valuation are included in the calculations. The verification and validation costs are assumed for each sub-project independently, i.e. USD 15,000 per Province and running costs of USD 0,04 per each CO_2e certificate issued

Examples of REDD projects worldwide

Some examples of the REDD projects worldwide are summarized in the below table:

[16] http://www.v-c-s.org
[17] http://www.climate-standards.org/standards/pdf/ccb_standards_second_edition_december_2008.pdf

Examples of REDD projects

Project	Description
Ulu Masen Project, Aceh, Indonesia	Size: 750,000 ha Emissions Reduction: 100 m tons CO2 over 30 years Conservation Benefit: 85% reduction in deforestation Community Benefit: Strengthening civil society and public institutions in environmental and protection governance Partners: Government of Aceh province, Indonesia; the World Bank (donor); Carbon Conservation (project developer); Fauna & Flora International (project implementer); Rainforest Alliance (verification) Budget: Estimated $ 48.8 m in 2007-2012, of which $17.5m (World Bank), $ 9m (Merrill Lynch) and $7.7 m (FFI) have been raised. Buyer: Merrill Lynch guaranteed purchase of first issued credits. The project could be $26 million in carbon credits for protecting rainforests. The credits typically cost $4 to $8 per ton of pollution reductions. Standard: the project won the approval from the Rainforest Alliance's Climate, Community & Biodiversity (CCB) Standards. The Ulu Masen project is the first project for reducing emissions from deforestation in developing countries (REDD) to be independently approved as conforming to the CCB Standards.
Juma Sustainable Development Reserve RED Project, Brazil	Location: Novo Aripuana, Amazonas, Brazil Size: 590,000 ha Emissions Reduction: 190 m tons by 2050 Conservation Benefit: Forest protection and monitoring deforestation in the reserve Community Benefit: Community livelihood enhancement, education and health services as well as the establishment of direct payment for environmental services Partners: Government of State of Amazonas; Sustainable Amazonas Foundation (project developer); Institute for Conservation and Sustainable Development of Amazonas and Conservation International (project partners); Marriott International (investor) Budget: Estimated $2.8 m, of which Marriott International has contributed $ 2.0 Buyer: carbon credits sold on the Chicago Climate Exchange
Noel Kempff Mercado National Park, Bolivia	Size: 1,582,322 ha Emissions Reduction: Prevents the release of 5.8 m tons of CO2 over 30 years Conservation Benefit: Preserves a diverse forest ecosystem Community Benefit: Provides alternative, sustainable economic opportunities Partners: Foundacion Amigos de la Naturaleza (project manager); Government of Bolivia; American Electric Power Company, BP, PacificCorp (investors); Winrock International (carbon monitoring) Budget: $ 9.6m Buyer: carbon credits sold on the Chicago Climate Exchange Comment: Concerns raised on benefits generated by the carbon credits (seem to have benefited state agencies and conservation organizations instead of local communities).

Issues

The issues on REDD include the questions of baseline definition, monitoring and handling leakage, as well as the questions on how payments from REDD should flow and how incentives should reach local forests users.

Vietnam needs to find funding for preparing national REDD strategy, establishing baseline and putting in place a monitoring system. The technical capacity exists to monitor deforestation via satellite, but cost-effectiveness remains an issue. The question of how to monitor degradation and qualify for carbon flows with high precision poses an even bigger problem, particularly for hilly and mountainous terrain and small plots. Accurate monitoring will require internationally agreed definitions, methodologies, and consistent characterization of emissions from deforestation and forest degradation.

Baseline rates of deforestation also make an issue, since most of the international proposals set baseline on rate historic deforestation, which does not reflect the interests of the countries with low deforestation rates and much efforts to conservation.

Leakage also remains an issue, in particular for the projects where conservation may displace deforestation to another area.

Results

The model prepared follow to the IPCC Tier 1 method generated the results as in the table below.

Annual Change in Carbon		Annual increase in biomass carbon stocks due to biomass growth	Annual carbon loss due to biomass removals	Annual carbon loss due to fuelwood removal	Annual other losses of carbon	Annual Change in Carbon	Annual Change in CO_2 equivalent [tonnes C yr^{-1}]
		ΔC_G	$L_{wood\text{-}removals}$	$L_{fuelwood}$	$L_{disturbances}$	ΔC	$\Delta CO_2 e$
Thanh Hoa	tonnes C yr^{-1}	8,655	247	2,975	0,11	5,433	-19,921
Nghe An	tonnes C yr^{-1}	5,133	142	1,671	0,04	3,320	-12,173
Ha Tinh	tonnes C yr^{-1}	8,064	567	3,178	0,22	4,319	-15,835
Quang Binh	tonnes C yr^{-1}	4,656	107	1,537	0,06	3,011	-11,040
Quang Tri	tonnes C yr^{-1}	4,029	497	2,256	0,12	1,276	-4,678
T.T. Hue	tonnes C yr^{-1}	6,267	828	3,509	0,67	1,929	-7,074
Quang Nam	tonnes C yr^{-1}	6,088	1,153	3,409	0,05	1,527	-5,597
Quang Ngai	tonnes C yr^{-1}	3,880	1,470	2,172	0,14	257	-869
Binh Dinh	tonnes C yr^{-1}	5,020	1,578	2,811	0,28	631	-2,313
Phu Yen	tonnes C yr^{-1}	3,134	168	1,755	0,10	1,211	-4,441
Ninh Thuan	tonnes C yr^{-1}	6,327	77	3,543	1,14	2,706	-9,923
Binh Thuan	tonnes C yr^{-1}	7,509	343	3,142	0,68	2,224	-8,153
Project	**tonnes C yr^{-1}**	**66,962**	**7,177**	**31,959**	**4**	**27,823**	**-102,017**

The analysis of scenarios of REDD carbon credits valuation generated the results as in the table below.

Benefit from REDD (PV) Scenarios:		Voluntary pessimistic	Voluntary optimistic	Compliance JI	Compliance CER	Compliance EUA
Thanh Hoa	USD m	0.02	1.97	1.97	6.21	5.68
Nghe An	USD m	0.01	1.20	1.20	1.20	3.79
Ha Tinh	USD m	0.02	1.56	1.56	4.93	6.10
Quang Binh	USD m	0.01	1.09	1.09	3.44	4.25
Quang Tri	USD m	0.00	0.45	0.45	1.45	1.79
T.T. Hue	USD m	0.00	0.69	0.69	0.69	2.20
Quang Nam	USD m	0.00	0.54	0.54	1.73	2.15
Quang Ngai	USD m	-0.01	0.07	0.07	0.26	0.32
Binh Dinh	USD m	-0.01	0.22	0.22	0.71	0.88
Phu Yen	USD m	-0.01	0.43	0.43	1.37	1.70
Ninh Thuan	USD m	0.01	0.98	0.98	3.09	3.82
Binh Thuan	USD m	0.00	0.80	0.80	2.53	3.13
Project	**USD m**	**0.03**	**10.00**	**9.99**	**27.61**	**37.81**

The benefits achieved under the 'Voluntary optimistic' scenario seem to be the most appropriate to apply for the evaluation of the Project. Under this scenario, the Project would yield the total Present Value (PV) of USD 9.8 million over the Project life of 50 years, corresponding to the annual CO_2-e sequestration of 102,017 tonnes.

If well designed and governed, REDD provides opportunities to positively affect forest-dependent livelihoods by:

- Generating revenue that governments could direct to social services in rural areas (health care centers, schools, water systems, irrigation, etc.)
- Creating new income streams for forest dwellers if they are participants in conservation payment programs or monitors of forest areas

Whether and how REDD revenues and benefits will be distributed to forest communities is a contentious issue. Experiences with REDD-like projects have so far yielded mixed results.

Attachment I-3: Table 1. Results Summary: Benefits of REED

Annual Change in Carbon		Annual increase in biomass carbon stocks due to biomass growth	Annual carbon loss due to biomass removals	Annual carbon loss due to fuelwood removal	Annual other losses of carbon	Annual Change in Carbon	Annual Change in CO_2 equivalent tonnes C yr^{-1}
		ΔC_G	$L_{wood\text{-}removals}$	$L_{fuelwood}$	$L_{disturbances}$	ΔC	$\Delta CO_2 e$
Thanh Hoa	tonnes C yr^{-1}	8,655	247	2,975	0.11	5,433	-19,921
Nghe An	tonnes C yr^{-1}	5,133	142	1,671	0.04	3,320	-12,173
Ha Tinh	tonnes C yr^{-1}	8,064	567	3,178	0.00	4,319	-15,836
Quang Binh	tonnes C yr^{-1}	4,656	107	1,537	0.06	3,011	-11,040
Quang Tri	tonnes C yr^{-1}	4,029	497	2,256	0.12	1,276	-4,678
T.T. Hue	tonnes C yr^{-1}	6,267	828	3,509	0.67	1,929	-7,074
Quang Nam	tonnes C yr^{-1}	6,088	1,153	3,409	0.05	1,527	-5,597
Quang Ngai	tonnes C yr^{-1}	3,880	1,470	2,172	0.14	237	-869
Binh Dinh	tonnes C yr^{-1}	5,020	1,578	2,811	0.28	631	-2,313
Phu Yen	tonnes C yr^{-1}	3,134	168	1,755	0.10	1,211	-4,441
Ninh Thuan	tonnes C yr^{-1}	6,327	77	3,543	1.14	2,706	-9,923
Binh Thuan	tonnes C yr^{-1}	5,709	343	3,142	0.68	2,224	-8,153
Project	**tonnes C yr^{-1}**	**66,962**	**7,177**	**31,959**	**3**	**27,823**	**-102,018**

Benefit from REDD (PV); scenarios:		Voluntary pessimistic	Voluntary optimistic	Compliance JI	Compliance CER	Compliance EUA
Thanh Hoa	PV USD m	0.02	1.97	1.97	6.21	7.68
Nghe An	PV USD m	0.01	1.20	1.20	1.20	3.79
Ha Tinh	PV USD m	0.02	1.56	1.56	4.93	6.10
Quang Binh	PV USD m	0.01	1.09	1.09	3.44	4.25
Quang Tri	PV USD m	0.00	0.45	0.45	1.45	1.79
T.T. Hue	PV USD m	0.00	0.69	0.69	0.69	2.20
Quang Nam	PV USD m	0.00	0.54	0.54	1.73	2.15
Quang Ngai	PV USD m	-0.01	0.07	0.07	0.26	0.32
Binh Dinh	PV USD m	-0.01	0.22	0.22	0.71	0.88
Phu Yen	PV USD m	-0.01	0.43	0.43	1.37	1.70
Ninh Thuan	PV USD m	0.01	0.98	0.97	3.09	3.82
Binh Thuan	PV USD m	0.00	0.80	0.80	2.53	3.13
Project	**PV USD m**	**0.03**	**10.00**	**9.99**	**27.61**	**37.81**

Attachment I-3: Table 2. Annual Increase in Carbon Stocks in Biomass

Land-use category: From Forest Land Remaining Forest Land

	A	G_W	R	G_{TOTAL}	CF	ΔC_G
ICCP Guidelines Equation No.	**Equation 2.9**	**Equation 2.10**			**Equation 2.9**	
	Area of Forest Land Remaining Forest Land	Average annual above-ground biomass growth	Ratio of below-ground biomass to above-ground biomass	Average annual biomass growth above- and below-ground	Carbon fraction of dry matter	Annual increase in biomass carbon stocks due to biomass growth
	[ha]	[tonnes d.m. ha^{-1} yr^{-1}]	[tonnes bg dm (tonne am dm)$^{-1}$]	[tonnes dm ha^{-1} yr^{-1}]	[tonnec C (tonne dm)$^{-1}$]	[tonnes C yr^{-1}]
Province, Subcategories for reporting year	JICA SAPROF	IPCC Guidelines, Table 4.12	0.5 or Table 4.4	G_{TOTAL} = GW * (1+R)	0.5 or Table 4.3	$\Delta C_G = A * G_{TOTAL} * CF$
Thanh Hoa						8,655
Improvement of Existing Plantations	1,400	5	0.27	6.35	0.47	4,178
Forest Protection	6,600	1	0.27	1.27	0.47	3,940
ANR+Enrichment	0	1	0.27	1.27	0.47	0
ANR	900	1	0.27	1.27	0.47	537
ANR-Coastal	0	1	0.40	1.4	0.47	0
Nghe An						5,133
Improvement of Existing Plantations	900	5	0.27	6.35	0.47	2,686
Forest Protection	4,100	1	0.27	1.27	0.47	2,447
ANR+Enrichment	0	1	0.27	1.27	0.47	0
ANR	0	1	0.27	1.27	0.47	0
ANR-Coastal	0	1	0.40	1.4		0
Ha Tinh						8,064
Improvement of Existing Plantations	1,000	5	0.27	6.35	0.47	2,985
Forest Protection	8,510	1	0.27	1.27	0.47	5,080
ANR+Enrichment	0	1	0.27	1.27	0.47	0
ANR	0	1	0.27	1.27	0.47	0
ANR-Coastal	0	1	0.40	1.4	0.47	0
Quang Binh						4,656
Improvement of Existing Plantations	800	5	0.27	6.35	0.47	2,388
Forest Protection	3,000	1	0.27	1.27	0.47	1,791
ANR+Enrichment	0	1	0.27	1.27	0.47	0
ANR	800	1	0.27	1.27	0.47	478
ANR-Coastal	0	1	0.40	1.4	0.47	0
Quang Tri						4,029
Improvement of Existing Plantations	0	5	0.27	6.35	0.47	0
Forest Protection	4,000	1	0.27	1.27	0.47	2,388
ANR+Enrichment	300	1	0.27	1.27	0.47	179
ANR	2,450	1	0.27	1.27	0.47	1,462
ANR-Coastal	0	1	0.40	1.4	0.47	0
T.T. Hue						6,267
Improvement of Existing Plantations	0	5	0.27	6.35	0.47	0
Forest Protection	8,000	1	0.27	1.27	0.47	4,775
ANR+Enrichment	500	1	0.27	1.27	0.47	298
ANR	2,000	1	0.27	1.27	0.47	1,194
ANR-Coastal	0	1	0.40	1.4	0.47	0
Quang Nam						6,088
Improvement of Existing Plantations	0	5	0.27	6.35	0.47	0
Forest Protection	7,000	1	0.27	1.27	0.47	4,178
ANR+Enrichment	2,100	1	0.27	1.27	0.47	1,253
ANR	1,100	1	0.27	1.27	0.47	657
ANR-Coastal	0	1	0.40	1.4	0.47	0
Quang Ngai						3,880
Improvement of Existing Plantations	0	5	0.27	6.35	0.47	0
Forest Protection	3,200	1	0.27	1.27	0.47	1,910
ANR+Enrichment	600	1	0.27	1.27	0.47	358
ANR	2,700	1	0.27	1.27	0.47	1,612
ANR-Coastal	0	1	0.40	1.4	0.47	0
Binh Dinh						5,020
Improvement of Existing Plantations	0	5	0.27	6.35	0.47	0
Forest Protection	3,710	1	0.27	1.27	0.47	2,214
ANR+Enrichment	0	1	0.27	1.27	0.47	0
ANR	4,700	1	0.27	1.27	0.47	2,805
ANR-Coastal	0	1	0.40	1.4	0.47	0
Phu Yen						3,134
Improvement of Existing Plantations	0	5	0.27	6.35	0.47	0
Forest Protection	4,350	1	0.27	1.27	0.47	2,597
ANR+Enrichment	0	1	0.27	1.27	0.47	0
ANR	900	1	0.27	1.27	0.47	537
ANR-Coastal	0	1	0.40	1.4	0.47	0
Ninh Thuan						6,327
Improvement of Existing Plantations	0	5	0.27	6.35	0.47	0
Forest Protection	7,900	1	0.27	1.27	0.47	4,716
ANR+Enrichment	1,200	1	0.27	1.27	0.47	716
ANR	1,500	1	0.27	1.27	0.47	895
ANR-Coastal	0	1	0.40	1.4	0.47	0
Binh Thuan						5,709
Improvement of Existing Plantations	0	5	0.27	6.35	0.47	0
Forest Protection	3,600	1	0.27	1.27	0.47	2,149
ANR+Enrichment	0	1	0.27	1.27	0.47	0
ANR	4,200	1	0.27	1.27	0.47	2,507
ANR-Coastal	1,600	1	0.40	1.4	0.47	1,053

Source: The sheet reflects exactly the 2006 IPCC Guidance (http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html)

Attachment I-3: Table 3. Loss of Carbon from Wood Removals

Land-use category: From Forest Land Remaining Forest Land

	H	$BCEF_R$	R	CF	$L_{wood\text{-}removals}$
ICCP Guidelines Equation No.	**Equation 2.12**				
	Annual wood removal	Biomass conversion and expansion factor for conversion of removals in merchantable volume to total biomass removals (including bark)	Ratio of below-ground biomass to above-ground biomass	Carbon fraction of dry matter	Annual carbon loss due to biomass removals
	[m^3 yr^{-1}]	[tonnes of biomass removals (m^3 of removals)$^{-1}$]	[tonnes bg dm (tonne ag dm)$^{-1}$]	[tonnes C (tonne dm)$^{-1}$]	(tonnes C yr^{-1})
Province, Subcategories for reporting year	JICA SAPROF	Table 4.5	zero (0) or Table 4.4	0.5 or Table 4.3	$L_{wood\text{-}removals} = H * BCEF_R * (1+R) * CF$
Thanh Hoa					247
Improvement of Existing Plantations	23	1.39	0.27	0.47	19
Forest Protection	108	3.11	0.27	0.47	201
AND+Enrichment	0	3.11	0.27	0.47	0
ANR	15	3.11	0.27	0.47	27
ANR-Coastal	0	3.11	0.40	0.47	0
Nghe An					142
Improvement of Existing Plantations	15	1.39	0.27	0.47	13
Forest Protection	70	3.11	0.27	0.47	129
AND+Enrichment	0	3.11	0.27	0.47	0
ANR	0	3.11	0.27	0.47	0
ANR-Coastal	0	3.11	0.40	0.47	
Ha Tinh					567
Improvement of Existing Plantations	34	1.39	0.27	0.47	28
Forest Protection	290	3.11	0.27	0.47	538
AND+Enrichment	0	3.11	0.27	0.47	0
ANR	0	3.11	0.27	0.47	0
ANR-Coastal	0	3.11	0.40	0.47	0
Quang Binh					107
Improvement of Existing Plantations	11	1.39	0.27	0.47	9
Forest Protection	42	3.11	0.27	0.47	77
AND+Enrichment	0	3.11	0.27	0.47	0
ANR	11	3.11	0.27	0.47	21
ANR-Coastal	0	3.11	0.40	0.47	0
Quang Tri					497
Improvement of Existing Plantations	0	1.39	0.27	0.47	0
Forest Protection	159	3.11	0.27	0.47	295
AND+Enrichment	12	3.11	0.27	0.47	22
ANR	97	3.11	0.27	0.47	180
ANR-Coastal	0	3.11	0.40	0.47	0
T.T. Hue					828
Improvement of Existing Plantations	0	1.39	0.27	0.47	0
Forest Protection	340	3.11	0.27	0.47	631
AND+Enrichment	21	3.11	0.27	0.47	39
ANR	85	3.11	0.27	0.47	158
ANR-Coastal	0	3.11	0.40	0.47	0
Quang Nam					1,153
Improvement of Existing Plantations	0	1.39	0.27	0.47	0
Forest Protection	426	3.11	0.27	0.47	791
AND+Enrichment	128	3.11	0.27	0.47	237
ANR	67	3.11	0.27	0.47	124
ANR-Coastal	0	3.11	0.40	0.47	0
Quang Ngai					1,470
Improvement of Existing Plantations	0	1.39	0.27	0.47	0
Forest Protection	390	3.11	0.27	0.47	724
AND+Enrichment	73	3.11	0.27	0.47	136
ANR	329	3.11	0.27	0.47	611
ANR-Coastal	0	3.11	0.40	0.47	0
Binh Dinh					1,578
Improvement of Existing Plantations	0	1.39	0.27	0.47	0
Forest Protection	375	3.11	0.27	0.47	696
AND+Enrichment	0	3.11	0.27	0.47	0
ANR	475	3.11	0.27	0.47	882
ANR-Coastal	0	3.11	0.40	0.47	0
Phu Yen					168
Improvement of Existing Plantations	0	1.39	0.27	0.47	0
Forest Protection	75	3.11	0.27	0.47	139
AND+Enrichment	0	3.11	0.27	0.47	0
ANR	15	3.11	0.27	0.47	29
ANR-Coastal	0	3.11	0.40	0.47	0
Ninh Thuan					77
Improvement of Existing Plantations	0	1.39	0.27	0.47	0
Forest Protection	31	3.11	0.27	0.47	57
AND+Enrichment	5	3.11	0.27	0.47	9
ANR	6	3.11	0.27	0.47	11
ANR-Coastal	0	3.11	0.40	0.47	0
Binh Thuan					343
Improvement of Existing Plantations	0	1.39	0.27	0.47	0
Forest Protection	69	3.11	0.27	0.47	129
AND+Enrichment	0	3.11	0.27	0.47	0
ANR	81	3.11	0.27	0.47	150
ANR-Coastal	31	3.11	0.40	0.47	63

Source: The sheet reflects exactly the 2006 IPCC Guidance (http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html)

Attachment I-3: Table 4. Loss of Carbon from Fuelwood Removals

Land-use category: From Forest Land Remaining Forest Land

	FG_{trees}	$BCEF_R$	R	FG_{part}	D	CF	$L_{fuelwood}$
ICCP Guidelines Equation No.	**Equation 2.13**						
	Annual volume of fuelwood removal of whole trees	Biomass conversion and expansion factor for conversion of removals in merchantable volume to total biomass removals (including bark)	Ratio of below-ground biomass to above-ground biomass	Annual volume of fuelwood removal as tree parts	Basic wood density	Carbon fraction of dry matter	Annual carbon loss due to fuelwood removal
	[m^3 yr^{-1}]	[tonnes of biomass removals (m^3 of removals) $^{-1}$]	[tonnes bg dm (tonne ag dm)$^{-1}$]	[m^3 yr^{-1}]	[tonnes m^{-3}]	[tonnes C (tonne dm)$^{-1}$]	[tonnes C yr^{-1}]
Province, Subcategories for reporting year	FAO statistics	Table 4.5	zero (0) or Table 4.4	FAO statistics	Tables 4.13	0.5 or Table 4.3	$L_{fuelwood}$ = [FG_{trees} *$BCEF_R$ * (1+R) + FG_{part} * D] * CF
Thanh Hoa							2,975
Improvement of Existing Plantations	0	1.39	0.27	1,598	0.62	0.47	468
Forest Protection	0	3.11	0.27	7,535	0.62	0.47	2,206
AND+Enrichment	0	3.11	0.27	0	0.62	0.47	0
ANR	0	3.11	0.27	1,028	0.62	0.47	301
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Nghe An							1,671
Improvement of Existing Plantations	0	1.39	0.27	1,028	0.62	0.47	301
Forest Protection	0	3.11	0.27	4,681	0.62	0.47	1,370
AND+Enrichment	0	3.11	0.27	0	0.62	0.47	0
ANR	0	3.11	0.27	0	0.62	0.47	0
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Ha Tinh							3,178
Improvement of Existing Plantations	0	1.39	0.27	1,142	0.62	0.47	334
Forest Protection	0	3.11	0.27	9,716	0.62	0.47	2,844
AND+Enrichment	0	3.11	0.27	0	0.62	0.47	0
ANR	0	3.11	0.27	0	0.62	0.47	0
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Quang Binh							1,537
Improvement of Existing Plantations	0	1.39	0.27	913	0.62	0.47	267
Forest Protection	0	3.11	0.27	3,425	0.62	0.47	1,003
AND+Enrichment	0	3.11	0.27	0	0.62	0.47	0
ANR	0	3.11	0.27	913	0.62	0.47	267
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Quang Tri							2,256
Improvement of Existing Plantations	0	1.39	0.27	0	0.62	0.47	0
Forest Protection	0	3.11	0.27	4,567	0.62	0.47	1,337
AND+Enrichment	0	3.11	0.27	343	0.62	0.47	100
ANR	0	3.11	0.27	2,797	0.62	0.47	819
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
T.T. Hue							3,509
Improvement of Existing Plantations	0	1.39	0.27	0	0.62	0.47	0
Forest Protection	0	3.11	0.27	9,134	0.62	0.47	2,674
AND+Enrichment	0	3.11	0.27	571	0.62	0.47	167
ANR	0	3.11	0.27	2,283	0.62	0.47	668
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Quang Nam							3,409
Improvement of Existing Plantations	0	1.39	0.27	0	0.62	0.47	0
Forest Protection	0	3.11	0.27	7,992	0.62	0.47	2,340
AND+Enrichment	0	3.11	0.27	2,398	0.62	0.47	702
ANR	0	3.11	0.27	1,256	0.62	0.47	368
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Quang Ngai							2,172
Improvement of Existing Plantations	0	1.39	0.27	0	0.62	0.47	0
Forest Protection	0	3.11	0.27	3,653	0.62	0.47	1,070
AND+Enrichment	0	3.11	0.27	685	0.62	0.47	201
ANR	0	3.11	0.27	3,083	0.62	0.47	902
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Binh Dinh							2,811
Improvement of Existing Plantations	0	1.39	0.27	0	0.62	0.47	0
Forest Protection	0	3.11	0.27	4,236	0.62	0.47	1,240
AND+Enrichment	0	3.11	0.27	0	0.62	0.47	0
ANR	0	3.11	0.27	5,366	0.62	0.47	1,571
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Phu Yen							1,755
Improvement of Existing Plantations	0	1.39	0.27	0	0.62	0.47	0
Forest Protection	0	3.11	0.27	4,966	0.62	0.47	1,454
AND+Enrichment	0	3.11	0.27	0	0.62	0.47	0
ANR	0	3.11	0.27	1,028	0.62	0.47	301
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Ninh Thuan							3,543
Improvement of Existing Plantations	0	1.39	0.27	0	0.62	0.47	0
Forest Protection	0	3.11	0.27	9,019	0.62	0.47	2,640
AND+Enrichment	0	3.11	0.27	1,370	0.62	0.47	401
ANR	0	3.11	0.27	1,713	0.62	0.47	501
ANR-Coastal	0	3.11	0.40	0	0.62	0.47	0
Binh Thuan							3,142
Improvement of Existing Plantations	0	1.39	0.27	0	0.62	0.47	0
Forest Protection	0	3.11	0.27	4,110	0.62	0.47	1,203
AND+Enrichment	0	3.11	0.27	0	0.62	0.47	0
ANR	0	3.11	0.27	4,795	0.62	0.47	1,404
ANR-Coastal	0	3.11	0.40	1,827	0.62	0.47	535

Source: The sheet reflects exactly the 2006 IPCC Guidance (http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html)

Attachment I-3: Table 5. Loss of Carbon from Disturbance

Land-use category: From Forest Land Remaining Forest Land

	$A_{disturbance}$	B_W	R	CF	$L_{disturbances}$	ΔC_L
ICCP Guidelines Equation No.	**Equation 2.14**					
	Area affected by disturbances	Average above-ground biomass of areas affected	Ratio of below-ground biomass to above-ground biomass	Carbon fraction of dry matter	Annual other losses of carbon	Annual decrease in carbon stocks due to biomass loss
	[ha yr^{-1}]	[tonnes dm ha^{-1}]	[tonnes bg dm (tonne ag dm)$^{-1}$]	[tonnes C (tonne dm)$^{-1}$]	(tonnes C yr^{-1})	(tonnes C yr^{-1})
Province, Subcategories for reporting year	National statistics	Table 4.9	zero (0) or Table 4.4	0.5 or Table 4.3	$L_{disturbances} = A * B_W * (1+R) * CF * fd$	$\Delta C_L = L_{wood\text{-}removals} + L_{fuelwood} + L_{disturbances}$
Thanh Hoa					0.11	
Improvement of Existing Plantations	0.03	1.00	0.27	0.47	0.02	487
Forest Protection	0.14	1.00	0.27	0.47	0.08	2,407
AND+Enrichment	0.00	1.00	0.27	0.47	0.00	0
ANR	0.02	1.00	0.27	0.47	0.01	328
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Nghe An					0.04	
Improvement of Existing Plantations	0.01	1.00	0.27	0.47	0.01	314
Forest Protection	0.05	1.00	0.27	0.47	0.03	1,500
AND+Enrichment	0.00	1.00	0.27	0.47	0.00	0
ANR	0.00	1.00	0.27	0.47	0.00	0
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Ha Tinh						
Improvement of Existing Plantations	0.04	1.00	0.27	0.47	0.02	363
Forest Protection	0.33	1.00	0.27	0.47	0.19	3,383
AND+Enrichment	0.00	1.00	0.27	0.47	0.00	0
ANR	0.00	1.00	0.27	0.47	0.00	0
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Quang Binh					0.06	
Improvement of Existing Plantations	0.02	1.00	0.27	0.47	0.01	277
Forest Protection	0.07	1.00	0.27	0.47	0.04	1,080
AND+Enrichment	0.00	1.00	0.27	0.47	0.00	0
ANR	0.02	1.00	0.27	0.47	0.01	288
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Quang Tri					0.12	
Improvement of Existing Plantations	0.00	1.00	0.27	0.47	0.00	0
Forest Protection	0.12	1.00	0.27	0.47	0.07	1,632
AND+Enrichment	0.01	1.00	0.27	0.47	0.01	122
ANR	0.07	1.00	0.27	0.47	0.04	999
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
T.T. Hue					0.67	
Improvement of Existing Plantations	0.00	1.00	0.27	0.47	0.00	0
Forest Protection	0.86	1.00	0.27	0.47	0.51	3,305
AND+Enrichment	0.05	1.00	0.27	0.47	0.03	207
ANR	0.21	1.00	0.27	0.47	0.13	826
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Quang Nam					0.05	
Improvement of Existing Plantations	0.00	1.00	0.27	0.47	0.00	0
Forest Protection	0.06	1.00	0.27	0.47	0.04	3,131
AND+Enrichment	0.02	1.00	0.27	0.47	0.01	939
ANR	0.01	1.00	0.27	0.47	0.01	492
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Quang Ngai					0.14	
Improvement of Existing Plantations	0.00	1.00	0.27	0.47	0.00	0
Forest Protection	0.12	1.00	0.27	0.47	0.07	1,793
AND+Enrichment	0.02	1.00	0.27	0.47	0.01	336
ANR	0.10	1.00	0.27	0.47	0.06	1,513
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Binh Dinh					0.28	
Improvement of Existing Plantations	0.00	1.00	0.27	0.47	0.00	0
Forest Protection	0.21	1.00	0.27	0.47	0.12	1,936
AND+Enrichment	0.00	1.00	0.27	0.47	0.00	0
ANR	0.26	1.00	0.27	0.47	0.16	2,453
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Phu Yen					0.10	
Improvement of Existing Plantations	0.00	1.00	0.27	0.47	0.00	0
Forest Protection	0.14	1.00	0.27	0.47	0.08	1,593
AND+Enrichment	0.00	1.00	0.27	0.47	0.00	0
ANR	0.03	1.00	0.27	0.47	0.02	330
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Ninh Thuan					1.14	
Improvement of Existing Plantations	0.00	1.00	0.27	0.47	0.00	0
Forest Protection	1.43	1.00	0.27	0.47	0.85	2,699
AND+Enrichment	0.22	1.00	0.27	0.47	0.13	410
ANR	0.27	1.00	0.27	0.47	0.16	512
ANR-Coastal	0.00	1.00	0.40	0.47	0.00	0
Binh Thuan					0.68	
Improvement of Existing Plantations	0.00	1.00	0.27	0.47	0.00	0
Forest Protection	0.43	1.00	0.27	0.47	0.26	1,332
AND+Enrichment	0.00	1.00	0.27	0.47	0.00	0
ANR	0.50	1.00	0.27	0.47	0.30	1,554
ANR-Coastal	0.19	1.00	0.40	0.47	0.13	598

Source: The sheet reflects exactly the 2006 IPCC Guidance (http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html)