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# Ex-Ante GHG Appraisal of the World Bank Sustainable Forest and Landscape Management Project (SFLM) for Bosnia and Herzegovina (2014-2019)

## Targeting Climate Change Mitigation in Agriculture with the EX-Ante Carbon Balance Tool (EX-ACT)



**About EX-ACT:** The *Ex Ante* Carbon-balance Tool aims at providing *ex-ante* estimations of the impact of agriculture and forestry development projects on GHG emissions and carbon sequestration, indicating its effects on the carbon balance.

See EX-ACT website: [www.fao.org/tc/exact](http://www.fao.org/tc/exact)

### Related resources

EX-ANTE Carbon-Balance Tool (EX-ACT): (i) [User Guidelines](#); (ii) [Tool](#); (iii) [Flyer](#)

See all EX-ACT resources in EASYPol under the Resource package, [Investment Planning for Rural Development, EX-1Ante Carbon-Balance Appraisal of Investment Projects](#)



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# Ex-Ante GHG Appraisal of the World Bank Sustainable Forest and Landscape Management Project (SFLM) for Bosnia and Herzegovina (2014-2019)

by

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, FAO



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## 1. Executive summary

The objectives of the Sustainable Forest and Landscape Management Project are (i) To build capacity of forestry sector stakeholders and (ii) to demonstrate approaches for sustainable forest and land management through integrated management of vulnerable forest, scrub and pasture landscapes. The project is providing a national coverage for Bosnia. The direct beneficiaries are the agencies associated with forestry management in the country; these benefit from institutional strengthening throughout their jurisdictions and include the Ministry of Agriculture, Water Management and Forestry (MAWF), the CFMCs (responsible for economic functions of forest management) and the Federation and Cantonal Forest Administrations. The entire country will benefit from improved forest management as it secures access to markets for sustainable timber that generates important export revenues in a key resource sector. In effect, the entire country is to some degree potentially vulnerable to increased climate-related hazards; appropriate adaptation strategies involve enhancing the resilience of the forest estate at risk, and of the various stakeholders and beneficiaries.

EX-ACT (EX-Ante Carbon balance Tool) is a scoping tool jointly developed by three FAO divisions (TCS, TCI and ESA), aimed at providing ex-ante estimations of the impact of agriculture and forestry development projects/programmes/value chains/policies on GHG emissions and C sequestration, indicating its effects on the Carbon-balance. Two technical brainstorming were organised with panels of national and regional experts, one focusing on RS specificities and the second one on FBiH. During the meetings, participants discuss every technical field action specified in project implementation and its plausible impact in terms of inputs used in EX-ACT, land use and land use change effect, forest and biomass evolution. Such brainstorming allow to use iterative simulation on project impact optimistic and pessimistic options, continuously questioning impact versus effective field actions deployed notably in term of fire prevention and impact on forest management, type of land use change occurring in reforestation.

The construction of the scenario, corresponding to the baseline (i.e. without project) and the implementation of the project (i.e. with project), were built following the different components and sub-component exposed in the “Project Appraisal Document”. The structures of the two appraisals followed the same methodology and approach, and results can be directly aggregated.

Executive Summary Table 1. Aggregated results for Bosnia-Herzegovina

EX-ACT Modules	Gross fluxes (All GHG in tCO <sub>2</sub> eq)		Balance (tCO <sub>2</sub> eq)
	Without	With	
Afforestation	- 25,811,317	- 36,921,309	- 11,109, 993
Forest management and avoided degradation	2,283,132	- 7,307,279	- 9,590,411
Investments	0	4,681,241	4,681,241
<b>Total</b>	<b>-23,528,184</b>	<b>-39,547,346</b>	<b>-16,019,162</b>

The implementation of the SFLM project will result in a total sink of *cerca* 16 MtCO<sub>2</sub>-eq for a total forest surface considered during the appraisal of 2,430,394 ha, i.e. a mean sink of 0.26 tCO<sub>2</sub>-eq per year and per ha.

## 2. Background

### 2.1 Study Framework: Ex-ante appraisal of the SFLM project

This report is prepared to provide an ex-ante appraisal of the carbon balance of the *Sustainable Forest and Landscape Management (SFLM) Project* proposed by the World Bank Sustainable Development Department (Europe and Central Asia Region) to the Global Environment Facility Trust Fund. The carbon -balance is the estimated potential mitigation impact which could be generated in the coming 20 years by the implementation of the project.

### 2.2 Country context

Bosnia and Herzegovina is a single sovereign state with a decentralized administrative structure. The State of Bosnia and Herzegovina is the central authority and the Federation of Bosnia and Herzegovina (Federation or FBiH) and Republika Srpska (RS) are its two constituent Entities. FBiH and RS are politically, administratively, and fiscally autonomous.



Figure 1. Location of Bosnia-Herzegovina within Europe (left) and administrative divisions (right) of Republika Srpska (RS) and Federation of Bosnia and Herzegovina (FBiH)

### 2.3 Forest in Bosnia and Herzegovina

Relative to the size of the country, the forest resources of BiH are among the richest in Europe in terms of their extent and variety. As shown in a recently-completed national forest inventory, funded by a World Bank Credit (37790-BA and 37791 -BA), BiH has a total designated forest area of 3.2 million ha, covering some 62 percent of the total land area, making it the most forested country in Europe. This compares with 24 percent for pasture land, much of it close to forest areas, and only 10 percent for arable land. Other sources (e.g. European CORINE Land Cover and Forest Assessment Report from FAO) gave similar figures (Table 1 below)

Table 1. Total forest and forest land area cover in Bosnia and Herzegovina (Source: FRA 2010/026 from FAO)

	Federation BiH (ha)			Republic of Srpska (ha)			Total (ha)
	State	Private	Total	State	Private	Total	
Forest	905.000	209.000	1.114.000	813.000	258.000	1.071.000	<b>2.185.000</b>
Forest land	301.000	69.000	370.000	160.000	19.000	179.000	<b>549.000</b>

In general, forests are considered one of Bosnia's foremost natural resources and, in particular, the rural population (estimated 2 million) considers the forests as an important source of employment (in forest industries), energy (fuelwood for heating, largely from forest residues) and recreation. According to the second National communication of BiH, forests present a rich and biodiversity due to their locations in three distinct geological and climatic regions: The Mediterranean region, the Euro Siberian-Bore American region, and the Alpine-Nordic region. BiH is one of the countries in Europe with the greatest diversity of species of plants and animals. Flora in Bosnia and Herzegovina accounts for about 4,500 species of high plants, 600 moss taxa and 80 ferns (Brujic, 2011).

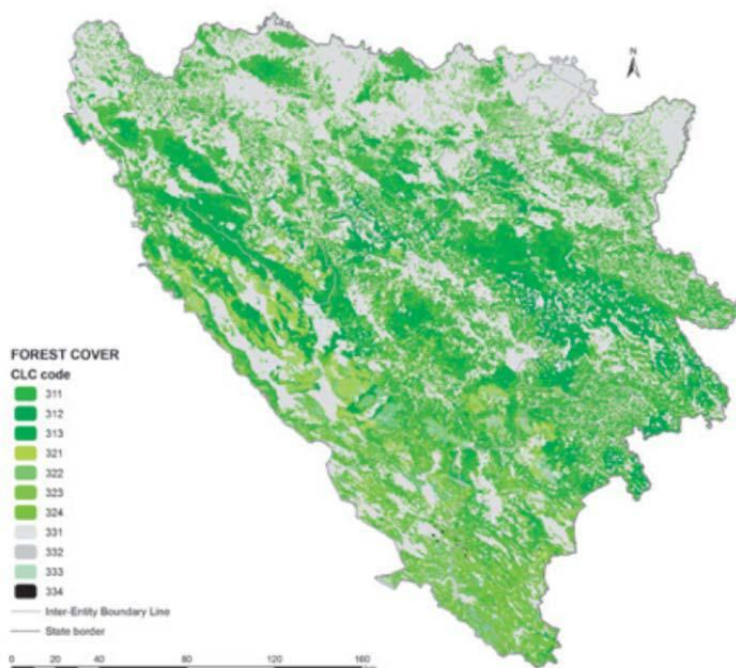


Figure 2. Forest cover in BiH (Source: European CORINE Land Cover 2000 from 2<sup>nd</sup> National Communication, 2009)

However, the main tree species are fir, spruce, Scotch and European pine, beech, and oaks (Table 2). About 80% of the forests are state-owned, while the remainder is owned by a large number of individual private owners.

Table 2. Growing stock of the most common species (Source: FRA 2010/026 from FAO)

Rank	Scientific name	Common name	Growing stock in forest (million cubic meter)	
			1990	2000
1 <sup>st</sup>	Fagus silvatica	Beech	138	174
2 <sup>nd</sup>	Abies alba	Fir	63	70
3 <sup>rd</sup>	Picea abies	Norway spruce	35	50
4 <sup>th</sup>	Quercus petrea	Oak	16	20
5 <sup>th</sup>	Pinus nigra	European Pine	6	8
6 <sup>th</sup>	Pinus silvestris	Scotch pine	5	7
<b>Remaining</b>			28	29
<b>Total</b>			291	358

In addition, forestry is cited as one of the most vulnerable sectors in BiH by the 2<sup>nd</sup> National Communication. Projections showed, according to climate scenarios A1B and A2, that agriculture, forestry and fishery sectors will face land degradation and erosion (due to extreme weather). In addition, it is expected that there will be increased needs for irrigation, an increased risk of forest fires, increases in ‘barren’ land and reduced biodiversity, etc. Thus without forestry sector is vulnerable. Even more, that, extended superficies as already degraded, thus as stated by the 2<sup>nd</sup> National Communication “Due to activities such as illegal logging, ore mining, forest fires, the area under forest cover has been shrinking rapidly; furthermore, a significant part of the forest cover has been declared as mined (numbers indicate approximately 10%) and has evident damage due to war activities’. Overall some 17 percent of the forest areas are classified as low, degraded forests, while an additional area of about 6 percent of the forest estate is classified as underutilized pasture land or bare landscapes, where natural regeneration to a forest structure could take place, given the right conditions.

#### 2.4 Sustainable Forest and Landscape Management (SFLM) Project: objectives and framework

In this context, The World Bank’s Board of Executive Directors approved Global Environment Facility (GEF) grant for the Sustainable Forest and Landscape Management (SFLM) Project for Bosnia and Herzegovina (BiH), to improve forest management, demonstrating modern techniques that reduce the vulnerability of forests to drought, fires, and pests. This overall project is organized around 3 components, divided in further sub-components (further described in next sections):

##### **Component 1. Enhanced Planning and Monitoring for SFLM**

- Sub-component 1.1. Forest Certification Support
- Sub-component 1.2. Forest Road Strategic Plan
- Sub-component 1.3. Forest Management Information System (FMIS) Enhancements for Mainstreamed Decision-Making

##### **Component 2. Demonstration and Replication of SFLM Techniques in Vulnerable Areas**

- Sub-component 2.1. Afforestation - Assisted Natural Regeneration and Stand Rehabilitation.
- Sub-component 2.2. Multi-purpose Forestry Demonstration Techniques
- Sub-component 2.3. Fire Management Technique Demonstration and Implementation
- Sub-component 2.4. Local Stakeholder Capacity Building

##### **Component 3. Project Management**

### **3. Methodology and tools used**

#### **3.1 EX-ACT tool**

The Ex-Ante Carbon-balance Tool (EX-ACT) is an appraisal system developed by FAO providing ex -ante estimates of the impact of agriculture and forestry development projects, programmes and policies on the carbon- balance. The carbon-balance is defined as the net balance from all GHGs expressed in CO<sub>2</sub> equivalents that were emitted or sequestered due to project implementation as compared to a business-as-usual scenario.

EX-ACT is a land-based accounting system, estimating C stock changes (i.e. emissions or sinks of CO<sub>2</sub>) as well as GHG emissions per unit of land, expressed in equivalent tonnes of CO<sub>2</sub> per hectare and year. The tool helps project designers to estimate and prioritize project activities with high benefits in economic and climate change mitigation terms. The amount of GHG mitigation may also be used as part of economic analysis as well as for the application for funding additional project components.

EX-ACT has been developed using mostly the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (IPCC, 2006) that furnishes EX-ACT with recognized default values for emission factors and carbon values, the so called Tier 1 level of precision. Besides, EX-ACT is based upon chapter 8 of the Fourth Assessment Report from working group III of the IPCC (Smith, et al., 2007) for specific mitigation options not covered in NGGI-IPCC-2006. Other required coefficients are from published reviews or international databases. For instance embodied GHG emissions for farm operations, transportation of inputs, and irrigation systems implementation come from Lal (Lal, 2004) and electricity emission factors are based on data from the International Energy Agency (IEA, 2013)

The EX-ACT appraisal process is interactive as well as participatory, and can strengthen the overall project design process, especially when a training and workshop element (for project teams, government counterparts, and other stakeholders) is integrated as part of the process. It may facilitate the discussion on ways to create incentives and institutional conditions that can promote their uptake (such as payments for environmental services or carbon markets).

Two technical brainstorming were organised with panels of national and regional experts (see Annexes 1 and 2), one focusing on RS specificities and the second one on FBiH. During the meetings, participants discuss every technical field action specified in project implementation and its plausible impact in terms of inputs used in EX-ACT, land use and land use change effect, forest and biomass evolution.

#### **3.2 Participatory approach**

The EX-ACT appraisal process is interactive as well as participatory, and can strengthen the overall project design process, especially when a training and workshop element (for project teams, government counterparts, and other stakeholders) is integrated as part of the process. It may facilitate the discussion on ways to create incentives and institutional conditions that can promote their uptake (such as payments for environmental services or carbon markets).

Two technical brainstorming were organised with panels of national and regional experts (see Annexes 1 and 2), one focusing on RS specificities and the second one on FBiH. During the meetings, participants discuss every technical field action specified in project implementation and its plausible impact in terms of inputs used in EX-ACT, land use and land use change effect, forest and biomass evolution. Such brainstorming allow to use iterative simulation on

project impact optimistic and pessimistic options, continuously questioning impact versus effective field actions deployed notably in term of fire prevention and impact on forest management, type of land use change occurring in reforestation.

The construction of the scenario, corresponding to the baseline (i.e. without project) and the implementation of the project (i.e. with project), were built following the different components and sub-component exposed in the “Project Appraisal Document” (Table 3)

Table 3. Components and sub-components of the project discussed with experts

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**Component Sub-Component and brief description**

**Component 1. Enhanced Planning and Monitoring for SFLM**

1.1 Forest certification support

To improve the sustainability of forest management, and community engagement with local people, through implementation of forest management to certifiable standards (e.g., FSC or PEFC)

1.2 Forest Road strategic plan

To identify the most urgent forest road rehabilitation projects through the preparation of a model forest roads master plan that would, at the end, permit a proper forest management, effective fire management, and realization of the full commercial potential.

1.3 Forest Management Information Systems (FMIS)

To improve the forest management operations through capacity building and localized development of the FMIS

**Component 2. Demonstration and Replication of SFLM Techniques in Vulnerable Areas**

2.1. Afforestation – Assisted Natural Regeneration and Stand Rehabilitation

Activities further are divided to include:

- (i) afforestation with native species;
- (ii) afforestation with new species appropriate to drying conditions or increased fire hazard;
- (iii) stand management complementing natural regeneration through thinning and weeding;
- (iv) stand rehabilitation using enrichment planting, limbing, or thinning;
- (v) forest conversion from coppice forest to high forest;
- (vi) production of seedlings using methods or species appropriate to improved climate resilience

2.2 Multipurpose forestry demonstration techniques

Implementation of demonstration plots of sustainable techniques with a minimum of 2 ha per sub-project. Examples of candidate activities include: (i) non-timber forest product (NTFP) harvesting and value added; (ii) hunting and wildlife management complementing forest management; (iii) biomass management for energy reduction; (iv) bio-mass thinning for local use and fire management; and, (v) forest-based tourism

2.3 Fire management technique demonstration and implementation

To implement appropriate small-scale fire management interventions. Preference will be given to activities involving an element of local engagement and participation.

2.4 Local stakeholders capacity building

To provide operational support to existing stakeholders at the local administrative and community level to engage in local participation in the above activities (including afforestation, innovative demonstration projects and fire management).

For each sub-component, the possible impacts in terms direct and indirect emissions of GHG or C sequestration were discussed with the expert of each region. Numbers of areas concerned and the different levels of biomass attainable according to the different states of the forest

were debated with the expert and the academic present. At the end, consensus were reach on numbers and on the module to be considered for the component and sub-components that will affect the GHG balance and thus need to be considered in the appraisal phase. Table 4 summarise the EXACT modules used and their relationships with the component/sub-components of the project.

Table 4: EX-ACT modules used for the different subcomponents appraised

Components and sub-components	EX-ACT Modules
<b>Component 1. Enhanced Planning and Monitoring for SFLM</b>	
1.2 Forest Road strategic plan	<b>6.3 Construction of new infrastructure for the project (irrigation systems, buildings, roads)</b> Construction of roads on the long term as a result of the adoption of the strategic plan
<b>Component 2. Demonstration and Replication of SFLM Techniques in Vulnerable Areas</b>	
2.1 Afforestation and rehabilitation	
- (i) and (ii) Afforestation	<b>2.2. Afforestation and Reforestation</b> Afforestation of new stands
- (iii) + (iv) stands management and rehabilitation	<b>5.1. Forest degradation and Management</b> Rehabilitation, i.e. improvement of the management of forest stands
- (v) Rehabilitation/Conversion of Coppice	<b>5.1. Forest degradation and Management</b> Rehabilitation, i.e. improvement of the management
- (vi) Afforestation with improved seedlings	<b>2.2. Afforestation and Reforestation</b> Afforestation of the stands with improved seedlings will replace traditional afforestation
2.3 Fire management	
	<b>5.1. Forest degradation and Management</b> Rehabilitation, i.e. improvement of the management
	<b>6.3 Construction of new infrastructure for the project (irrigation systems, buildings, roads)</b> Construction of firefighting roads
	<b>6.2 Energy consumption (electricity, fuel,...)</b> Consumption of fuel for fire controle

The following sub-components were considered to have a limited impact on the GHG balance, and thus were not included in the appraisal:

- Forest certification support
- Forest Management Information Systems (FMIS)
- Demonstration techniques
- Capacity building

The subcomponent 1.2 has no direct associated GHG emissions, but if the action is successful, the resulting “Forest Road strategic plan” will be adopted and enhanced, in comparison with a business as usual scenario (the without project implementation in EX-ACT), the construction of new roads. While it is expected to have an impact on the subsequent 40 years after the end of the project, in order to be conservative the capitalization phase were set to 20 years.

Finally, once the scope of the assessment was set, the participants exchange information concerning the superficies to be used in the appraisal but also the forest/plantation types to be considered and their associated stand biomass, rates of growth for plantation, level of degradation and improvement. The retained tier-2 values are given in the annexes 3 and 4.

### 3.3 [Parameters used in the description](#)

For both RS and FBiH estimates, the following description was considered: The climate was set to “Cool Temperate”, with a moisture regime as “Moist”. The main soil type was set to “LAC soils”. In terms of duration the implementation phase were set to 5 years, and a capitalisation phase set to 20 years.

## 4. [EX-Ante Appraisal results](#)

Results are presented according to each administrative area appraised, in order to maximise the precision of the balance which used specific information for each administrative unit.

### 4.1 [Republika Srpska \(RS\) appraisal](#)

#### ***Afforestation and reforestation***

This activity concerns the subcomponent 2.1 of the project (see Table 4). Additional 386.4 ha will be planted in comparison with the baseline. This corresponds to forest plantation of the agroecological “*temperate continental forest*”. Specialist desired to use a tier2 value; they proposed to consider an aboveground growth rate of 10 m<sup>3</sup> of wood. This number were converted in t C per ha using an average wood density of 0.4 and the default IPCC carbon content for wood of 47%, as a result the number rate established to 1.88 t C per ha and per year, that is exactly the same value as the default growth rate proposed by EX-ACT. The other parameters (belowground biomass growth, etc) were thus set using the proposed default values. In addition the project implementation will result in the afforestation forest stands with improved seedlings which will replace traditional afforestation. As a result 25,000 ha of forest plantation will be implemented with an associated aboveground growth rate of 10 m<sup>3</sup>, in replacement (without project scenario) of 25,000 ha planted with a lower productivity (set to half of the value attainable with the improved seedlings). Both plantations will occur on set aside lands.

This activity corresponds to a total sink of 2.9 million tC (Figure 3).

2.2. Afforestation and Reforestation											
Available AFZ: 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.											
Type of vegetation that will be planted	Fire Use (y/n)	Previous land use	Area that will be afforested/reforested				Total Emissions (tCO <sub>2</sub> -Eq)		Balance		
			Without	*	With	*	Without	With			
Forest Zone 2	Improved Ref.	NO	Set Aside	0	D	386.4	D	Comp. 2.1 -Reforestation	0	-130 646	-130 646
Forest Zone 2	Improved Ref.	NO	Set Aside	0	D	25000	D	Comp. 2.1. Quality of seed	0	-8 452 767	-8 452 767
Plantation Zone 2	Normal Ref.	NO	Set Aside	25 000	D	0	D		-5 660 967	0	5 660 967
Select the vegetation		NO	Select previous use	0	D	0	D		0	0	0
Select the vegetation		NO	Select previous use	0	D	0	D		0	0	0
Select the vegetation		NO	Select previous use	0	D	0	D		0	0	0
* Note concerning dynamics of change : D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)											
Tier 2											
Total AffRe-forestation									-5 660 967	-8 583 413	-2 922 446

Figure 3. Screen copy of the module “afforestation and reforestation” for RS.

### Forest management and avoided forest degradation

The rehabilitation of the coppice (subcomponent 2.1 – (v), see table 4) will occur on 151 ha, while the rehabilitation with thinning (subcomponent 2.1 – (iii) and (iv), see table 4) will concern 835 ha. National statistics were used to determine the nominal aboveground biomass attainable by the forest vegetation in the “temperate continental forest”. As a result the nominal aboveground biomass was set to 69 t C /ha, and the belowground biomass were set proportionally to the default value. The degradation levels were also modified based on expert judgment of the participants (see Annex 3).

The implementation of appropriate small-scale fire management interventions will result in improving the overall the total forest area, e.g. 200,000 ha of Karst-area forest and 900,000 ha of temperate continental forest. The Karst-area forest biomass was set to 66% of the Tier 2 value set for the temperate continental forest (see above). It was estimated that annual fire events occurs in average in 4% of the Karst-area forest and 1% for the other areas. With the implementation of the project it is expected that those numbers will be reduced to respectively 3% and 0.5%. And as a result the degradation level will decrease drastically in the Karst-area forest, while it will remain the same (low level of degradation) in the other areas.

This activity corresponds to a total sink of about 5 million tC (Figure 4). Most of the sink is due to the small-scale fire management interventions in the Karst area.

5.1. Forest degradation and Management																	
Available AFZ: 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.																	
Type of vegetation that will be degraded	Degradation level of the vegetation			Fire occurrence and severity				Area (ha)				Total Emissions (tCO <sub>2</sub> -eq)		Balance			
	Initial state	At the end without project	with project	without (y/n)	Periodicity (year)	Impact (% burnt)	with (y/n)	Periodicity (year)	Impact (% burnt)	Start (ha)	Without (ha)	*	With (ha)		*	Without	With
Forest Zone 2	Large	Large	None	NO			NO			151	151	D	151	D	0	-58 038	-58 038
Forest Zone 2	Moderate	Moderate	None	NO			NO			835	835	D	835	D	0	-183 394	-183 394
Forest Zone 4	Moderate	Moderate	Low	YES	1	4%	YES	1	3%	200 000	200 000	D	200 000	D	0	-4 210 206	-4 210 206
Forest Zone 2	Low	Low	Low	YES	1	1%	YES	1	0.5%	900 000	900 000	D	900 000	D	1 265 569	632 785	-632 785
Select the vegetation	Select level	Select level	Select level	NO			NO			0	0	D	0	D	0	0	0
Select the vegetation	Select level	Select level	Select level	NO			NO			0	0	D	0	D	0	0	0
* Note concerning dynamics of change : D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)																	
Tier 2																	
a Comp. 2.1. Rehabilitation/Conversion of Coppice (v) b Comp. 2.1.Thinning (iii)+(iv) c Comp. 2.3 Improved fire management of Karst area in RS d Comp. 2.3 Improved fire management of "other areas" in RS																	
Total forest degradation															1 265 569	-3 818 853	-5 084 423

Figure 4. Screen copy of the module “forest degradation and Management” for RS.

### Construction of roads and fuel

The implementation of a strategic plan for effective fire management will result in the construction of few new roads and consumption of fuel by vehicles. But the Forest Road strategic plan will on the long terms conditioned the build of roads. Those roads would be indispensable for a proper forest management and the realization of the full commercial potential of the forest. It was estimated that this will affect one third of the forest areas in 40 years, converted into 1/6 in 20 years of the capitalization phase. To estimate the superficies of

new roads it was retained a road density of 7.5 km roads per 1000 ha and a mean road size of 4 m wide, i.e. a total road surface of 5.5 million m<sup>2</sup>.

Those activities correspond to a total GHG emission of about 1.8 million tC.

**SFLM project balance for RS**

The SFLM project appraisal for RS concerned in total more than 1.1 million ha and presented a positive impact, i.e. an overall decrease in the GHG emission of 6.2 M tCO<sub>2</sub>-eq with the project implementation compared to the business as usual baseline (Figure 5).

Component of the project	Gross fluxes		Balance
	Without	With	
<b>All GHG in tCO<sub>2</sub>eq</b>			
<b>Positive = source / negative = sink</b>			
<b>Land Use Changes</b>			
Deforestation	0	0	0
Afforestation	-5 660 967	-8 583 413	-2 922 446
Other	0	0	0
<b>Agriculture</b>			
Annual	0	0	0
Perennial	0	0	0
Rice	0	0	0
<b>Grassland &amp; Livestocks</b>			
Grassland	0	0	0
Livestock	0	0	0
<b>Degradation</b>	1 265	-3 818 853	-5 084 423
<b>Inputs &amp; Investments</b>	0	1 799 661	1 799 661
<b>Total</b>	<b>-4 395 397</b>	<b>-10 602 605</b>	<b>-6 207 208</b>
<b>Per hectare</b>	<b>-4</b>	<b>-9</b>	<b>-6</b>
<b>Per hectare per year</b>	<b>-0.2</b>	<b>-0.4</b>	<b>-0.2</b>

Figure 5. Screen copy of the gross emissions without and with the project, and net result of the implementation of the project.

The afforestation will results in an increasing sink, while the avoided degradation of the forest will shift from a net emission to a sink. The improvement of the infrastructure will result in a net sink, but largely oversized by the benefits of the project (Figure 6).

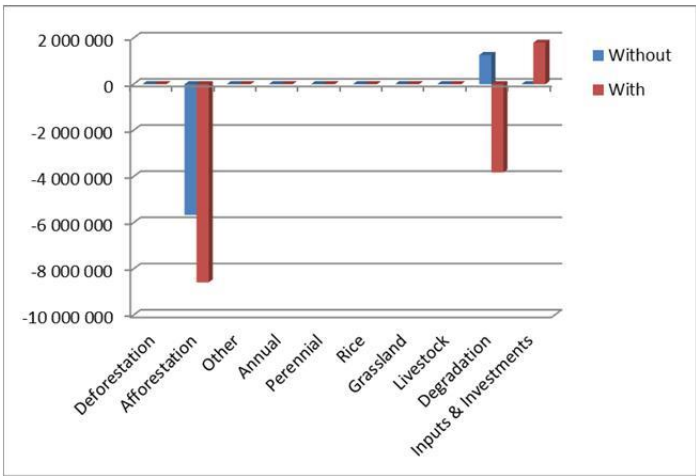


Figure 6. Graphical representation of the balance for RS.

## 4.2 Federation of Bosnia and Herzegovina (FBiH) appraisal

### Afforestation and reforestation

This activity concerns the subcomponent 2.1 of the project (see Table 4). Additional 521 ha will be planted in comparison with the baseline. This corresponds to forest plantation of the agroecological “temperate mountain forest”. Default values were considered adequate by participants.

In addition the project implementation will result in the afforestation forest stands with improved seedlings which will replace traditional afforestation. As a result 62,500 ha of forest plantation will be implemented, in replacement (without project scenario) of 62,500 ha planted with a lower productivity (set to 70% of the value attainable with the improved seedlings). Both plantations will occur on set aside lands.

This activity corresponds to a total sink of about 8.2 million tC (Figure 7).

2.2. Afforestation and Reforestation										
Available ALZ: 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.										
Type of vegetation that will be planted	Fire Use (y/n)	Previous land use		Area that will be afforested/reforested				Total Emissions (tCO <sub>2</sub> -Eq)		Balance
		Without	With	Without	With	Without	With			
Forest Zone 3	2.1 (i)	NO	Degraded Land	0	D 521	D	0	-234 272	-234 272	
Forest Zone 4	2.1 (iv)	NO	Degraded Land	62500	D 0	D	-20 150 350	0	20 150 350	
Forest Zone 3	2.1 (v)	NO	Degraded Land	0	D 62500	D	0	-28 103 625	-28 103 625	
Select the vegetation		NO	Select previous use	0	D 0	D	0	0	0	
Select the vegetation		NO	Select previous use	0	D 0	D	0	0	0	
Select the vegetation		NO	Select previous use	0	D 0	D	0	0	0	
* Note concerning dynamics of change : D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)										
Tier 2								Total AffRe-forestation		-20 150 350 -28 337 897 -8 187 547
F. zone 3 = Improved with seedlings F. zone 4 = not Improved										

Figure 7. Screen copy of the module “afforestation and reforestation” for FBiH.

### Forest management and avoided forest degradation

The rehabilitation of the coppice (subcomponent 2.1 – (v), see table 4) will occur on 801 ha, while the rehabilitation of coppice with thinning (subcomponent 2.1 – (iii) and (iv), see table 4) will concern 400 ha. The degradation levels were also modified based on expert judgment of the participants (see Annex 4).

The implementation of appropriate small-scale fire management interventions will result in improving the overall the total forest area, e.g. 280,000 ha of Karst -area forest and 960,000 ha of temperate continental forest. The Karst-area forest biomass was set to the equivalent of 70 m<sup>3</sup>. It was estimated that annual fire events occurs in average in 4.5% of the Karst-area forest and 1% for the other areas. With the implementation of the project it is expected that those numbers will be reduced to respectively 3.5% and 0.8%. And as a result the degradation level will decrease drastically in the Karst-area forest, while it will remain the same (low level of degradation) in the other areas.

This activity corresponds to a total sink of about 4.5 million tC (Figure 8). Most of the sink is due to the small-scale fire management interventions in the Karst area.

5.1. Forest degradation and Management														
Available ALZ: 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.														
Type of vegetation that will be degraded	Degradation level of the vegetation			Fire occurrence and severity				Area (ha)				Total Emissions (tCO <sub>2</sub> -eq)		Balance
	Initial state	At the end without project	with project	Periodicity (y/n)	Impact (year) (% burnt)	Periodicity (y/n)	Impact (year) (% burnt)	Start (t/ha)	Without (t/ha)	With (t/ha)	Without	With		
a Forest Zone 3	Moderate	Moderate	None	NO		NO		601	601	D 601	D	0	-152 099	-152 099
b Forest Zone 3	Moderate	Moderate	None	NO		NO		400	400	D 400	D	0	-101 231	-101 231
c Forest Zone 4	Moderate	Moderate	Low	YES	1 4.5%	YES	1 3.5%	280000	280 000	D 280 000	D	0	-4 049 145	-4 049 145
d Forest Zone 3	Low	Low	Low	YES	1 1.0%	YES	1 0.8%	960000	960 000	D 960 000	D	1 017 562	814 050	-203 512
Select the vegetation	Select level	Select level	Select level	NO		NO		0	0	D 0	D	0	0	0
Select the vegetation	Select level	Select level	Select level	NO		NO		0	0	D 0	D	0	0	0
* Note concerning dynamics of change : D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)														
Tier 2								Total forest degradation		1 017 562 -3 488 425 -4 505 988				
a Thinning b coppice to high level forest c karst forest d other forests														

Figure 8. Screen copy of the module “forest degradation and Management” for FBiH.

**Construction of roads and fuel**

The same calculation as in RS where considered for FBiH (see above) Those activities correspond to a total GHG emission of about 2.8 million tC.

**SFLM project balance for RS**

The SFLM project appraisal for RS concerned in total more than 1.1 million ha and presented a positive impact, i.e. an overall decrease in the GHG emission of 6.2 M tCO<sub>2</sub>-eq with the project implementation compared to the business as usual baseline (Figure 9).

Component of the project	Gross fluxes		Balance
	Without	With	
<b>All GHG in tCO<sub>2</sub>eq</b>			
<b>Positive = source / negative = sink</b>			
<b>Land Use Changes</b>			
Deforestation	0	0	0
Afforestation	-20 150 350	-28 337 897	-8 187 547
Other	0	0	0
<b>Agriculture</b>			
Annual	0	0	0
Perennial	0	0	0
Rice	0	0	0
<b>Grassland &amp; Livestocks</b>			
Grassland	0	0	0
Livestock	0	0	0
<b>Degradation</b>	1 017 562	-3 488 425	-4 505 988
<b>Inputs &amp; Investments</b>	0	2 881 580	2 881 580
<b>Total</b>	<b>-19 132 788</b>	<b>-28 944 742</b>	<b>-9 811 955</b>
<b>Per hectare</b>	<b>-15</b>	<b>-22</b>	<b>-8</b>
<b>Per hectare per year</b>	<b>-0.6</b>	<b>-0.9</b>	<b>-0.3</b>

Figure 9. Screen copy of the gross emissions without and with the project, and net result of the implementation of the project in FBiH

The afforestation will results in an increasing sink, while the avoided degradation of the forest will shift from a net emission to a sink. The improvement of the infrastructure will result in a net sink, but largely oversized by the benefits of the project (Figure 10).

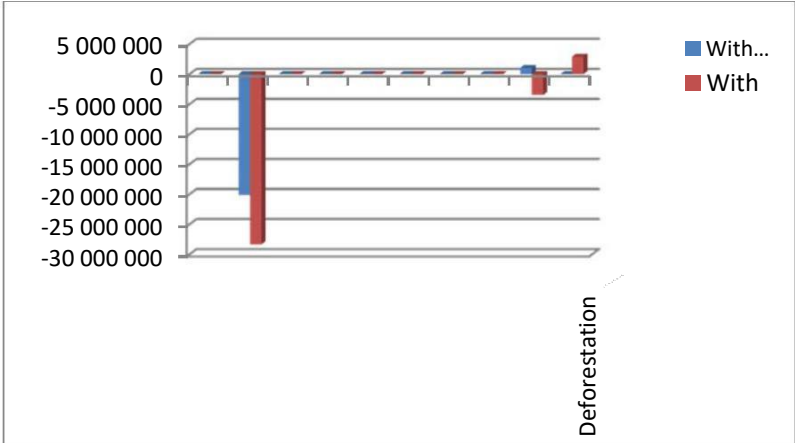


Figure 6. Graphical representation of the balance for RS.

### 4.3 [Consolidated results for SFLM project in Bosnia-Herzegovina](#)

This section presents the aggregated result at level of Bosnia-Herzegovina. The structures of the two appraisals followed the same methodology and approach, and results can be directly aggregated (Table 5).

Table 5. Aggregated results for Bosnia-Herzegovina

EX-ACT Modules	Gross fluxes (All GHG in tCO <sub>2</sub> eq)		Balance (tCO <sub>2</sub> eq)
	Without	With	
Afforestation	- 25,811,317	- 36,921,309	- 11,109, 993
Forest management and avoided degradation	2,283,132	- 7,307,279	- 9,590,411
Investments	0	4,681,241	4,681,241
<b>Total</b>	<b>-23,528,184</b>	<b>-39,547,346</b>	<b>-16,019,162</b>

The implementation of the SFLM project will result in a total sink of circa 16 MtCO<sub>2</sub>-eq for a total forest surface considered during the appraisal of 2,430,394 ha, i.e. a mean sink of 0.26 tCO<sub>2</sub>-eq per year and per ha.

### 4.4 [Economic performance](#)

While the above values provide the expected technical mitigation impact, it is at the same time important to associate also a rough monetary value with the in that way generated benefits. Based on a Social Cost of Carbon of 21 US\$ per ton (US Interagency working Group ) and discounted at 10% over the 20 years of the carbon balance appraisal, the net present value of the GHGs mitigation is estimated around US\$ 143 million.

On the opposite, using a low carbon market price average of 3 US\$/ TCo<sub>2</sub> between 2014 and 2034, the carbon balance represents an incremental Net Present Value of only 20.4 Mio USD.

### 4.5 [Incremental Natural Capital generated](#)

As a project that rehabilitates degraded forest, improves quality of planted forests and ensures fire protection of forestry areas (2.4 million ha of forest with improved fire protection), the SFLM project, beside GHG mitigation impact, reconstitutes the Forestry timber stock, improves watershed resilience to floods through increase biomass coverage, regulates water stream flow and contributes to biodiversity.

It thus produces a set of benefits that are clearly distinct from their climate change mitigation achievements and are closely related to the incremental existence of additional biomass and reactivation of the ecosystem. While most of the benefits are of public nature, environmental resources and non-degraded natural capital may also provide an important source for income and food security.

The project leads to an estimated increase in timber of roughly around 2.59 million t of dry matter due to the project (8.8 million tons of additional forestry biomass). Valuing timber at 87.72 USD per cubic meter and thus utilizing the average between the higher European and lower US-American timber price, the over 20 years created incremental timber stocks have a net present value of 97 mio USD.

## **5. Ways to improve results**

A pro-active discussion occurred on possible actions and options to be developed and integrated in forest management information systems for carbon monitoring purposes. The simple approach already implementable is to use EX-ACT options that allow incorporating Tier 2 coefficients. It is also possible to provide minor adaptations into EX-ACT in order to implement for instance national forest classification and their corresponding coefficients in a selectable list of Tier 2 forests. A third option that would need a higher time framework and need more important changes has also been identified: an approach based on three steps taking advantage of EX-ACT as accounting framework:

- (i) first to adapt/design a specific EXACT – built model integrating Bosnia tier 2 Forestry coefficients;
- (ii) secondly to design a periodic forest area mapping to upgrade periodically achievements of Forest Management Plans (data collection, GIS services);
- (iii) third to use the first two outputs to appraise Carbon Mitigation achievements and eventually claim for C payments

## 6. Annex 1. List of participants in Banja Luka

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## 8. Annex 3. Data used in EX-ACT modules (RS appraisal)

### Land Use change Module

2.2. Afforestation and Reforestation										
Available AEZ 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.										
Type of vegetation that will be planted	Fire Use (y/n)	Previous land use	Area that will be afforested/reforested				Total Emissions (tCO <sub>2</sub> -Eq)		Balance	
			Without	With	Without	With	Without	With		
Forest Zone 2	NO	Set Aside	0	386.4	0	0	0	-130 646	-130 646	
Forest Zone 2	NO	Set Aside	0	25000	0	0	0	-8 452 767	-8 452 767	
Plantation Zone 2	NO	Set Aside	25 000	0	0	0	-5 660 967	0	5 660 967	
Select the vegetation	NO	Select previous use	0	0	0	0	0	0	0	
Select the vegetation	NO	Select previous use	0	0	0	0	0	0	0	
Select the vegetation	NO	Select previous use	0	0	0	0	0	0	0	
* Note concerning dynamics of change : D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)										
<b>Tier 2</b>							<b>Total Aff/Re-forestation</b>	<b>-5 660 967</b>	<b>-8 583 413</b>	<b>-2 922 446</b>

2.2. Afforestation and Reforestation													
Available AEZ 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.													
You have indicated that you are using the following types of vegetation Forest Zone 2 Forest Zone 2 Plantation Zone 2													
Use this part only if you want to refine analysis with Tier 2 coefficients (default values are provided for your information only, while EX-ACT will use Tier 2 values automatically wherever specified)													
Type of vegetation (that will be planted)	Growth rates for systems up to 20 yr old				Growth rates for systems after 20-yr old				Litter	Dead wood	Soil C	Tier 2	
	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2					
Forest - Zone 1	1.08		0.48		1.08		0.48		21	0	85		
Forest - Zone 2	1.88	1.9	0.83	0.8	1.88	1.9	0.83	0.8	21	0	85		
Forest - Zone 3	1.41		0.62		1.41		0.62		21	0	85		
Plantation - Zone 1	2.07		0.91		2.07		0.91		21	0	85		
Plantation - Zone 2	1.88	0.9	0.83	0.4	1.88	0.9	0.83	0.4	21	0	85		
Plantation - Zone 3	1.41		0.62		1.41		0.62		21	0	85		
	0.00		0.00		0.00		0.00		0	0	0		

### Forest management module

5.1. Forest degradation															
Available AEZ 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.															
Type of vegetation that will be degraded	Degradation level of the vegetation			Fire occurrence and severity					Area (ha)			Total Emissions (tCO <sub>2</sub> -eq)		Balance	
	Initial state	At the end without project	with project	without (y/n)	Periodicity (year)	Impact (% burnt)	with (y/n)	Periodicity (year)	Impact (% burnt)	Start (t/ha)	Without (t/ha)	With (t/ha)	Without		With
a Forest Zone 2	Large	Large	None	NO			NO			151	151	D 151	D 0	-58 038	-58 038
b Forest Zone 2	Moderate	Moderate	None	NO			NO			835	835	D 835	D 0	-183 394	-183 394
c Forest Zone 4	Moderate	Moderate	Low	YES	1	4%	YES	1	3%	#####	200 000	D 200 000	D 0	-4 210 206	-4 210 206
d Forest Zone 2	Low	Low	Low	YES	1	1%	YES	1	0.5%	#####	900 000	D 900 000	D 1 265 569	632 785	-632 785
Select the vegetation	Select level	Select level	Select level	NO			NO			0	0	D 0	D 0	0	0
Select the vegetation	Select level	Select level	Select level	NO			NO			0	0	D 0	D 0	0	0
* Note concerning dynamics of change : D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)															
<b>Tier 2</b>												<b>Total forest degradation</b>	<b>1 265 569</b>	<b>-3 818 853</b>	<b>-5 084 423</b>

5.1. Forest degradation and management										
Available AEZ 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.										
Use this part only if you want to refine analysis with Tier 2 coefficients (default values are provided for your information only, while EX-ACT will use Tier 2 values automatically wherever specified)										
Type of vegetation (that will be degraded)	Above-ground		Below-ground		Litter		Dead wood		Soil C	
	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2
Forest - Zone 1	56.4		14.1		21.00		0.0		85.0	
Forest - Zone 2	56.4	69.0	14.1	17.3	21.00	21.0	0.0		85.0	
Forest - Zone 3	61.1		13.4		21.00		0.0		85.0	
Kaf	0.0	46.5	0.0	11.6	0.00	14.2	0.0		0.0	85.0
Plantation - Zone 1	75.2		16.5		21.00		0.0		85.0	
Plantation - Zone 2	47.0		11.8		21.00		0.0		85.0	
Plantation - Zone 3	47.0		11.8		21.00		0.0		85.0	
	0.0		0.0		0.00		0.0		0.0	

Kaf = Karst area forest

## Inputs module

6.2 Energy consumption (electricity, fuel,...)							
Description and unit to report	Quantity consumed per year				Total Emissions (tCO <sub>2</sub> -eq)	Balance	
	Start	Without	With	*			
<b>Electricity (MWh per year)</b>					Without	With	
Please select the country of origin	0	0	D	0	0	0	
<b>Liquide or gaseous (in m<sup>3</sup> per year)</b>							
Gasoil/Diesel	0	0	D	16	0	948	
Gasoline	0	0	D	0	0	0	
Gas (LPG natural)	0	0	D	0	0	0	
Butane	0	0	D	0	0	0	
Propane	0	0	D	0	0	0	
Ethanol	0	0	D	0	0	0	
User defined (Tier 2):	0	0	D	0	0	0	
<b>Solid (in tonnes of dry matter per year)</b>							
Wood	0	0	D	0	0	0	
Peat	0	0	D	0	0	0	
* Note concerning dynamics of change: D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)							
Tier 2					Total from energy	0	948

6.3 Construction of new infrastructure for the project (irrigation systems, buildings, roads)							
Description and unit to report	Surface concerned			Total Emissions (tCO <sub>2</sub> -eq)		Balance	
	Without	With		Without	With		
<b>Irrigation systems (total in ha)</b>							
Solid set sprinkle	0	0		0.0	0.0	0.0	
Please select	0	0		0.0	0.0	0.0	
<b>Buildings and roads (total in m<sup>2</sup>)</b>							
Road for medium trafic (concrete)	0	6 300 000	Component 1.2 indirect long term (1/3 #of the area in 40 yr)/2 for 20yr	0.0	2 009 700.0	2 009 700.0	
Road for medium trafic (concrete)	0	138 600	Component 2.3 Fire management = Fire fighting roads	0.0	44 213.4	44 213.4	
Please select	0	0		0.0	0.0	0.0	
Please select	0	0		0.0	0.0	0.0	
Please select	0	0		0.0	0.0	0.0	
Please select	0	0		0.0	0.0	0.0	
Please select	0	0		0.0	0.0	0.0	
Tier 2					Total from construction	0	2 053 913

## 9. Annex 4. Data used in EX-ACT modules (FBIH appraisal)

### Land Use change Module

2.2. Afforestation and Reforestation											
Available AEZ 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.											
Type of vegetation that will be planted	Fire Use (y/n)	Previous land use	Area that will be afforested/reforested				Total Emissions (tCO <sub>2</sub> -Eq)		Balance		
			Without	*	With	*	Without	With			
Forest Zone 3	2.1 (i)	NO	Degraded Land	0	D	521	D	0	-234 272	-234 272	
Forest Zone 4	2.1 (vi)	NO	Degraded Land	62500	D	0	D	-20 150 350	0	20 150 350	
Forest Zone 3	2.1 (vi)	NO	Degraded Land	0	D	62500	D	0	-28 103 625	-28 103 625	
Select the vegetation	NO	Select previous use		0	D	0	D	0	0	0	
Select the vegetation	NO	Select previous use		0	D	0	D	0	0	0	
Select the vegetation	NO	Select previous use		0	D	0	D	0	0	0	
* Note concerning dynamics of change : D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)											
<b>Tier 2</b> F. zone 3 = Improved with seedlings F. zone 4 = not Improved										<b>Total Aff/Re-forestation</b> -20 150 350 -28 337 897 -8 187 547	

Use this part only if you want to refine analysis with Tier 2 coefficients (default values are provided for your information only, while EX-ACT will use Tier 2 values automatically wherever specified)

All values are in t of carbon per ha (tC/ha)

Type of vegetation (that will be planted)	Growth rates for systems up to 20-yr old		Growth rates for systems after 20-yr old		Litter	Dead wood	Soil C	Tier 2				
	Above-ground	Below-ground	Above-ground	Below-ground								
	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2				
Forest - Zone 1	1.08		0.48		1.08		0.48		21	0	85	
Forest - Zone 2	1.88		0.83		1.88		0.83		21	0	85	
<b>Forest - Zone 3</b>	<b>1.41</b>	<b>1.0</b>	<b>0.62</b>	<b>0.4</b>	<b>1.41</b>	<b>1.0</b>	<b>0.62</b>	<b>0.0</b>	<b>21</b>	<b>0</b>	<b>85</b>	<b>85.0</b>
Plantation - Zone 1	2.07		0.91		2.07		0.91		21	0	85	
Plantation - Zone 2	1.88		0.83		1.88		0.83		21	0	85	
Plantation - Zone 3	1.41		0.62		1.41		0.62		21	0	85	
	0.00		0.00		0.00		0.00		0	0	0	

F. zone 3 = Improved with seedlings  
F. zone 4 = not Improved

### Forest management module

5.1. Forest degradation and Management													
Available AEZ 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.													
Type of vegetation that will be degraded	Degradation level of the vegetation			Fire occurrence and severity				Area (ha)		Total Emissions (tCO <sub>2</sub> -eq)		Balance	
	Initial state	At the end		Periodicity	Impact	Periodicity	Impact	Start	Without	With	Without		With
a Forest Zone 3	Moderate	Moderate	None	NO		NO		601	601	D	0	-152 099	-152 099
b Forest Zone 3	Moderate	Moderate	None	NO		NO		400	400	D	0	-101 231	-101 231
c Forest Zone 4	Moderate	Moderate	Low	YES	1 4.5%	YES	1 3.5%	280000	280 000	D	0	-4 049 145	-4 049 145
d Forest Zone 3	Low	Low	Low	YES	1 1.0%	YES	1 0.8%	960000	960 000	D	1 017 562	814 050	-203 512
Select the vegetation	Select level	Select level	Select level	NO		NO		0	0	D	0	0	0
Select the vegetation	Select level	Select level	Select level	NO		NO		0	0	D	0	0	0
* Note concerning dynamics of change : D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)													
<b>Tier 2</b> a Thinning b coppice to high level forest c karst forest d other forests										<b>Total forest degradation</b> 1 017 562 -3 488 425 -4 505 988			

5.1. Forest degradation and Management											
Available AEZ 1.Temperate oceanic forest - 2.Temperate continental forest - 3.Temperate mountains systems - 4.											
Type of vegetation (that will be degraded)	Above-ground		Below-ground		Litter		Dead wood		Soil C		
	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2	Default	Tier 2	
Forest - Zone 1	56.4		14.1		21.00		0.0		85.0		
Forest - Zone 2	56.4		14.1		21.00		0.0		85.0		
<b>Forest - Zone 3</b>	<b>61.1</b>	<b>23.3</b>	<b>13.4</b>	<b>5.1</b>	<b>21.00</b>	<b>8.0</b>	<b>0.0</b>		<b>85.0</b>	<b>85.0</b>	
Karst	0.0		0.0		0.00		0.0		0.0		
Plantation - Zone 1	75.2		16.5		21.00		0.0		85.0		
Plantation - Zone 2	47.0		11.8		21.00		0.0		85.0		
Plantation - Zone 3	47.0		11.8		21.00		0.0		85.0		
	0.0		0.0		0.00		0.0		0.0		

Use this part only if you want to refine analysis with Tier 2 coefficients (default values are provided for your information only, while EX-ACT will use Tier 2 values automatically wherever specified)

Degradation level (% of biomass lost)

	Default	Tier 2
None	0	
Very low	10	
Low	20	45
Moderate	40	50
Large	60	
Extrem	80	

Before thinning and Coppice level of degr

## Inputs module

### 6.2 Energy consumption (electricity, fuel,...)

Description and unit to report	Quantity consumed per year					Total Emissions (CO <sub>2</sub> -eq)		Balance
	Start	Without	With	*	*	Without	With	
<b>Electricity (MWh per year)</b>								
Please select the country of origin	0	0	D	0	D	0	0	0
<b>Liquide or gaseous (in m<sup>3</sup> per year)</b>								
Gasoil/Diesel	0	0	D	0	D	0	0	0
Gasoline	0	0	D	0	D	0	0	0
Gas (LPG/ natural)	0	0	D	0	D	0	0	0
Butane	0	0	D	0	D	0	0	0
Propane	0	0	D	0	D	0	0	0
Ethanol	0	0	D	0	D	0	0	0
User defined (Tier 2):	0	0	D	0	D	0	0	0
<b>Solid (in tonnes of dry matter per year)</b>								
Wood	0	0	D	0	D	0	0	0
Peat	0	0	D	0	D	0	0	0

\* Note concerning dynamics of change : D correspond to "Default", "I" to Immediate and "E" to Exponential (Please refer to the Guidelines)

**Tier 2**

Total from energy: 0 0 0

### 6.3 Construction of new infrastructure for the project (irrigation systems, buildings, roads)

Description and unit to report	Surface concerned			Total Emissions (CO <sub>2</sub> -eq)		Balance
	Without	With		Without	With	
<b>Irrigation systems (total in ha)</b>						
Solid set sprinkle	0	0		0.0	0.0	0.0
Please select	0	0		0.0	0.0	0.0
<b>Buildings and roads (total in m<sup>2</sup>)</b>						
Road for medium trafic (concrete)	0	9010667	Component 1.2 indirect long term (1/3 #of the area in 40 yr)/2 for 20yr	0.0	2 874 402.7	2 874 402.7
Road for medium trafic (concrete)	0	22500	Component 2.3 Fire management = Fire fighting roads	0.0	7 177.5	7 177.5
Please select	0	0		0.0	0.0	0.0
Please select	0	0		0.0	0.0	0.0
Please select	0	0		0.0	0.0	0.0
Please select	0	0		0.0	0.0	0.0
Please select	0	0		0.0	0.0	0.0

**Tier 2**

Total from construction: 0 2 881 580 2 881 580