

ANNEX 3

GUIDELINES COMPONENT 4



**PROPOSED METHODOLOGY FOR ANALYSING AGENTS AND
DRIVERS OF DEFORESTATION IN PILOT SITES**

**COMPONENT 4 OF FFEM PROJECT
“OPTIMIZING THE PRODUCTION OF GOODS AND SERVICES BY
MEDITERRANEAN WOODLAND ECOSYSTEMS IN THE CONTEXT OF
GLOBAL CHANGES»**



OBJECTIVES OF COMPONENT 4

Financed by the French Global Environment Facility (FFEM), the component 4 of the project “Optimizing the production of goods and services by Mediterranean woodland ecosystems in the context of global changes” aims to enhance environmental services provided by Mediterranean forest ecosystems through innovative financing mechanisms. The component focuses particularly on the Mediterranean forest importance for climate change mitigation under REDD+ (Reducing emissions from deforestation and forest degradation, including conservation, sustainable forest management and enhancement of forest carbon stocks).

The planned steps for implementing the component 4 are as follows:

- Analysis of deforestation and degradation agents and drivers in Mediterranean forest ecosystems;
- Development or adjustment of a methodology at a project scale (such as VCS¹-Verified Carbon Standard methodologies) in order to promote the mitigation potential of Mediterranean forests. It will include methodological proposals adapted to the Mediterranean context in order to elaborate reference scenarios and monitor emissions and removals;
- Development of project notes, including proposals for “widened REDD+” activities² designed to promote environmental services provided by forest ecosystems (especially CO₂ emissions reductions and removals enhancements). Those project notes will also include a first approximation of CO₂ emissions reductions and/or removals enhancements (according to the methodology developed during the previous step) which could be obtained through the implementation of the proposed “widened REDD+” activities;
- Promotion of the developed methodology, the selected projects and the role of Mediterranean forests targeting forest carbon certification standards (VCS especially) and international negotiating authorities (in particular the UNFCCC).

This component is closely linked to the other components of the FFEM project. It will seek to:

- Coordinate data collection efforts with the component 1 as many data needed in components 1 and 4 are the same. Consequently, guidelines for component 1 and 4 have been developed in close collaboration ;

¹ VCS is a certification program for voluntary greenhouse gases emissions reduction projects. Currently, it is the most frequently used standard at an international level and more specifically for the AFOLU sector (Agriculture, Forestry and other Land Use), which includes REDD+.

² We are talking about « widened REDD+ activities » in order to take into account the enhancement of other forest ecosystem services (the FFEM project seeks to promote the mitigation potential of Mediterranean forests as well as other environmental services, which will be characterized under component 2) and the mitigation potential related to agriculture and pastures land management (sometimes known as REDD++, according to a submission by Eastern African countries in 2009, in preparation for the Copenhagen Conference Of the Parties).

- Whenever possible, take into account the estimated effect of climate change (component 1) on forest cover (direct effect) or on other deforestation and degradation drivers (indirect effect) in the preliminary reference scenario of REDD+ projects. This consideration could enable to valorize the carbon potential of the foreseeable measures implemented to reduce forest ecosystem vulnerability to climate change ;
- Include in the formulation of “widened REDD+” activities recommendations concerning the improvement of forest ecosystem adaptation to climate change (which will be identified in component 1);
- Promote the other environmental services identified in component 2 during the scoping step of the methodology aiming at enhancing the Mediterranean forests mitigation potential and during the design of “widened REDD+” activities;
- Valorize the results of component 3 regarding participatory approaches, which could be used to determine “widened REDD+” activities.

1. OBJECTIVES OF ANALIZING DEFORESTATION AND DEGRADATION AGENTS AND DRIVERS

The deforestation and degradation agents and drivers analysis (first step of the implementation of component 4) has the following purposes:

- Collect information on pressures affecting Mediterranean forests, so that the methodology which will be proposed to promote the mitigation potential of these forests can take into account this diversity of situations. The development of the methodology for analysing drivers of deforestation and degradation is based on a first review of the pressures identified in the 13 pilot sites which were presented during the first steering committee of the FFEM project ;
- Identify the most suitable projects for REDD+ implementation and for the complete implementation of the component 4 (especially in the case of Tunisia who presented two pilot sites for the analysis of agents and drivers of deforestation) ;
- Feed the section “causes” of the project notes (which will be a summary of the analysis completed during this first phase);
- Help the formulation of “widened REDD+” activities which will have to deal appropriately with pressures on forest ecosystems.

2. SELECTED PILOT SITES

As agreed during the second steering committee held in early June in Beirut, pilot sites concerned by the analysis of agents and drivers of deforestation and degradation are:

- Djelfa in Algeria
- Maamora in Morocco
- Barbara and Siliana in Tunisia
- Duzlerçami in Turkey

Djabal Moussa pilot site in Lebanon will not be subject to a formal analysis of agents and drivers of deforestation since component 4 in Lebanon will focus instead on the carbon finance dimension of the national reforestation programme. However, the data collected by other components on the Djabal Moussa site will also feed the methodology which will be developed in order to promote the Mediterranean forests mitigation potential.

3. THEORETICAL FRAMEWORK FOR THE ANALYSIS OF AGENTS AND DRIVERS OF DEFORESTATION AND DEGRADATION

The causes assessment conducted here deals with deforestation (meaning the transition from forest to non-forest, according to the forest definition registered by the country under the UNFCCC or if it doesn't exist, according to the FAO definition), and also degradation (in the REDD+ sense of the term, meaning that the vegetation remains forest but forest carbon stocks and associated environmental services are decreasing).

A large scientific literature exists about drivers of deforestation and degradation. In the case of this study, we have chosen to base the analysis on the best-known theoretical framework under REDD+ (meaning mentioned by REDD+ methodologies validated by the VCS standard and by the Readiness Preparation Proposals presented by countries under the FCPF – Forest Carbon Partnership Facility³ and the UN-REDD – United Nations collaborative initiative on REDD in developing countries⁴). Those theoretical frameworks (Geist and Lambin, 2001⁵; Angelsen and Kaimowitz, 1999⁶) distinguish:

³ The Forest Carbon Partnership is a facility created in 2008 and managed by the World Bank, in order to support REDD+ implementation at national level. It includes a readiness fund which is financing Readiness preparation proposals (RPP) and a carbon fund which is financing verified emissions reductions (performance-based payments). For more details: <http://www.forestcarbonpartnership.org/>

⁴ The United Nations collaborative initiative on REDD in developing countries is a joint program of three UN agencies (FAO, UNDP, UNEP) which seeks to support national REDD+ strategies and promote the informed and significant participation of all stakeholders, including local communities and indigenous people. For more details: <http://www.un-redd.org/>

⁵ H.J. Geist, E.F. Lambin, *What drives tropical deforestation? A meta-analysis of proximate and underlying causes of deforestation based on subnational case study evidence*. LUCR Report Series No.4, 2011. Available at: http://www.pik-potsdam.de/members/cramer/teaching/0607/Geist_2001_LUCC_Report.pdf

⁶ A. Angelsen, D. Kaimowitz, *Rethinking the Causes of Deforestation: Lessons from Economic Models*. The World Bank Research Observer, vol. 14, no 1, February 1999, pp73-98. Available at: <http://www.infoiarna.org.gt/media/file/areas/economia/documentos/artic/2-rethinking%20causes%20of%20deforestation.pdf>

- Deforestation and degradation agents, who are individuals, households, firms or institutions affecting forest cover both in surface (deforestation) and structure (degradation);
- Direct causes of deforestation and degradation, meaning the activities which affect directly forest cover. They can be grouped into three categories: expansion of agro-pastoral activities, wood extraction, and expansion of infrastructures (Geist and Lambin, 2001). Direct causes occur generally at a local scale;

Indirect causes of deforestation and degradation, referring to the underlying drivers of deforestation which will influence the occurrence and intensity of direct causes. Among those underlying causes, we can mention social, political and institutional, economic, technologic and cultural causes (Geist and Lambin, 2001). Those drivers occur at a local scale but also at a national and even international scale.

Deforestation and degradation generally result from a combination of direct and indirect causes operating simultaneously at different geographic and temporal scale and influencing retroactively each other.

4. APPLICATION OF THIS THEORETICAL FRAMEWORK IN THE PROJECT CONTEXT

On the basis of a review of the 13 potential pilot sites presentations made during the first steering committee of the FFEM project and presentations realised by countries during the Solsona workshop for component 1, main direct causes of deforestation and degradation in the Mediterranean region have been identified. Those direct causes have been classified into the three groups of causes identified by Geist and Lambin, 2001.

As the pilot sites presentations underlined the importance of fires and progressive deterioration of trees (under the influence of parasite attacks or climate events) as an important cause of deforestation and degradation of forest ecosystem in the region, those drivers are also included in the section “other direct causes”.

Direct pressures on forest cover	Pilot sites of FFEM project (in bold those concerned by component 4)	Carbon impact on forest cover
Agro-pastoral expansion		
Overgrazing (by local or transhumant herds)	Djelfa in Algeria Barbara and Siliana in Tunisia Jabal Moussa in Lebanon Maamora in Morocco Düzlerçami in Turkey	DEGRADATION through : -Grazing of sprouts and acorn consumption (in the case of oaks forests), which limit the natural regeneration and lead to a progressive aging of forest; -In certain cases, removing branches and the top of the trees in order to feed herds; -Soil compaction and decrease of soil's water reserve, which limit natural regeneration and trees growth.
Subsistence or commercial agriculture (cereals, vegetables, arboriculture, fodder...)	Chréa in Algeria Jabal Moussa in Lebanon Maamora in Morocco	DEFORESTATION through the expansion of agricultural activities in forest areas
Wood extraction		
Firewood and/or charcoal (heating, hammam and cooking for a domestic or a commercial purpose)	Chréa and Djelfa in Algeria Barbara et Siliana in Tunisia Jabal Moussa in Lebanon Maamora in Morocco Düzlerçami in Turkey	DEGRADATION , through the extraction of forest biomass
Extraction of non-timber forest products	Chréa in Algeria Jabal Moussa in Lebanon Maamora in Morocco	The unsustainable extraction of non-timber forest products can lead in some cases to a DEGRADATION by limiting natural regeneration (collection of acorns from cork oaks or argan tree fruits for instance)
Logging (legal or not, sustainable or not, for a domestic or a commercial purpose)	Djelfa in Algeria Maamora in Morocco	DEGRADATION , through : -the extraction of forest biomass -and shrubs removing (for example to promote cork oaks regeneration).
Expansion of infrastructure		
Urbanisation (legal or illegal)	Chréa in Algeria Jabal Moussa in Lebanon Maamora in Morocco Düzlerçami in Turkey	DEFORESTATION (direct impact through construction) and potentially DEGRADATION (indirect impact through the increase of fragmentation (which can raise forest cover vulnerability), risks of forest fires and encroachments by population)
Tourism / recreation	Chréa et Djelfa in Algeria Maamora in Morocco Düzlerçami in Turkey	DEGRADATION (through trampling of sprouts, soil compaction and increase of forest fire risks)

Quarry (and other potential mining exploitations)	Jabal Moussa in Lebanon Düzlerçami in Turkey	DEFORESTATION (direct impact through exploitation)
Infrastructures (roads and industries)	Jabal Moussa in Lebanon Maamora in Morocco	DEFORESTATION (direct impact through construction) and potentially DEGRADATION (through environmental contamination generated by industries for instance)
Other direct causes		
Increase of temperature and decrease of precipitations + increase of the frequency of extreme climate events	Chréa and Djelfa in Algeria Barbara and Siliana in Tunisia Maamora in Morocco	DEGRADATION through the progressive deterioration of trees, slowdown in growth, decrease in natural regeneration and potentially through the increase of human pressure on forest to offset a possible loss of revenue due to climate change (drop of livestock and agricultural productivity for instance)
Forest fires	Chréa and Djelfa in Algeria Barbara and Siliana in Tunisia Jabal Moussa in Lebanon Düzlerçami in Turkey	DEGRADATION of certain types of ecosystems
Parasite attacks	Chréa and Djelfa in Algeria Jabal Moussa in Lebanon Maamora in Morocco	DEGRADATION (progressive deterioration of trees and reduction of forest growth)

Direct causes analysis will look for characterizing all identified causes, describing and ranking them and if possible trying to quantify their impact.

Even if the agents and drivers analysis focuses on deforestation and degradation, it is also anticipating next steps of component 4, through:

- Collecting information on existing forest management practices and on potential reforestation activities in order to specify the REDD+ activities potential (beyond simple deforestation and degradation, meaning taking into account conservation, sustainable forest management and enhancement of forest carbon stocks);
- Collecting information on existing management practices of pastoral and agricultural lands, in order to be able to assess (in the future) the emissions reduction/removals enhancement potential through sustainable management of pastoral and agricultural lands;
- Ensuring a sufficient level of information on agents and drivers to comply with the requirements of the AFOLU (Agriculture, Forestry and Land Use) VCS methodologies;
- Working to identify from now which widened REDD+ activities could be implemented to optimize environmental goods and services production, while reducing emissions and enhancing CO₂ removals, in order to be able to identify in the future which activities have the greater carbon potential and should receive particular attention while developing the methodology for promoting climate change mitigation potential of Mediterranean forests.

Based on existing theoretical frameworks and on those specific objectives, a detailed list of information to be collected and analysed for the study of deforestation agents and drivers has been developed. This list is presented the present document (chapter 6). Part of requested information requested for this analysis is identical to the one requested for component 1; therefore it will require a coordination effort in data collection between those two components.

5. WORK PROGRAM

The analysis of agents and drivers of deforestation is planned for July-December 2013.

The scheduled activities are as follows:

- **Development of the methodology to analyze agents and drivers of deforestation (July 2013).** A review of the draft methodology by thematic referents is also expected during this period, in order to check that every possible direct cause is taken into account, that the information list presented in chapter 6 is adapted to the projects context and will be understandable by national experts responsible for data collection. Thematic referents should also assess at first sight which information is missing and will have to be collected on the field.
- **Contracting with partner countries (August 2013) through a joint LoA with component 1,** including especially the time spent by national experts (having a good knowledge of pilot sites) and the collection of additional field data.

- **Phase 1: data collection (September-October 2013).** The information requested in chapter 6 could be collected through a review of existing literature (including non-scientific literature), discussions with local experts and whenever possible field surveys with local populations. Given the limited time available for the study, it is however important to keep in mind that it will not be possible to gather all the missing information through field surveys and in certain cases it will be necessary to look for national default data. During this phase, a mission of support by the team in charge of component 4 will be carried out in every country (Algeria, Morocco, Tunisia and Turkey).
- **Mid-term workshop held in Rabat (end of October or early November 2013).** During this workshop, every country will present a first analysis of agents and drivers of deforestation and degradation in its pilot sites and we will discuss the format of the expected final products for the driver analysis. Next steps linked to component 4 will also be broached for 2014 and 2015.
- **Phase 2: Report on agents and drivers of deforestation (November and early December 2013).** An analytical report of the drivers will be prepared by each country (according to the format discussed during the mid-term workshop held in Rabat). An online support from the team in charge of component 4 will also be provided during this phase.
- **Results presentation during the next steering committee (December 2013).**

6. INFORMATION TO BE COLLECTED FOR THE ANALYSIS OF AGENTS AND DRIVERS OF DEFORESTATION AND DEGRADATION IN THE PILOT SITES

This chapter describes the necessary information to characterize successively the agents and the direct and underlying causes of deforestation and forest degradation in pilot sites of the FFEM project “Optimizing the production of goods and services by Mediterranean woodland ecosystems in the context of global changes”.

For all information requested, please specify:

- The data source
- The date
- The methodology that enabled to generate the information (in the original report or for this specific study)
- A quick qualitative assessment of data quality

Please also gather the different original reports in a file which could be shared with the team working on component 4.

6.1. Location of the pilot site in its environment

Please include here the following maps in digital format (vector):

Maps used for C1/C4:

- **Pilot site boundaries.** The pilot site will include **forest ecosystems**, which will for example be subject to an analysis of vulnerability to climate change under component 1 and an analysis of agents and drivers of deforestation and degradation under component 4, **but also non forested areas** (agricultural or urban lands) where the forest users live and where alternative activities could be proposed under component 4 to reduce the pressures on forest ecosystems (improving grazing or cropping practices for instance) or to improve forest carbon stocks (reforestation for instance) (Figure 1).

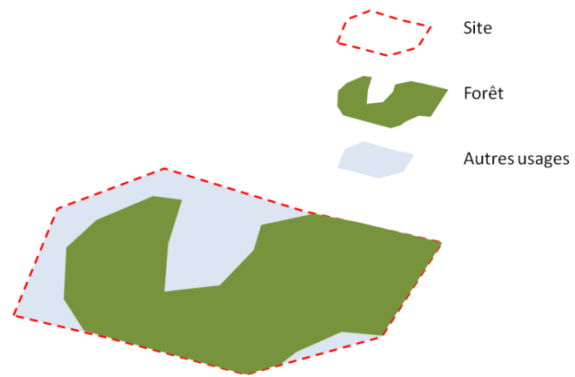


Figure 1. Example of territories delimitations within a pilot site

- **Administrative categories** (administrative limits and human implantations: cities, villages, ...)

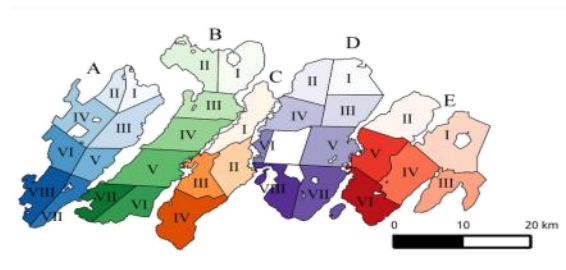


Figure 2 : Example of administrative limits in the case of Maamora pilot site (administrative district)

- **Land management systems** (forest management units, protected areas...)

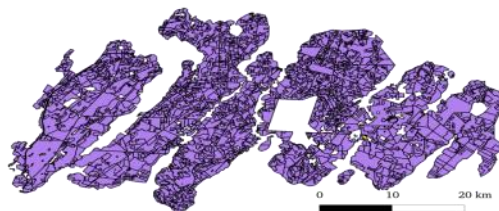


Figure 3: Example of land management systems' limits, in Maamora site (forest management unit, including for example series, plots, elements...).

- Existing **biophysical data**:
 - Altitude map
 - Slope map
 - Soil map
 - Hydrographic network map

Specific data for component 4:

- Map of **land tenure** (ownership types)
- Map of **land use rights** applying on the territory (areas dedicated to timber exploitation, fuelwood, grazing, agricultural areas...). If there is no official map, those maps can also be drawn according to expert opinions.

6.2. Land use changes

One of the main information to consider when analysing direct causes of deforestation and forest degradation is the historic **evolution of forest ecosystems and alternative land uses**. Indeed, it can enable to quantify the responsibility of each direct cause by identifying spatially the percentage of changes caused by each activity.

Do any land use maps covering the boundaries of the pilot site exist? This section focuses on maps that characterize not only forest cover (and the different forest types) but also permit to distinguish the alternative land uses. Therefore, it is interesting here to gather all the maps that have been created at project scale, as well as other scales (while encompassing the pilot sites of the FFEM project).

Under component 1, new maps of forest cover change, land use change and distribution of the main tree species will be generated. On the contrary, the objective here is to produce an inventory of the already existing maps for the pilot site.

Please list here the already existing maps:

Name and institutions	Covered dates (for multi-temporal maps)	Scale	Characterized land uses	Data source (type of sensors for satellite imagery, etc.)	Used methodology	Available format
...						

After extracting the data specific to the pilot site (“cutting” the local, regional and national maps according to the pilot site boundaries), please indicate for each map and for each date the area (in hectare) of the existing land uses. Different results can exist for a same use and a same date (depending on the data source), in this case please show the different results while indicating which data source is more reliable and why.

Area (in ha) of land uses (including the different types of forest and alternative land uses)	Date 1 :	Date 2 :	Date 3 :	Date 4 :	Date 5 :	... (add dates by chronological order)
Land use 1 :						
Land use 2:						
Land use 3:						
Land use 4:						
Land use 5:						
...						

NB : please consider only dates after 1990.

It is important to keep in mind those data because they should theoretically be consistent with the rest of the analysis (if it is not the case, it is necessary to try to understand why).

6.3. Agents of deforestation and degradation

6.3.1. Identification of deforestation and degradation agent groups

An agent group of deforestation and degradation is a group of actors (households, firms, public authorities...) who develop the same socio-economic activities affecting the forest cover. Those actors can be present in the pilot site or not. For instance, agents can be local breeders (i.e. breeders located within the pilot site boundaries and developing livestock activities and collecting firewood or lumber for a domestic use), or nomad breeders (i.e. breeders who do not live in the area of direct influence of the pilot site but whose herds have a transhumance route which goes through the pilot site boundaries), agro-pastoralists (who will carry out both agricultural and pastoral activities), forest holders (who will follow a forest management plan and could be public or private), charcoal makers (who will only focus on charcoal production for a commercial purpose), tourists, mining operators (public or private), etc. It is necessary to identify the different agent groups. In order to do so, we identified the potential socio-economic activities which can affect forest cover within the pilot site boundaries. For some activities we made a distinction between either domestic or commercial use, as it could be helpful to differentiate the different types of agents (for instance, to differentiate farmers who develop subsistence agricultural activities from farmers who develop commercial agricultural activities, each responding to different underlying causes and will have different impact on forest). Each agent group implements a combination of activities, and in the following table, it is necessary to put a cross in front of all the activities undertaken by an agent.

Undertaken activities (direct causes of deforestation and degradation)	Agent group 1:	Agent group 2:	Agent group 3:	Agent group 4:	Agent group 5:	Agent group 6:	...
Sedentary livestock							
Transhumant livestock							
Subsistence agriculture							
Commercial agriculture							
Subsistence fuelwood collection							
Commercial fuelwood collection							
Subsistence charcoal production							

Commercial charcoal production							
Subsistence lumber collection							
Commercial lumber collection							
Subsistence collection of non-timber forest products*							
Commercial collection of non-timber forest products*							
Urbanisation							
Tourism (trampling)							
Mining (including quarry)							
Industrial infrastructures							
Road infrastructures							
Forest fires							
...							

**NB : Only collection of non-timber forest products having an impact on the surface or the structure of forests is considered here, i.e. which can likely generate degradation or deforestation if those collections are not sustainable (for example collection of acorns or fruits of the argan tree preventing the regeneration of oaks or argan trees)*

For each agent group, we look for characterizing its socio-economic evolution (the characterization of undertaken activities is broached with the direct causes of deforestation).

6.3.2. Socio-economic characteristics of global population

GLOBAL POPULATION	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Number of families living in the pilot site	<i>Distinguish between sedentary and nomad families</i>
Average size of the families living in the pilot site	
Number of families affecting forest ecosystems within the pilot site <i>(this number can be superior to the previous number, since it can include people who do not live near the pilot site but affect the ecosystem periodically such as tourists, nomad breeders, etc.)</i>	<i>Please specify how this value was obtained and who are the additional groups who are taken into account here (i.e. groups who are not living within the boundaries of the pilot site)</i>
Evolution over time of the number of inhabitants living within the pilot site boundaries	<i>Existing data since 2000 and projected up to 10 years Explain the evolution reasons for each period (population growth – indicate growth rates; migrations –indicate origin and reasons, etc.)</i>
Evolution over time of the number of inhabitants affecting the ecosystem of the pilot site	<i>Existing data since 2000 and projected up to 10 years Explain the evolution reasons for each period (population growth – indicate growth rates; migrations –indicate origin and reasons, etc.)</i>
Main socio-economic and cultural characteristics of the population living within the pilot site <i>(belonging to particular social or religious groups, principal source of revenue, etc.)</i>	

6.3.3. Socio-economic characteristics of the different agent groups

For agent groups who are households, please fill out the table below:

AGENT GROUP 1:	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Evolution over time of the size of the agent group (number of people)	<i>Existing data since 2000 and projected up to 10 years Explain the evolution reasons for each period (population growth – indicate growth rates; migrations – indicate origin and reasons, etc.)</i>
Which percentage of the agent group affecting the forest cover of the pilot site lives within the pilot site?	
Average size of the families for this agent group (if different from the average size for the global population)	
Main socio-economic and cultural characteristics of this agent group	
Privileged location of the agent group in the pilot site	<i>In the form of freehand drawn maps or descriptions (based on expert opinions) of the areas where the agent group is present</i>

THIS TABLE HAS TO BE REPRODUCED FOR EACH AGENT GROUP IDENTIFIED IN THE PREVIOUS SECTIONS.

For the **public or private institutional agents** (mining firms for instance), please provide a description of the institution, its activities and its development objectives in the area (in geographical and quantitative terms).

6.4. Direct causes of deforestation

IN THIS SECTION, PLEASE FILL OUT ONLY THE TABLES THAT CONCERN THE DIRECT CAUSES WHICH AFFECT THE PILOT SITE.

They will be then classified in section 4.

6.4.1. Local breeding

This section concerns livestock herds belonging to families located within the boundaries of the pilot site (but those herds can also do transhumance somewhere else during part of the year). In this case, the use of the term “breeding system” stands for a herd from the same species and managed under the same practices.

LOCAL BREEDING SYSTEM n°1:	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Species and total number of individuals managed under the same practices	<i>Provide also information about the herd structure (if existing)</i>
Free range area used by the herd within the pilot site	<i>Distinguish if possible the surface of the free range area by type of natural vegetation</i>
Area of pastures used by the herd within the pilot site	
Evolution over time of the surface of free range areas and pastures occupied by this breeding system and of the number of individuals in the pilot site	<i>Historical data for the last 10 years and projection over the next 10 years; reasons for this evolution</i>
Breeding management norms	<i>Are the free range areas in forest authorized? Are they organized and in which way? What is the level of control and respect of those norms?...</i>
Location of the cause “overgrazing” in the massif	<i>Add a map if possible (land use map or freehand drawn map according to expert opinions), otherwise describe the areas used for the development of this activity</i>
Do the herds pasture on lands outside the project area?	<i>When? Which frequency? Where?</i>
Are there any forest protection practices to avoid cattle entering the	

pilot site? If there is, what are the concerned surfaces in the site?	
Characterization of the impacts on forest cover (positive or negative)	
Grazing of sprouts?	<i>Description of the impact (frequency, data on the level of regeneration and/or degradation...) on the basis of existing information</i>
Cutting branches/the top of the trees?	<i>Description of the impact (amounts harvested, data on the level of degradation...) on the basis of existing information</i>
Soil compaction and degradation?	<i>Description of the impact (data on available water resources and tree growth...) on the basis of existing information</i>
Use of fire for livestock management?	<i>Which practices are being used? (frequency, period, ...) Which percentage of the total burnt area was burnt for this breeding system?</i>
Other (please specify)	
Livestock management	
Quantity of (gross) production by head and for the total herd	<i>Quantity of milk: /head and /herd Quantity of meat : /head and /herd Quantity of other products : /head and /herd</i>
Level of products processing	<i>For each product, please specify the portion that has been processed and the quantity of processed products that has been obtained (for the herd)</i>
Destination of products	<i>For each product (gross and processed), please specify the percentage of auto consumption and sale, where the sale is made (% for each destination) and the sale price of the products</i>
Livestock intensification level	<i>Feeding (composition of the feed ration), health management, pasture management...</i>
Estimation of the average net profit per ha	<i>Taking into account the carrying capacity, the quantity of generated products, the sale price of the products and deducting the production costs including paid workforce (ie non from the family) Specify the calculation</i>

Other carbon potential linked to breeding activities	
Is there any tendency of converting the pastures into another land use type?	<i>If yes: into which land use type? Why? Please provide existing quantitative data</i>
Silvopastoral pasture management	<i>If yes: which area? Which number of trees per ha? Tree species? Average DBH of the trees?</i>
Is it relevant to increase tree density in pastures? Why?	
Quantity of manure produced by the herd	
Existing manure management practices	<i>Is there manure spreading? Which part of manure is spread? At which frequency? When?</i>
Would it be relevant to implement new manure management practices?	<i>Which ones and why?</i>
Activities to mitigate the impact of overgrazing on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	<i>Please specify for each activity if they have already been implemented in the area, if so please indicate the results that have been obtained and the reasons explaining those results</i>
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

THIS TABLE HAS TO BE COPIED FOR EACH BREEDING SYSTEM (at least for each animal species and also for the same species if different management practices exist).

6.4.2. Transhumant pastoralism

This section focuses on herds coming from areas outside the pilot site which can be lead to graze within the pilot site at certain times of the year.

Transhumand breeding system n°1 : _____	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Species and total number of individuals managed under the same practices	<i>Provide also information about the herd structure (if existing)</i>
Origin and period of grazing within the pilot site	
Surface of free range area dedicated to transhumant herds within the pilot site	
Evolution over time of the surface of free range areas and pastures occupied by this breeding system and of the number of transhumant individuals in the pilot site	<i>Historical data for the last 10 years and projection over the next 10 years; reasons for this evolution</i>
Transhumant breeding management norms	<i>Are the free range areas in forest authorized? Are they organized and in which way? What is the level of control and respect of those norms? Is there any conflict with local breeders?...</i>
Location of the cause “transhumant overgrazing” in the massif	<i>Add a map if possible (land use map or freehand drawn map according to expert opinions), otherwise describe the areas used for the development of this activity</i>
Characterization of the impacts on forest cover (positive or negative)	
Are the impacts different from those caused by local herds?	<i>If yes: how?</i>
Livestock management	

Are the characteristics of herd management different from those of local herds?	<i>If yes: how? Please specify the average net profit per ha</i>
Activities to mitigate the impact of “transhumant overgrazing” on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	<i>Please specify for each activity if they have already been implemented in the area, if so please indicate the results that have been obtained and the reasons explaining those results</i>
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

THIS TABLE HAS TO BE REPRODUCED FOR EACH TRANSHUMANT BREEDING SYSTEM (at least for each animal species and also for the same species if different management practices exist).

6.4.3. Agriculture

This section focuses on the different cropping systems, i.e. one or more varieties which are cultivated on the same plot and under the same practices (for the same cereal, it is possible to find different cropping systems depending on the intensification level, the rotation or the association existing in the plot).

Cropping system n°1 : _____	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Varieties being part of the cropping system	
Are the different varieties of the cropping system in association and/or in rotation?	<i>Describe the associations (density of each species) and rotation (successions and temporality)</i>
Area of the cropping system in the pilot site	

Evolution over time of the cropping system in the pilot site	<i>Historical data for the last 10 years and projection over the next 10 years; reasons for this evolution evolution</i>
Location in the massif	<i>Add a map if possible (land use map or freehand drawn map according to expert opinions), otherwise describe the areas used for the development of this activity</i>
Cropping management norms	<i>Is it authorized to cultivate in forest? In which areas? What is the level of control and respect for those norms?...</i>
Impact on forest cover	<i>How are the crops installed: through complete clearing or agroforestry systems?</i>
Use of forest fire by farmers	<i>Which fire practices are being used for this cropping system? (Frequency, period, ...) Which percentage of total burnt area is burnt for this cropping system?</i>
Cropping system management	
Annual production/ha	<i>For each variety being part of the cropping system</i>
Sale price of the products	
Level of products processing	<i>For each product specify the portion that has been processed and the product obtained</i>
Products destination	<i>For each product (fresh or processed) specify the percentage of auto-consumption and the percentage of sale. Where does the sale occur? (% for each destination) What is the sale price of the products?</i>
Intensification level of the cropping system	<i>Irrigation? Fertilizers? Pesticides?</i>
Estimation of the average net profit per ha	<i>Please take into account the produced quantity/ha and the sale price of the different products as well as the production costs of the cropping system (including paid labour force, ie not from family). Thanks for detailing the calculation.</i>
Other carbon potential linked to agricultural activity	

Is there a tendency of converting this cropping system into another land use type?	<i>If yes: into which land use type? Why? Please provide existing quantitative data</i>
Quantity of crop residues	<i>Quantity/ha</i>
Crop residues management practices	<i>Are they left unharvested? Are they incorporated to the soil? Burnt? What is the frequency of those practices?</i>
Would it be relevant to implement improved practices of crop residues management?	<i>Which one? Why?</i>
Quantity and type of used nitrogen fertilizers	
Existence of fallow practices	<i>For how long? With which land use?</i>
Existence of tillage practices	<i>Please specify type and depth of tillage and its frequency</i>
Would it be relevant to improve tillage practices (or stop tillage practices)? Why?	
Agro-forestry management of the cropping system	<i>If yes: which area? Number of trees/ha? Species? Average DBH of trees?</i>
Would it be relevant to increase tree density in the cropping system?	
Activities to mitigate the impact of this cropping system on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	<i>Please specify for each activity if they have already been implemented in the area, if so please indicate the results that have been obtained and the reasons explaining those results</i>
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

REPEAT THIS TABLE FOR EACH CROPPING SYSTEM.

6.4.4. Fuelwood collection

This section focuses on fuelwood collection while the following section focuses on charcoal. Please make sure to differentiate them.

Fuelwood	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Volume of fuelwood collected from the pilot site (m3)	<i>Please detail calculation</i>
Location in the massif	<i>Add a map if possible (land use map or freehand drawn map according to expert opinions) otherwise describe the areas used for the development of this activity</i>
Impacts on forest cover	<i>Which types of trees are being collected in priority (dead-wood on the ground, dead-wood on standing trees, living wood?...)? Which wood species are being prioritized? In which type of forest cover? To what extent are those collections causing degradation?</i>
Management norms for fuelwood collection	<i>Is fuelwood collection authorized? Is it part of a forest management plan? What are the existing management norms?</i>
Volume of standing trees affected by fuelwood collection (in m ³ , including losses due to harvest)	<i>Please detail calculation</i>
Evolution over time of collected and damaged quantity of wood	<i>Historical data for the last 10 years and projection over the next 10 years; reasons for this evolution</i>
Actual proportion of the different species in the quantity of collected fuelwood	
Wood density of those different species (if specific national information exists)	
Percentage of the fuelwood quantity dedicated to domestic uses	<i>Please specify the uses and if possible their energetic efficiency</i>
Percentage of the fuelwood quantity dedicated to commercial uses	<i>Please specify the uses and if possible their energetic efficiency</i>

Sale price of fuelwood (commercial use)	
Existing energetic alternatives	<i>Please list those alternatives and precise their location</i>
Activities to mitigate the impact of this direct cause on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	<i>Please specify for each activity if they have already been implemented in the area, if so please indicate results that have been obtained and reasons explaining those results</i>
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

6.4.5. Charcoal production

Charcoal	Existing data (please include data source, method of production, and quality assessment of the data)
Volume of wood collected from the pilot site for charcoal production (m3)	<i>Please detail calculation</i>
Carbonization techniques	<i>Used technique ? Carbonization yields ?</i>
Quantity of charcoal produced (in m3)	<i>Please detail calculation</i>
Location in the massif	<i>Add a map if possible (maps of the areas used for wood collection for charcoal production or freehand drawn map according to expert opinions) otherwise describe the areas used for the development of this activity</i>
Impacts on forest cover	<i>Which types of trees are being collected in priority (dead-wood on the ground, dead-wood on standing trees, living wood?...)? Which wood species are being prioritized? In which type of forest cover? To what extent are those collections causing degradation?</i>

Management norms for wood collection for charcoal production	<i>Is wood collection for charcoal production authorized? Is it part of a forest management plan? What are the existing management norms?</i>
Volume of standing trees affected by wood collection for charcoal production (in m ³ , including losses due to harvest)	<i>Please detail calculation</i>
Evolution over time of collected and damaged quantity of wood	<i>Historical data for the last 10 years and projection over the next 10 years; reasons for this evolution</i>
Actual proportion of the different species in the quantity of collected wood for charcoal production	
Wood density of those different species (if specific national information exists)	
Percentage of charcoal quantity dedicated to domestic uses	<i>Please specify the uses and if possible their energetic efficiency</i>
Percentage of charcoal quantity dedicated to commercial uses	<i>Please specify the uses and if possible their energetic efficiency</i>
Sale price of fuelwood (commercial use)	
Existing energetic alternatives	<i>Please list those alternatives and precise their location. Price of energetic alternatives? Existence of a national policy for the promotion of these other energetic sources? If so, content of this policy?</i>
Activities to mitigate the impact of this direct cause on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	<i>Including techniques for improving the carbonization yield. Please specify for each activity if they have already been implemented in the area, if so please indicate results that have been obtained and reasons explaining those results</i>
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

6.4.6. Non timber forest products collection

The economic assessment of all non-timber forest products (NTFP) will be carried out under component 2 of the FFEM project. Here this section focuses only on non-timber forest products which could cause a degradation of the forest cover (harvest of acorns preventing regeneration for instance) and their impact on forest cover.

For each non-timber forest product collected which could be a cause of degradation, please fill out the following table.

NTFP n°1 : _____	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Quantity of NTFP collected within the pilot site	<i>Please detail calculation</i>
Quantity of NTFP produced by the ecosystem within the pilot site	<i>Please detail calculation</i>
Location in the massif	<i>Add a map if possible (map of the areas dedicated to NTFP collection or freehand drawn map according to expert opinions) otherwise describe the areas used for the development of this activity</i>
Impacts on forest cover	<i>To what extent those collections cause degradation?</i>
Management norms for NTFP collection	<i>Is NTFP collection authorized? Is it part of a forest management plan? What are the existing management norms?</i>
Evolution over time of the quantity of NTFP collected	<i>Historical data for the last 10 years and projection over the next 10 years; reasons for this evolution</i>
Percentage of NTFP quantity dedicated to domestic uses	<i>Please specify also their uses if possible</i>
Percentage of the NTFP quantity dedicated to commercial uses	<i>Please specify also their uses if possible</i>
Sale price of NTFP (commercial use)	
Activities to mitigate the impact of this direct cause on forest cover	

Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

6.4.7. Lumber extraction

First, please provide information here on forest management practices (joint data between C1/C4):

- **Forest management plans** implemented during the last 15/20 years;
- Describe succinctly the **principal orientations** of the previous and actual forest management plans and give also some indications on the future orientations in the next few years if the management plan is under revision in the different forest management units of the pilot site.

Moreover, under component 4, we are looking to characterize the impact of forest management plans on forest cover but also the impact of illegal logging (if any) and to obtain information about wood sector. Please note that legal lumbering (i.e. planned under forest management plans) and illegal logging are distinguished in the following tables.

LEGAL LUMBER	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Area dedicated to legal lumbering	<i>Area in ha, percentage of plantations and natural forest areas, number of forest management units</i>
Quantity of legal lumber (i.e. planned under forest management plans) harvested within the pilot site	<i>By species Please distinguish those which come from plantation and those which come from natural forest area</i>

Authorities responsible for lumbering	<i>Describe the authorities and their role in the forest sector</i>
Location in the massif	<i>Add a map if possible (map of areas dedicated to lumber extraction or freehand drawn map according to expert opinions) otherwise describe the areas used for the development of this activity</i>
Impacts on forest cover	<i>To what extent is lumbering causing degradation? (including direct impacts of lumbering but also indirect impacts related to forest tracks construction, lumberyards...) To the contrary, to what extent lumbering allows to increase carbon stocks of forests? Please describe these positive impacts</i>
Evolution over time of the quantity of collected lumber (legal)	<i>Historical data for the last 10 years and projection over the next 10 years; reasons for this evolution</i>
Percentage of collected lumber quantity dedicated to domestic uses	<i>Please specify also the use and the storage time of wood in each use. By species</i>
Percentage of collected lumber quantity dedicated to commercial uses	<i>Please specify also the use and the storage time of wood in each use and the geographical destination of the wood which has been sold. Processing level of the wood and types of operators in the sector? By species</i>
Lumber sale price	<i>By species</i>
Plantations (afforestation, enrichment of forest cover)	
For each planted plot: -Tree species -Age of the trees -Land use prior to plantation (agricultural or pastoral use, planted forest, natural vegetation) -Permanence duration of previous land use	
Planned plantations	Species, location, previous land uses and permanence duration of previous land uses

Activities to mitigate the impact (direct or indirect) of this direct cause on forest cover or to strengthen its positive impact?	
Describe potential activities that could be implemented	<i>Please specify for each activity if they have already been implemented in the area, if so indicate the results that have been obtained and the reasons explaining those results</i>
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	
Illegal logging	Existing data (please include data source, method of production, and quality assessment of the data)
Estimation of the quantity of illegal wood collected in the pilot site	<i>By species Please distinguish illegal logging in plantations and in natural forest areas. Please detail calculation.</i>
Control modalities	<i>Authorities in charge of controlling illegal logging and their respective role</i>
Location in the massif	<i>Add a map if possible</i>
Impacts on forest cover	<i>To what extent is illegal logging causing degradation? (including direct impacts of logging but also indirect impacts related to forest tracks construction, lumberyards...)</i>
Evolution over time of the quantity of illegal wood collected	<i>Historical data for the last 10 years and projection over the next 10 years; reasons for this evolution</i>
Percentage of illegal wood quantity dedicated to domestic uses (if known)	<i>Please specify also their uses and the storage time of the wood in each use. By species.</i>
Percentage of illegal wood quantity dedicated to commercial uses (if known)	<i>Please specify also the use and the storage time of wood in each use and the geographical destination of the wood which has been sold.</i>
Illegal wood sale price (if known)	<i>By species</i>

Activities to mitigate the impact of this direct cause on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

6.4.8. Urbanization

This section is focusing on both legal and illegal urbanization in forested areas.

Urbanization (legal or illegal)	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Urbanized area within the pilot site	<i>Area in ha Percentage of legal and illegal urbanization</i>
Location of this urbanized area	<i>Existing map or description of most suitable areas</i>
Historic evolution of the urbanized area	<i>Historical data for the last 10 years and reasons for this evolution Please distinguish legal and illegal urbanization when possible</i>
Urban expansion management	<i>Authorities responsible for granting building permits, in charge of building, existence of a local urbanism plan, level of control, existing conflicts...</i>
Impact of urbanization on forest cover	<i>Describe direct impacts (responsibility of urbanization in the total deforestation observed in the past...) and indirect impacts (trampling, fire risks...) If urbanization generates forest fire risks: which percentage of total burnt area is caused by urbanization?</i>

Existing urban expansion plans	<i>Local urbanism plans (forested areas which should be urbanized and their location)</i>
Possible evolution of illegal urbanization	<i>Please describe it quantitatively and geographically</i>
Activities to mitigate the impact of this direct cause on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

6.4.9. Tourism

Tourism	Existing data (please include data source, method of production, and quality assessment of the data)
Description of the area accessible for tourism	<i>Accessible area (ha) and location (maps)</i>
Touristic frequentation	<i>Historical evolution of the visitor number for the last 10 years and projection over the next 10 years; reasons for this evolution</i>
Tourism management	<i>Authorities in charge of planning and controlling tourism Management modalities Existing or expected facilities Existing conflicts</i>
Impacts of tourism on forest cover	<i>Describe potential impacts and try to quantify them (trampling, fire risks...) If tourism generates forest fire risks: which percentage of total burnt areas is caused by tourism?</i>

Activities to mitigate the impact of this direct cause on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

6.4.10. Mining (quarry included)

Mining	Existing data <i>(please include data source, method of production, and quality assessment of the data)</i>
Area dedicated to mining within the pilot site	<i>Area in ha Portion of legal and illegal mining</i>
Location of mining	<i>Please distinguish legal and illegal mining if possible</i>
Description of mining practices	<i>Ore mined Extraction methods Mining products outlet Mining profitability Start dates of the mining projects Type of mining operators (international or national firms, households...)</i>
Historic evolution of mining	<i>Historical evolution for the last 10 years and reasons for this evolution Please distinguish legal and illegal mining if possible</i>
Mining management	<i>Authorities in charge of granting exploration and mining permits, level of control, existing conflicts...</i>

Impact of mining on forest cover	<i>Describe direct impacts (role of mining in the total deforestation observed in the past) and indirect impacts (migrants' arrival, ground water and streams pollution which could generate a decrease of tree growth, fire risks...) If mining generates fire risks: which percentage of total burnt area is caused by mining?</i>
Development plans of mining activities	<i>Planned areas for mining activities and location</i>
Possible evolution of illegal mining activities (if so)	<i>Describe them quantitatively and geographically</i>
Activities to mitigate the impact of this direct cause on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

6.4.11. Infrastructures

Road infrastructures	Existing data (please include data source, method of production, and quality assessment of the data)
Map of existing roads in the pilot site	<i>By type of roads (primary, secondary, tertiary...)</i>
Historical evolution of road construction	<i>Kilometres of roads built those last 10 years by type of roads and reasons for this evolution</i>
Road infrastructure planning	<i>Responsible authorities, existing level of road planning and control of the potential impact of roads on environment...</i>

Impact of roads on forest cover	<i>Describe direct impacts (responsibility of roads in the total deforestation observed in the past...) and indirect impacts (migrants' arrival, fire risks...) If roads generate fire risks: which percentage of total burnt area is caused by road infrastructures?</i>
Road infrastructure expansion plans	<i>Kilometres of roads to be built and location (ideally use maps)</i>
Activities to mitigate the impact of this direct cause on forest cover	
Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover	<i>Describe potential activities that could be implemented to mitigate the impact of this direct cause on forest cover</i>
Other relevant information	
<i>Include here any other additional data relevant to characterize this direct cause of deforestation or degradation</i>	

Impacts of other infrastructures could also occur, especially **industrial infrastructures** located either in or outside the pilot site (i.e. impacts related to ground water and streams pollution which could limit tree growth for instance). If so, please mention those infrastructures and describe their impacts.

6.4.12. Direct impacts of climate change and extreme events

This section focuses on historical data related to the evolution of climate conditions (precipitations and temperatures) and to extreme climatic and biophysical events.

Minimum joint data between C1/C4:

- Evolution of **annual precipitation** and minimal, maximal and average **temperatures** since 1975;
- Identification of extreme/exceptional biophysical and climatic events since 1975:
 - Exceptional meteorological events (drought, storms, etc.);
 - Potential phenomenon such as **erosion** and/or watershed **flooding** (if relevant for the pilot site);

- **Impacts on forest cover:** try to identify thanks to existing literature, databases (national or satellite imagery) or expert opinions the consequences of such extreme past events on forest cover, both in structure and surface.;
- **Future evolution:** under component 1, evolution scenarios of those drivers will be produced. However, under component 4 and while waiting for the results of component 1, please describe briefly and qualitatively the anticipated impacts of the future evolution of climate and extreme events on forest cover (major trends according to expert opinions);
- Describe the already undertaken **measures** in forest management plans to limit the impact of extreme events and of the evolution of temperatures/precipitations.

The indirect impacts of climate change on other causes (such as fires, parasite attacks or the intensity of agro-pastoral causes...) will be discussed in the “feedback” section.

6.4.13. Forest fires

Describe here (joint data between C1/C4):

- The historical evolution of **burnt areas** (since 1975)
- The **origin** of forest fires (using for instance European Union classification – see figure 4)
- The **impact** of fires on forest cover (affected strata, impact on tree growth...)
- If available, characterize the **evolution** of the future fire regimes (according to expert opinions)
- What are the **prevention measures** implemented to limit fire risks (tracks, watering places, firebreaks...) and precise which **impact** (positive or negative) they had on forest cover (for example : positive impact of firebreaks by limiting fire risks but negative impact while they are installed due to the removed forest area)
- Which **additional measures** could be implemented in the future to limit fire risks and its impact on forest cover?

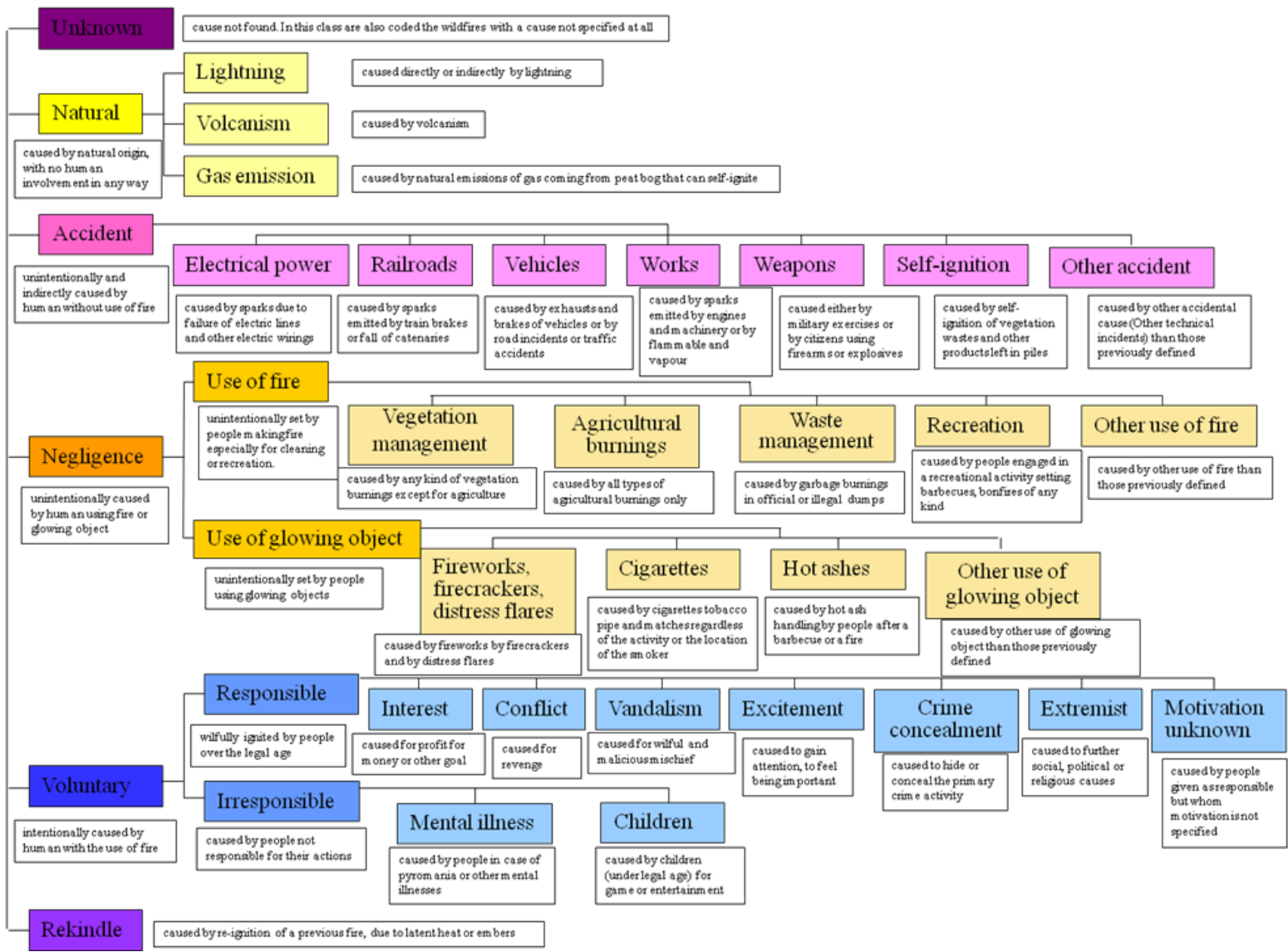


Figure 4: Classification of fires by the European Union

6.4.14. Parasite attacks

Please describe here (joint data between C1/C4):

- **Historical evolution** of progressive deterioration of trees as a result of parasite attacks (insect pests, diseases, etc.) (since 1975)
- **Impact** of parasite attacks on forest cover (affected strata and species, impacts on tree growth...)
- If available, characterize the **evolution** of future regimes (according to expert opinions)
- Which **prevention measures** are already implemented in order to limit the risks of progressive deterioration of trees as a result of parasite attacks and specify if so what have been their impact (positive or negative) on forest cover (for example : impact of removed trees to fight against parasite attacks)?
- Which **additional measures** could be implemented on the future to limit risks of progressive deterioration of trees as a result of parasite attacks?

6.5. Indirect causes

For each direct cause, please indicate now what are the underlying causes. Those underlying causes could be:

- Economic
- Political and institutional
- Demographic
- Technologic
- Sociocultural

As an example, a list of underlying causes identified in the existing literature is provided below:

Examples of indirect causes (adapted from Geist et Lambin, 2001)		
Economic factors	Market growth and commercialisation	Rapid market growth (especially of the export-oriented sector), rise of cash economy, increasing commercialisation incorporation into world economy... Increased market accessibility (especially of urban markets) Growth of sectoral industries (wood-related, agriculture and livestock-related, mineral-related, others) Lucrative foreign exchange earnings Growth of demand for consumer goods and services procured with cash due to a rise in well-being (wood-related, agriculture-related, tourism, housing and transport...)
	Specific economic structures	Speculative gains (including land speculation) Poverty and related factors (lack of income opportunities, joblessness, resource poverty, low living standard, etc.) Economic downturn, crisis conditions Indebtedness of households or governments
	Urbanization and industrialization	Urbanization : growth of urban markets, tourism development Industrialization : built-up of new forest-based or -related industries
	Specific economic parameters	Comparative advantages due to cheap, abundant production factors Specific production conditions Price increases or decreases (of land, input, products...)
Policy and institutional factors	Formal policies	On taxation, charges, tariffs, prices On credits, subsidies, licenses, concessions On economic development (agriculture, infrastructure) On finance, investment, trade On population (migration) On land

		Other pro-deforestation and degradation policies
	Informal policies	Corruption, lawlessness Poor performance, mismanagement Clientelism
	Property rights regimes	Insecure ownership, land tenure insecurity Land race, race for property rights Titling, legalization, consolidation of individual titles Customary rights Privation of land right Open access conditions
Technological factors	Agro-technological change	Land use intensification Land use extensification Other changes (production orientation...)
	Technological applications in the wood sector	Damage and wastage due to poor logging performance Wastage in wood processing, due to poor industry performance Lack of cheap, technological alternatives to fuelwood or charcoal Poor domestic and industrial furnace performance
	Other production factors in agriculture	Low or high level of technological inputs Land-related factors (land scarcity) Labour-related factors (labour availability) Capital-related factors (credits availability, access to irrigation...)
Cultural or socio-political factors	Public attitudes, values, beliefs	Public unconcern or lack of political support for sustainable forest management, low environmental education, and dominance of other public attitudes (modernization...) Unconcern about the welfare of future generations Beliefs about forests
	Individual and household	Unconcern by individuals about the environment Individual behaviours of rent-seeking, continuation of inherited modes of resource use

	behaviour	Social demand towards Mediterranean forests
	Socio-political changes	War, rebellion, revolution, social disorder... Abrupt shifts in national policies
Demographic factors	Population pressure	
	Natural population growth	Fertility, mortality
	Migrations	Immigration, emigration Population displacements
	Population density	Density evolution and spatial population distribution
	Life cycle	Life cycle features (repartition between training, work and leisure time ...) Way of life evolution (urban/rural)

You can use the same structure of underlying causes of deforestation and degradation or organize them differently according to the specific features of each situation. In any case, please indicate the underlying causes that influence each direct cause, and deal with direct causes by descending order in terms of damages (carbon stocks affected); same for underlying causes.

UNDERLYING CAUSES (classify them by descending order and describe as much as possible the cause-effect relationship – indicate data source)	
DIRECT CAUSE n°1 :	
(from the most important to the least important)	
.....	
	...

REPEAT THIS TABLE FOR EACH DIRECT CAUSE DESCRIBED IN THE PREVIOUS SECTION

6.6. Feedbacks between causes

In addition to the cause-effect relationships between direct and indirect causes described in the section “indirect causes”, feedbacks (positive or negative) between direct causes or between direct and indirect causes can exist. Those feedbacks can influence the intensity and the occurrence of deforestation and degradation of forest cover

A typical example of feedback between direct causes would be for instance the impact of the direct cause climate change (evolution of temperatures and precipitations or extreme events) on other direct causes. Therefore, the evolution of temperatures and precipitations can influence (positively or negatively) the intensity of forest logging and its impact on forest cover (for example by limiting tree growth and compelling the farmer/operator to reduce rotation periods in order to maintain logging profitability), have impact on agriculture (increasing or reducing the productivity and generating for instance an increase or a decrease of crops areas in order to maintain a constant level of revenue), or on breeding (droughts can lead to an increase of branches removals in order to feed the herds or an increase of the area of free land ranges within the forest but it can also lead to a reduction of the pressure due to pasture because of a relocation of the activity towards other areas or a diversification of the economic activity). Another example can relate to the facilities installed to limit forest fires in a massif, which can have a negative impact on forest cover when the facilities are built up (tracks, water areas, firebreaks), but a positive impact on a longer term basis through the diminution of forest fire risks.

An example of feedback between direct and indirect causes would be the impact of technological changes for instance: an agricultural intensification can initially reduce pressure from agricultural activities on forest cover knowing that it can help to maintain a constant or superior revenue for an equal or inferior surface area. However, it can increase over time the opportunity cost of agricultural activities and increase the attractiveness of the activity, leading to an increased interest for the activity from owners and migrants and an additional deforestation. Another example of feedbacks between direct and indirect causes would be the evolution of cork market or isolation in eco-building, which can influence the management of oak forests (in some cases it can lead to neglecting the forest with an increased degradation and forest fire risk, and in other cases it can lead to an increased interest of owners for cork collection, thus generating positive indirect impacts for the ecosystem restoration).

Do you identify any feedback between direct causes or between indirect and direct causes within the pilot site? Can you describe and quantify them as much as possible?