



## **Project: Optimising the production of goods and services by Mediterranean forests in a context of global changes**

Component 2: Assessment of the socio-economic value of goods and services provided by Mediterranean forest ecosystems

### **Methodological document: draft structure**

#### **Forewords**

Following the national meeting which allowed the objectives, goods and services valued, drivers of change and frames of scenarios and methods to implement to be clarified, we propose below a draft structure of a methodological document which will define more precisely the steps of implementation and validate the approach. This common frame for this document will also facilitate exchange between pilot sites as well as methodological capitalization foreseen in the project.

Some tools can support you in this reflections and methodology preparation process:

- The report<sup>1</sup> « Methods and tools for socio-economic assessment of goods and services provided by Mediterranean forest ecosystems » made by EFIMED and CTFC;
- A set of methodologies and tools sheets<sup>2</sup>;
- A sheet on your pilot site and with specific recommendations<sup>3</sup>.

#### **1. Evaluation context**

##### **1.1. Overall management/development objective in the pilot site**

The overall management objective in the Düzlerçamı pilot site is the sustainable management of national forest resources and thereby contributing to the wealth of the society and sustainable development of the country. The specific objectives in the pilot site are as follows:

- Sustaining timber production,
- Further developing tourism and recreation activities in the area,
- Enhancing the non-wood forest products collection and production in the area.

Düzlerçamı pilot site is located inside the Antalya Regional Directorate of Forestry. At a regional perspective, the site is not only important for industrial wood production but also for the conservation of natural resources. Under the functional planning approach of the General Directorate of Forestry (GDF), “Ecological Functions” were assigned to a big proportion of the pilot site. Industrial wood production is foreseen in this area, however the primary focus remains as sustaining the health of the forest and protection of soil.

The pilot site was located within the application zone of a project realized towards enhancing the resistance of forests to forest fires in 2011 (YARDOP Project: Yanan Alanların Rehabilitasyonu ve Yangına Dayanıklı Ormanlar Tesisi Projesi). A total of approximately 5,500 ha land was managed towards opening fire prevention roads, and mainly broad leaved trees (e.g. cypress, fruit trees, oak and oleanders) were planted near the roads. This project is not foreseen to be repeated at the pilot site in the future.

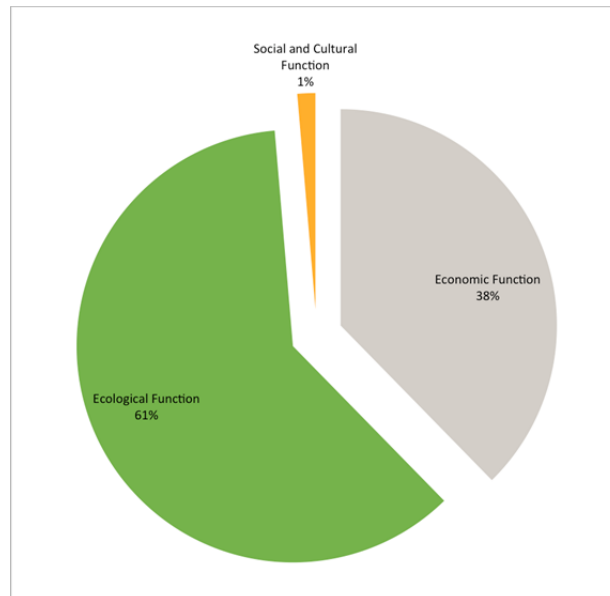
A high proportion of the site (50%) is overlapping with a legally protected area: Düzlerçamı wildlife reserve, where hunting is not allowed (other than game hunting) and management practices are carried out towards conservation of wildlife. Finally, the amount of allowable cut assigned to the pilot site in the final planning period (covering the period 2012-2021) has decreased by 68% (80,150 m<sup>3</sup>) in comparison to the previous

<sup>1</sup> Document sent by Marion Duclercq, by email, on 1<sup>st</sup> October 2013.

<sup>2</sup> Documents sent by Marion Duclercq, by email, on 19 September 2013.

<sup>3</sup> Documents sent by Marion Duclercq, by email, on 19 September 2013.

management period (covering the period 1997-2006). The main reason of this was an increase in the surface area allocated to conserving ecological functions in the pilot site. As a conclusion, even if the pilot site is actively managed towards industrial wood production and other services, the primary goal in the site remains as the conservation and sustainable use of natural resources.



**Figure 1.** Pie chart showing reflecting areas assigned to different functions in the pilot site.

## 1.2. Objectives of the socio-economic assessment of goods and services provided by forest ecosystems in the pilot site

Projects towards valuation of ecosystem goods and services are unfortunately rare in Turkey. Furthermore, cases where valuation assessments are incorporated into natural resources management practices and decision-making processes are even rarer. This project sets a good example in Turkey, detailing how socio-economic value of ecosystem goods and services can be incorporated into different steps of management practices.

Düzlerçamı pilot site, located very close to one of the biggest cities of Turkey, namely Antalya, provides diverse types of goods and services at local, regional and national level. One national park (Güllük Dağı-Termessos National Park of 6,600 ha) is located at the western border of the pilot site.

The forest management plan of the site has recently been finalized and a moderate to good level of knowledge exists about the site. The prime objective of the project is supporting management decisions at the Düzlerçamı pilot site through socio-economic valuation of ecosystem goods and services. Every 10 years management plans of state-owned forests are being updated. Through this approach, efforts can be focused on monitoring the impact of management decisions on ecosystem goods and services and accordingly preparing management plans and taking decisions towards increasing the sustainability of natural resources.

The pilot site is located inside the Antalya regional directorate of forestry under the general directorate of forestry. The majority of the site (app. 70%) consists of state owned forests and there exist private owned agricultural lands and settlements inside the limits of the pilot site. Finally the boundaries of Düzlerçamı wildlife reserve overlaps highly with the pilot site. In terms of biodiversity, the pilot site acts as a genetic reserve for the only autochthonous population of fallow deer (*Dama dama*) in the world and hosts one of the largest pine forests on flat land in Turkey.

This project is focused on the ecosystem goods and services and management practices in the state owned forest land. The incomes generated through natural resource use in state owned forests of the area belong to the treasury.

During the production of forest and non-wood forest products, priority is given to generating income to local people by the state. Furthermore, animal husbandry practices are carried out by local people using and/or

benefiting from the natural resources present in the site. Also given its proximity to Antalya city, the site serves as a recreation site with the presence of a couple of recreation spots rented to private companies and/or to the Municipality by the General Directorate of Forestry. Protected areas of different types (one wildlife reserve, 10 natural, archeological and urban SIT<sup>4</sup> areas) are present inside the area with different legal restrictions. Finally, game hunting is offered to national/local and foreign hunters by private companies (which applies to the Ministry to acquire these rights through a bidding procedure), under the surveillance of the Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks. In these practices, 20% of the income generated is given to local district legal entity (former village entities) where the hunting took place. Furthermore people helping hunters are usually from the local villages, providing additional income.

In conclusion, there are diverse goods and services used by diverse stakeholders in the pilot site and this can provide a good basis for comparing different management alternatives in order to better assess their influence on the ecosystem goods and services. The goods and services present at Düzlerçamı pilot site, whose production would directly or indirectly be impacted by pursuing management/development objectives are:

1. Industrial wood,
2. Biodiversity protection,
3. Fodder and forage,
4. Food products,
5. Water regulation,
6. Recreation and tourism,
7. Carbon sequestration,
8. Hunting and game products,
9. Historical and educational services,
10. Air quality regulation.

### 1.3. Potential synergies / coordination with other projects

Plans and projects realized in the pilot site and benefiting from different ecosystem goods and services are potential contributors/beneficiaries of the project. Especially plans and projects about wood production, tourism, hunting and non-wood forest products are the key contributors to the project in terms of data, time provision and changes expected. The outcomes of this socio-economic assessment can in turn feed into the planning phases of these projects towards sustainable use of natural resources.

One of the key projects in this respect is the integrated approach to management of forests project (GEF Funded GDF and UNDP Project which started in 2014, full title: *Integrated Approach to Management of Forests in Turkey, with Demonstration in High Conservation Value Forests in the Mediterranean Region*). This project will promote an integrated approach to management of forests in Turkey, demonstrating multiple environmental benefits in high conservation value forests in the Mediterranean forest region. More particularly, the project will demonstrate approaches to generating, measuring, reporting on and verifying carbon, biodiversity and socio-economic benefits generated through this integrated approach. The outcomes of the Component 2 can in turn support this project and will construct a concrete on the ground example to integrated management approaches.

Within the project itself, two components are of key importance: Component 1 and Component 4. One of the outcomes of the Component 1 of the project is towards taking into account the estimated direct impact of climate change on forest cover or indirectly on other causes of deforestation and degradation to reduce vulnerability to climate change. The impacts estimated for the Düzlerçamı pilot site can be incorporated into the algorithm of Component 2 if supplied before its finalization. This would permit identifying the impacts of climate change specifically on the pilot site in a detailed manner and also give clues about the interaction of climate change with ecosystem goods and services under different scenarios at the pilot site.

If this would not be possible, information collected through literature surveys about the impacts of climate change on the Mediterranean forest ecosystems (gathered from the literature surveys) can be used in the

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<sup>4</sup> This is a type of protected area in Turkey, previously managed by Ministry of Culture and Tourism. Prohibits human activities and designated for cultural, or natural or archeological values of sites. Mainly are small area but strictly protected areas

Component 2. It would also be essential for the national experts of the two components to work closely during the scenario identification and cost-benefit analysis. Finally, any opportunities to share data and contacts, to visit the pilot site together will be explored through direct contacts and/or the intermediation of the focal point and thematic expert of the General Directorate of Forestry.

Component 4 of the project will mainly focus on identifying the deforestation and degradation agents and drivers in the pilot site. Therefore it is of critical importance for the experts of the two components to exchange views regarding the drivers and levers acting on the forest ecosystems. If present, information on carbon storage potential at the site level, if not from the literature at the Mediterranean basin scale, will be requested from the national expert of the component to be incorporated into the valuation of carbon sequestration in the pilot site.

Among the data to be commonly collected by Component 1 and 4, some can also be integrated into the analysis of Component 2, e.g. data on episodes of decline of forest cover and causes (insect pests, parasites, diseases); wildfires (specify burned area, causes, number of affected trees; if present description on the future evolution of fire regimes and prevention measures proposed to mitigate risks). Finally generic maps of the pilot site to be collected on the ground in the framework of Component 2 can be shared with both Component 1 and 4: map of land tenure (ownership), Digital Elevation Model (DEM), slope (vector map), soil map (showing diversity of soil types; vector map), hydrography (vector map), settlements, road networks, protected areas, water bodies, etc.

Finally, the 3<sup>rd</sup> Component of the project aims at improving modes of governance for forest ecosystems. Tools developed in the framework of this component can be employed for the stakeholder consultation work to be done in Component 2. Also the possibilities of organizing common meetings will be explored to effectively interact with the work being done under the 3<sup>rd</sup> Component.

## **2. Description of the priority goods and services for the study**

### **2.1. Industrial wood – Definition and resources availability**

#### **2.1.1. The good or service to value**

Industrial wood production is one of the most important ecosystem good and service in the pilot site. The amount of industrial wood production in the site is planned through forest management plans of 10 years. For this purpose, annual increment wood is estimated in the site following a standardized approach of the General Directorate of Forestry. Following the functional planning approach of the General Directorate of Forestry, the activities and their intensity are distinguished for different parts of the forest. Accordingly with the functions assigned to stands, the allowable cut in different stand types is determined. However on the ground, production amounts can differ from the planned amounts. Therefore it is essential to refer to the annual production tables (namely Table 35), which are at prepared by forest chiefs. The critical aspect here is the extent of data; whether long-term information is kept on the ground. In the absence of “realized” production data, “planned” information can be used as a substitute. The current and future production amounts will be gathered from the most recent management plan covering the period 2012-2021.

On top of the incomes generated through production of industrial wood, there are certain costs inquired by the management and production activities on the ground, e.g. human resources, roads and other facilities construction, maintenance costs, etc. Information regarding costs at the level of the pilot site will be asked from the Antalya Forest Management Directorate. Finally experts in the Forest management Department and Forest Production and Marketing Department will be contacted to gather further information on the income generated and expended on the ground.

If present, information on the management costs will be incorporated to assess the “net incomes” from wood production in the site. However the preliminary interviews on the ground have indicated the difficulty of generating such data – if not impossible. Further communications will be held with the General Directorate of Forestry experts in Ankara to acquire this information. If not CBA assessments will be carried out using the existing information from the pilot site.

#### **2.1.2. The unit of physical measurement**

Quantity of harvested industrial wood in cubic meters, corresponding annual income generated in terms of euros are the units of physical measurement under the wood production and corresponding annual expenses towards harvesting the industrial wood on the ground.

### 2.1.3. The beneficiary population

Public, i.e. General Directorate of Forestry.

### 2.1.4. Data requirements, available or accessible and relevant existing studies for the pilot site

Data	Details	Holder	Update	Availability
Wood production	Stand types and functions assigned to stand types (in GIS), allowable cut (m <sup>3</sup> ), quantity of harvested industrial wood (m <sup>3</sup> ), annual production tables (Table 35), annual income generated through market price for wood, management costs (if present) and GIS data on the site: map of land tenure, stand types, ecological functions assigned to the site, digital elevation model (DEM), slope (vector map), soil map, hydrography, settlements, road networks, protected areas, water bodies, etc.	General Directorate of Forestry Antalya Regional Directorate of Forestry	2012-2021, if present for the previous years	Will require 4-6 weeks to ask and gather the data, additional 2 weeks to control and 2 weeks to incorporate data.

### 2.1.5. The assessment method considered and the opportunity to realize a cost-benefit analysis (based on available data and resources).

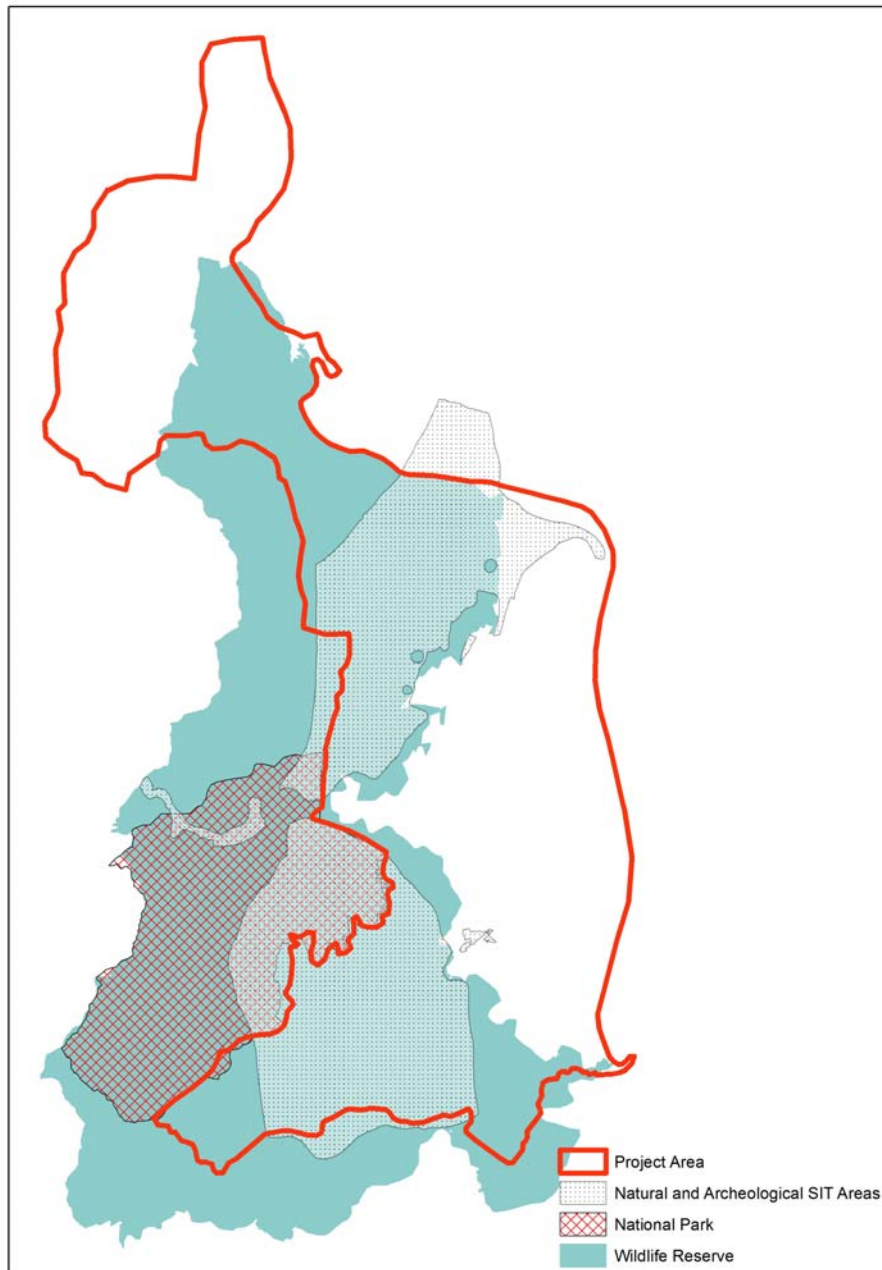
The assessment method considered for the industrial wood production is the market price method. On this topic, data on wood production, market prices for wood sold and relevant experts at local and national level are available. Information on management costs will be tried to be collected on the ground and from central authorities. This would permit realizing a cost-benefit analysis for the industrial wood.

## 2.2. Biodiversity Protection – Definition and resources availability

### 2.2.1. The good or service to value

According to the information presented in the forest management plan of the pilot site, there exist 430 plant taxa, of which 33 are endemic to Turkey. Furthermore 24 of the plant species are listed as threatened in IUCN and two species are listed in the Bern Convention appendices (namely *Cyclamen coum* and *Alkanna pinardii*). Parts of the management unit also belong to one of the best-known Wildlife Reserves in Turkey and home to a rare population of fallow deer (*Dama dama*). This population was put under protection in mid 1960s, and recently was used as the source for two reintroductions elsewhere in the country through translocations. Wild goat (*Capra aegagrus*) is another key asset since they form the main target for game hunting. Other wildlife such as wild boars (*Sus scrofa*), golden jackal (*Canis aureus*), caracal (*Caracal caracal*), lynx (*Lynx lynx*) and badger (*Meles meles*) increase the value of the pilot site. Accordingly, the presence of fallow deer and wild goats were identified as the key components of the biodiversity the site hosts in the plan. However up to date information about important biodiversity aspects (species, habitats, etc.) are still missing in the site.

The mentioned wildlife reserve, namely Düzlerçamı Wildlife Reserve, was designated in 1974, and borders were redefined in 2005, for the conservation of fallow deer and wild goat. The reserve covers approximately 29,000 ha and 47% of this overlaps with the pilot site (Fig. 2).



**Figure 2.** The project area and different types of legally protected sites inside or near the project area.

Similar to the functions detailed in management plans of the forests, wildlife reserves are also divided into units with different restrictions to human activities. Such a “zoning” study has already been carried out for the wildlife reserve and different zones were identified. In the framework of the project, the General Directorate of Nature Conservation and National Parks experts will be contacted to acquire the plan and the zones identified. Furthermore a seed orchard of 19.5 ha is located inside the pilot site. The seed orchard is important as it acts like a genetic reserve, which can sustain long-term adaptive capacity of the tree species.

### 2.2.2. The unit of physical measurement

Annual management costs of conservation bodies in terms of euros.

### 2.2.3. The beneficiary population

Society in general.

#### 2.2.4. Data requirements, available or accessible and relevant existing studies for the pilot site

Data	Details	Holder	Update	Availability
Management costs	Data on the costs of managing the wildlife reserve, different zones of activities in the reserve, costs of managing the seed orchard	General Directorate of Forestry Antalya Regional Directorate of Forestry, General Directorate of Nature Conservation and National Parks	All existing information	Will require 6 weeks to ask and gather the data, additional two weeks to control and 1 week to incorporate data.

#### 2.2.5. The assessment method considered and the opportunity to realize a cost-benefit analysis (based on available data and resources).

In the absence of detailed information on the biodiversity aspects of the site, furthermore the limited duration of the project and budget constraints, stated preference methods will not be employed to value the biodiversity protection ecosystem good in the pilot site. The assessment will rather depend on the annual budget of the local branch of the General Directorate of Nature Conservation and National Parks who is managing the wildlife reserve, and the expenses of the General Directorate of Forestry regarding managing the seed orchard. Both these will be employed as indicators for assessing the biodiversity protection function of the pilot site. Furthermore non-monetary values will be acknowledged in the produced reports, such as the fallow deer genetic resource, intrinsic value of wildlife, others.

It is not possible to include biodiversity in the cost-benefit analysis, since costs and benefits will always be equal due to the valuation method.

### 2.3. Fodder and forage – Definition and resources availability

Goat breeding is a common practice in the region and in some villages, cattle raising is also done. Especially in the 1980s, a conflict between goat breeding and forestry was ongoing, which led to sharp decreases in the number of domestic goats kept in the area. Since the 1990s, even in the existence of financial support from the government, the number of animals kept in the area did not show a drastic increase and remains more or less stable. Similarly, there has not been a drastic emigration or immigration from or to the settlements.

Grazing might be prominent in parts of the pilot site, however detailed and up to date information about the livestock numbers in the region is lacking. It might be possible to acquire information on the number of domestic animals in the area from the Ministry of Food, Agriculture and Livestock but the highest resolution of data will remain most likely at the level of districts.

During our interviews on the ground we were informed that a grazing plan was prepared for the pilot site, however not through assessing the existing number of animals and the capacity of the site, but rather through identifying sites where grazing can be carried out and those where it cannot be. Therefore the plan as it is will not permit acquiring further data about the existing and foreseen grazing pressure on the ground. In the absence of such long-term detailed information, it would require opinion of experts to deduct what proportion of these animals are using the natural resources inside the pilot site, therefore this ecosystem good will not be employed in the cost-benefit analysis for the pilot site.

### 2.4. Food products – Definition and resources availability

In the management plan of the forest, a small part of the forest (36.2 ha) which is mainly made up of stone pine (*Pinus pinea*) and almond (*Prunus dulcis*) trees is dedicated to non-wood forest product (NWFP) function. The almond production sites are private forestation sites rented to private people/companies whereas the stone

pine production is carried out under the NWFP function. Furthermore, presence of 47 economically important NWFP was identified in the management plan. However no estimates on their distribution, economic value or the intensity of collection could be presented. Even if NWFP production is a topic gaining importance in Turkey, inventories on different species are yet to be carried out to collect all the relevant information. In the absence of detailed information, this ecosystem good will not be employed in the cost-benefit analysis for the pilot site.

## 2.5. Water regulation – Definition and resources availability

In the management plan of the pilot site, an area of 358.9 ha (out of which 15.8 is forested area) is allocated to water regulation function. The forests and bush sites to the north of the site with this function are chosen mainly because they serve to cleaning ground water and water in streams, rivers and lakes. Furthermore the presence of forests with high forest closure in the pilot site does contribute to controlling floods in the region. Both these services are of prime importance however lacking data. In the absence of data, this ecosystem good will not be employed in the cost-benefit analysis for the pilot site.

## 2.6. Recreation and Tourism – Definition and resources availability

### 2.6.1. The good or service to value

Antalya and its surroundings are one of the key tourism hotspots in Turkey. According to the Prime Ministry Investment Support and Promotion Agency, 25 million passengers flew to Antalya Airport in 2012; 20 million of these passengers were passengers on international flights. The airport has more than 50 different airways flying from/to more than 75 destinations and is ranked the 21<sup>st</sup> busiest airport in the world by number of international passengers.

Located very close to Antalya, the Düzlerçamı pilot site is also influenced by recreation and tourism activities. Güver Cliff is one of the tourist attraction points near the pilot site visited regularly by both national and international tourists. Furthermore the forest itself is used by recreation purposes regularly.

### 2.6.2. The unit of physical measurement

Number of visitors (with tours or individually), past data on the income generated through entry fees in the pilot site, income generated through eco-tours arriving at the pilot site per year as Euros.

### 2.6.3. The beneficiary population

Tourism agencies, tour guides, local communities supplying services to the sector, tourists (national and foreign).

### 2.6.4. Data requirements, available or accessible and relevant existing studies for the pilot site

Data	Details	Holder	Update	Availability
Number of visitors	Data on number of tourists visiting the site, number of eco-tours being carried out by the tourism agencies (if present), tourism master plan covering the pilot site, past data on the entrance fees, tour fees	General Directorate of Forestry Antalya Regional Directorate of Forestry, Association of Turkish Travel Agencies, Ministry of Culture and Tourism	All existing information	Will require 8 weeks to ask and gather the data, additional three weeks to control and 1 week to incorporate data.



## 2.6.5. The assessment method considered and the opportunity to realize a cost-benefit analysis (based on available data and resources).

In the framework of the assessment, tourism and recreation activities will be considered together. During our interviews on the ground we were informed that Güver Cliff used to be a designated protected area managed by the General Directorate of Nature Protection and National Parks. However its status was removed and the site was given under the direction of the General Directorate of Forestry. Under the management of the formal authority, entry fees are told to be collected for the site (this information was not given with certainty).

However currently, under the management of the General Directorate of Forestry no entry fees are being collected. We will therefore try to acquire this information and if possible also data on the management expenses in Güver Cliff. If we can succeed in collecting this data, we can use these past data it as a proxy of the site's recreation service potential. However, further discussions on the ground have highlighted that the site was not used heavily as a tourism spot, but by small groups of people. There is an ongoing ecotourism potential evaluation study being implemented for the wildlife reserve by Akdeniz University. The study is not yet finalized, if we can acquire rough estimates from this project, we will use this as an alternative to evaluate the tourism good and service with the market price method. If absent, we will base our assessment only on recreation potential of the site as explained below.

There exists four recreation spots (Mesire Yeri in Turkish) which are state owned forests rented either to the Municipality or to private companies in the pilot site. Two of these spots are no longer active. But one site rented by the Municipality and the second by a private company is being heavily used by people from Antalya. Agreements are signed with these bodies and rents are collected in this framework by the General Directorate of Forestry. We will try to get information about the net incomes of the two spots to carry out the recreation valuation with market price method.

There are numerous private tourism companies organizing eco-tours around Antalya, however the preliminary communications on the ground indicated that the pilot site was not used heavily for tourism purposes. It was told that the main tourism spot for the foreign tourists was no the pilot site but rather the Termesos National Park. Further communications will be carried out to better assess the potential of tourism in the pilot site.

## 2.7. Carbon sequestration – Definition and resources availability

### 2.7.1. The good or service to value

The Düzlerçamı pilot site is made up of majorly Turkish pine (*Pinus brutia*) forests. For assessing the carbon sequestration ecosystem good, estimates given by the General Directorate of Forestry at the national scale for coniferous and broad-leaved forests will be employed. The calculation method and the assumptions generated by the Directorate are used all around the country to estimate the above and below ground carbon sequestration. The coefficients used in this method is generic, thus if the sequestration data specific to the pilot site can be produced in the framework of the Component 4, it will be used to calculate the carbon sequestration potential of the forest.

### 2.7.2. The unit of physical measurement

Amount of carbon stored in the pilot site in tones and social cost of carbon (SCC) estimate for the pilot site

### 2.7.3. The beneficiary population

Society in general

### 2.7.4. Data requirements, available or accessible and relevant existing studies for the pilot site

Data	Details	Holder	Update	Availability
Amount of carbon	The carbon stored in the pilot site will be estimated	Carbon credit experts, General	All existing information	Will require 6-8 weeks to ask and gather the

sequestered	using tables generated by the General Directorate of Forestry at the national scale. Social cost of carbon estimates OECD or USA or figures according to Ackerman and Stanton <sup>5</sup> will be used to value the carbon sequestered.	Directorate of Forestry Antalya Regional Directorate of Forestry		data, additional two weeks to control and 1 week to incorporate data.
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#### 2.7.5. The assessment method considered and the opportunity to realize a cost-benefit analysis (based on available data and resources).

The detailed forest maps will be used to come up with the amount of carbon stored in the above ground and under ground biomass, using the coefficients generated at the national scale. The SCC estimates in OECD or USA or figures according to Ackerman and Stanton will be used to value the carbon sequestered in the pilot site.

## 2.8. Hunting and game products – Definition and resources availability

### 2.8.1. The good or service to value

Düzlerçamı pilot site is among the first established game tourism sites in Turkey. Under the General Directorate of Nature Conservation and National Parks, each year the Central Hunting Committee (made up of ministry experts, NGO representatives, academicians and representatives of hunting organizations) meets towards identifying hunting permitted areas, annual quotas in hunting, game species, fines and game tourism sites and quotas. In Düzlerçamı pilot site, for every year with permitted game tourism, specific quotas are given to identify how many wild goats can be hunted. In the last committee meeting (covering the period 2014-2015), the quota was identified as 3 individuals. Thus, Düzlerçamı pilot site is not among the sites where a heavy hunting pressure is prevailing and the pressure is not foreseen to change drastically in the future.

### 2.8.2. The unit of physical measurement

Hunting permits prices, market price of game tourism products and illegal hunting fines, all in terms of Euros.

### 2.8.3. The beneficiary population

Local communities, hunters, enterprises (game tourism companies).

### 2.8.4. Data requirements, available or accessible and relevant existing studies for the pilot site

Data	Details	Holder	Update	Availability
Number of hunters (local, national and international)	Data on the number of hunters hunting in the pilot site, information on management costs (if present), hunting permit price, market price of game products in the pilot site, illegal hunting fines collected in the pilot site, inventory	General Directorate of Nature Conservation and National Parks, General Directorate of Forestry Antalya Regional Directorate of Forestry, Hunting Associations, Private hunting ground owners	All existing information	Will require 6-8 weeks to ask and gather the data, additional two weeks to control and 1 week to incorporate data.

<sup>5</sup> [http://www.e3network.org/papers/Climate\\_Risks\\_and\\_Carbon\\_Prices\\_executive-summary\\_full-report\\_comments.pdf](http://www.e3network.org/papers/Climate_Risks_and_Carbon_Prices_executive-summary_full-report_comments.pdf)

	of wild goat populations in the region			
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**2.8.5. The assessment method considered and the opportunity to realize a cost-benefit analysis (based on available data and resources).**

The number of people participating to hunting activities and the overall population size of the wild goats are essential to assess this ecosystem good. It is possible to acquire some information about the number of people participating in game tourism activities and its market price (amount paid to the game animal, and to the local guides accompanying the hunters) from the General Directorate of Nature Conservation and National Parks central and local authorities. Furthermore, even if the majority of the pilot site overlaps with the wildlife reserve, where hunting (other than game hunting) is forbidden, there are still some limited areas where hunting can take place.

We will try to use expert opinion to come up with the number of registered hunters in the region and coming from other parts of the country hunting in the pilot site legally. If the estimates can be gathered, market price of the hunting permit can be employed to assess this ecosystem good. However there exists no information about the number of illegal hunters using the site, thus an assumption is to be made to account for the number of illegal hunters (e.g. as much as registered hunters) and to come up with a more complete assessment. Furthermore, fines collected from detected illegal hunting activities can be incorporated into the assessment. The population size of wild goats in the pilot site can be used to assess the overall potential of the site in terms of game hunting. Market price method will be used to value this ecosystem good.

**2.9. Historical and Educational Services – Definition and resources availability**

A small proportion of the Düzlerçamı pilot site is allocated to scientific purposes; more specifically towards seed research in Turkish pine and monitoring the success of different clones derived from differed seed trials (8.3 ha). The establishment of research forests makes it possible to carry out the research studies collectively, demonstrating the outcomes of the research studies to implementing bodies, enhancing forestry practices, etc. The presence of such a research site is important and requires decades of investment. Furthermore there exists a training center developed towards tackling forest fires, active since the last years and serving to local and national foresters. Both research and training centers like those present in the pilot site are serving to the historical and educational services. However this is a topic very difficult to quantify as an ecosystem good and there exists no baseline data for such an assessment. Therefore this ecosystem good will not be employed in the cost-benefit analysis for the pilot site.

**2.10. Air quality regulation – Definition and resources availability**

The Düzlerçamı pilot site is located very close to one of the biggest cities in Turkey, namely Antalya. One of the regulatory ecosystem good and services is the air quality regulation of the forest. Even if air quality regulation is a topic of prime importance, there is no long term monitoring data, which can supply information about this function. Therefore this ecosystem good will not be employed in the cost-benefit analysis for the pilot site.

**2.11. Recap and choice of goods and services to value**

As a first step, the priority level of the ecosystem goods and services in the Düzlerçamı pilot site was decided by the national expert following a first round of discussion by the project experts in the General Directorate of Forestry and an academican working on the area. The outcomes of this prioritization study should be seen as a draft result and the list will be presented to other stakeholders at local scale at the next phase of the project. The input of stakeholders will be incorporated into the priority levels (e.g. upgrading or downgrading priority levels, and if relevant adding new goods and services to the list).

	Priority level	Methods considered	Data availability	Expertise availability	Assessment complexity	Implementation cost	CBA feasible
Industrial wood	1	MP	++	++	0	+	yes
Biodiversity protection	1	Cost of maintenance	+	++	++	++	no
Food and forage	2	MP	0	+	++	++	no
Water regulation	4	CB	0	+	++	++	no
Recreation and tourism	2	MP or TC	+	+	++	++	yes
Carbon sequestration	3	MP	+++*	++	++	+	yes
Hunting and game products	3	MP	+	++	++	+	no
Historical and educational services	4	CV or CE	0	+	+	++	no
Air quality regulation	4	CB	0	+	++	++	no

\* Due to the duration of the project and budget constraints, stated preference methods will not be employed.

\*\* To be acquired from the outcomes of Component 4 activities. In the absence of this, data availability should be considered as "+".

### 3. Scenario preparation

#### 3.1. Description of the method of scenario definition

At the first stage of the project, one scenario is identified in the Düzlerçamı pilot site by the national expert following a first round of discussion by the project experts in the General Directorate of Forestry and an academician working on the area. While doing this, discussions were held with these experts to identify (i) human activities taking place in the site (plans and projects), (ii) the plans and projects expected to influence the priority ecosystem goods and services present in the pilot site, (iii) changes expected to occur in these plans and projects, (iv) whether the influence of these changes on the ecosystem goods and services can be assessed. This approach permitted identifying the most likely and measurable changes expected to take place in the pilot site.

Secondly, one site visit (12-14 May 2014) and a project inception meeting (27-28 May 2014) held in Antalya permitted us to further discuss the drivers and levers and to come up with one alternative scenario. During the inception meetings, comments from the experts of the project (thematic and national experts and other stakeholders) were gathered to finalize the scenario development phase.

#### 3.2. Drivers and levers of change

The overall management objective of the project in the Düzlerçamı pilot site is the sustainable management of national forest resources and thereby contributing to the wealth of the society and sustainable development of the country. While industrial wood production is the primary activity in the area, the site is also being used for tourism purposes, grazing, non-wood forest products collection and hunting.

The priority ecosystem goods and services in Düzlerçamı pilot site were identified as: (i) industrial wood, (ii) biodiversity protection, (iii) recreation and tourism, (iv) carbon sequestration and (v) hunting and game products (see Section 2.11). Following a preliminary assessment as explained in Section 3.1, the most likely plans and projects expected to take place in Düzlerçamı pilot site whose effects can be measured are identified..

Alternatives such as: (i) intensification of recreation activities in the site, (ii) intensification on non-wood forest products production in the pilot site, and (iii) intensification of industrial plantation in the site were mentioned by the stakeholders in the visits and meetings. Overall it was the intensification of recreation activities on which a general consensus was as the most likely change to occur in the site. The ministry experts have confirmed that it was likely to include more recreation spots in the new plans to correspond to increased demands from Antalya citizens. Therefore this was identified as the prime lever of the project. During meetings with local

directorates of GDF, questions regarding possible locations of new recreations spots and their size were asked and information regarding this was collected.

According to the 4th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2007) the Mediterranean region is one of the regions expected to be impacted most negatively from climate change. Among these impacts, decrease in water resources, drought, forest fires, deaths related to heat waves, ecological degradations, erosion, changes in the agricultural productivity and increases in the vector related diseases are listed. The forests of the Mediterranean region are thus expected to be drastically influenced by climate change. We therefore chose climate change to be the prime driver influencing ecosystem goods and services in Düzlerçamı pilot site.

The remaining three topics considered as important for the site were eliminated due to the reasons given below:

- In 2009, a pilot study was carried out in the pilot site to assess whether industrial plantation can be carried out in the Düzlerçamı forests. The soil quality of the pilot site is told to be the highest in comparison to other parts of the Antalya Regional Directorate. Therefore, the pilot site was chosen as the best candidate to carry out this study. There are some discussions towards the efficiency of the efforts (given the rocky structure of the land, the machine use - an important component of the industrial plantation work - was told to be limited) and there is no consensus whether the industrial plantation efforts will increase in the future in the pilot site.
- We have discussed if any changes are expected in terms of illegal hunting pressure in the pilot site. We did not foresee any change in the hunting pressure but discussed if intensification of tourism can lead to a change. Because the pilot site is located very close to a big city, we presumed that any changes in the tourism pressure would not result in major changes in the existing hunting pressure at the site.
- There are ongoing efforts towards enhancing the non-wood forest production at the national scale. Under the General Directorate of Forestry, Non-Wood Forest Products Department is established specifically for this purpose. However at this stage it is not possible to estimate the existing NWFP in the pilot site, nor the direction and amount of change that will occur on the production. Therefore we decided to exclude the impact of plans to increase the NWFP production among the drivers.
- The pilot site is being used for fodder and forage by the local animal breeders, therefore grazing pressure is among the factors influencing ecosystem goods and services. However, we have discussed that the direction of changes in the grazing pressure cannot be estimated in the site and thus excluded this factor from the drivers in the pilot site.

Scenario: The base case is the situation existing on the ground where there exists (i) moderate recreation activities and (ii) moderate impacts of climate change. The alternative scenario is based upon expected changes to occur in the use of the good and services, i.e. (i) increased allocation of the forest sites to recreation activities, and (ii) increase in fire risk, alterations of the growth rate of trees due to climate change.

Drivers or levers	Expected impact on ecosystem goods and services <sup>7</sup> (intensity: --, -, 0, +, ++)				
	Industrial wood	Biodiversity protection	Recreation and tourism	Carbon sequestration	Hunting and game products
<b>Scenario I</b>					
Impacts of climate change	--	--	--	--	-*
Increased allocation of forest sites to recreation activities	-	-	++	-	0**

\* Under the General Directorate of Nature Conservation and National Parks, regular inventories are being carried out especially towards big mammal species to estimate the population sizes of different species. However data collected in these studies are very heterogeneous in terms of methodology, quality and data collection effort. Therefore this

<sup>6</sup>IPCC (ed.). 2007. Climate change 2007: the physical science basis; Contribution of Working Group I to the fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY.

<sup>7</sup> See table B of the form concerning the importance of forest goods and services on pilot sites, sent on 22 April 2013.

information cannot be used to come up with population trends. Thus we cannot model how these trends can change with climate change and impact the hunting and game products in the pilot site. Therefore even if this ecosystem good is expected to be impacted by climate change, we will not be able to quantify it in the CBA assessment.

*\*\*Intensifying ecotourism and recreation:* The two types of activities are mainly carried out in different parts of the pilot site and in different periods, therefore we will not assess the impact of intensifying ecotourism and recreation on hunting and game products in the CBA.

## 4. Socio-economic valuation of selected goods and services

### 4.1. Industrial wood

#### 4.1.1. Description of the method selected

**Step 1 – Data collection and verification:** At a first step, GIS data of Düzlerçamı pilot site will be requested from the General Directorate of Forestry: map of land tenure, stand types, ecological functions assigned to the site, digital elevation model (DEM), slope (vector map), soil map, hydrography, settlements, road networks, protected areas, water bodies, etc. Furthermore data on annual production tables will be requested to gather past data about on the ground application towards industrial wood production. Finally information on management costs will be gathered for the pilot site.

The amount of industrial wood to be produced in the pilot site is planned through management plans of 10 years (the last management plan of the site is covering 2012-2021). To refer to past productions in the site, data on annual production tables will be explored. And information on the economic income generated from industrial wood production in the past will be gathered from Forest Production and Marketing Department. These values will be verified together with the Antalya Regional Directorate of Forestry Düzlerçamı experts, experts involved in preparing the management plan and also experts in the Silviculture Department and in Forest Production and Marketing Department.

During the preliminary contacts we had on the ground, data on annual income generated in terms of euros and corresponding annual expenses towards harvesting the industrial wood on the ground appeared to be the only existing information between years 2004 and 2013.

Using past market prices and different discount rates, the current and future (under scenarios) demand and supply functions will be produced, differential value at the timber price will be valued and a potential consumer surplus will be estimated. The reduced harvest costs will be incorporated into the assessment through the impacts of driver and lever under the scenario.

#### 4.1.2. Valuation method implementation of the good or service

Steps/sub-steps	Description and details	Tools (surveys, software...)/data to obtain	Stakeholders involved /population target (if survey)	Resources (humans, logistics, technical, time, period...)	Expected results and deliverable	Main risks and contingency plan
<b>Step 1 – Data collection and verification</b>						
Sub-step 1.1 – Data collection	GIS based data of Düzlerçamı pilot site and management costs	Data purchase; face to face, telephone, fax and emails	General Directorate of Forestry Antalya Regional Directorate of Forestry experts, experts in the Silviculture and Forest Production and Marketing departments and experts involved in the preparation of the management plan of the site	Human: Communications and data collection, Logistics: GIS software and data, Technical: internal resource Work time: 1 month	Full dataset	Missing data or integral errors to GIS based data, absence of inventory books Contingency Plan: Data verification through the aid of forestry experts
Sub-step 1.2 - Data verification	Control and completion of data	Face to face, telephone, fax and emails	General Directorate of Forestry Antalya Regional Directorate of Forestry experts, experts in the Silviculture and Forest Production and Marketing departments and experts involved in the preparation of the management plan of the site	Human: Communications and data collection, Logistics: GIS software and data, Technical: internal resource Work time: 2 weeks	Corrected and completed dataset	Errors or missing information which can not be completed, Contingency plan: Data completion with extrapolation through the aid of experts on the ground
<b>Step 2 – Data analysis</b>						

<b>Steps/sub-steps</b>	<b>Description and details</b>	<b>Tools (surveys, software...)/data to obtain</b>	<b>Stakeholders involved /population target (if survey)</b>	<b>Resources (humans, logistics, technical, time, period...)</b>	<b>Expected results and deliverable</b>	<b>Main risks and contingency plan</b>
Sub-step 2.1 – Data analysis	Calculation of the industrial wood production	Telephone calls, emails, face to face meetings	General Directorate of Forestry Antalya Regional Directorate of Forestry experts, experts in the Silviculture and Forest Production and Marketing departments and experts involved in the preparation of the management plan of the site	Human: internal and external, Logistics: GIS software and analysis tools, Work time: 2 months	Analysis outcomes	Insufficient input from the experts. Contingency Plan: To request external support from other stakeholders (e.g. academicians).



## 4.2. Recreation and Tourism

### 4.2.1. Description of the method selected

**Step 1 – Data collection and verification:** In the assessment, tourism and recreation activities will be considered together. Past data on the number of visitors/year at Güver Cliff will be explored. Furthermore information on the rent costs, net income and number of visitors of the recreation spots will be explored. TÜRSAB (Association of Turkish Travel Agencies) and major tourism companies in the region will also be contacted to gather further information. The private tourism companies active in the region will be identified through the aid of TÜRSAB and Antalya Regional Directorate of Forestry experts.

**Step 2 – Data analysis:** In general, the pilot site is used mainly for recreation purposes (through the present recreation spots). Market price method will be employed to assess the recreation potential of the pilot site. Furthermore, the majority of the transfers to the recreation spots are carried out using private transportation, and a small proportion by city buses. The gasoline prices and the distance of the recreation spots to Antalya city will be used to assess the travel cost of the people to arrive at the recreation spots. The annual rent costs and net incomes of the recreation spots will also be incorporated into the analysis.

Using past rent prices, number of visitors and net incomes of the recreation spots and different discount rates, the current and future (under scenarios) demand and supply functions will be produced, a potential consumer surplus will be estimated. The expected increase in recreation incomes will be incorporated into the assessment through the impacts of driver and lever under the scenario.

#### 4.2.2. Valuation method implementation of the good or service

Steps/sub-steps	Description and details	Tools (surveys, software...)/data to obtain	Stakeholders involved /population target (if survey)	Resources (humans, logistics, technical, time, period...)	Expected results and deliverable	Main risks and contingency plan
<b>Step 1 – Data collection and verification</b>						
Sub-step 1.1 – Data collection	Number of visitors at the , recreation spots, rent prices and net income by the municipality and private companies renting the recreation spots	Data purchase; face to face, telephone, fax and emails	General Directorate of Forestry Antalya Regional Directorate of Forestry experts, TÜRSAB, private tourism companies, Ministry of Culture and Tourism experts	Human: Communications and data collection, Logistics: GIS software and data, Technical: internal resource Work time: 8 weeks	Full dataset	Missing data or integral errors to GIS based data, Contingency Plan: Data verification through the aid of tourism experts
Sub-step 1.2 - Data verification	Control and completion of data	Face to face, telephone, fax and emails	General Directorate of Forestry Antalya Regional Directorate of Forestry experts, TÜRSAB, private tourism companies, Ministry of Culture and Tourism experts	Human: Communications and data collection, Logistics: GIS software and data, Technical: internal resource Work time: 3 weeks	Corrected and completed dataset	Errors or missing information which can not be completed, Contingency plan: Data completion with extrapolation through the aid of experts on the ground
<b>Step 2 – Data analysis</b>						
Sub-step 2.1 – Data analysis	Travel cost and market price analysis	Telephone calls, emails, reports	General Directorate of Forestry Antalya Regional Directorate of Forestry experts, TÜRSAB, private tourism companies, Ministry of Culture and Tourism	Human: internal and external, Logistics: GIS software and analysis tools, Work time: 2,5 months	Analysis outcomes	Insufficient input from the experts. Contingency Plan: To request external support from other stakeholders (e.g. tourism companies, local guides).

<b>Steps/sub-steps</b>	<b>Description and details</b>	<b>Tools</b> (surveys, software...)/ <b>data to obtain</b>	<b>Stakeholders involved /population target (if survey)</b>	<b>Resources</b> (humans, logistics, technical, time, period...)	<b>Expected results and deliverable</b>	<b>Main risks and contingency plan</b>
			experts			

## 4.3. Carbon sequestration

### 4.3.1. Description of the method selected

**Step 1 – Data collection and verification:** At a first step, carbon sequestration estimates given by the General Directorate of Forestry at the national scale for coniferous and broad-leaved forests at the national scale will be gathered. For this, experts of the fourth component will be contacted and if present, estimates for the pilot site will be used. Data on different stand types present in the pilot site will be employed for the calculations of the carbon sequestration ecosystem good. Finally, social cost of carbon estimates in OECD or USA or figures according to Ackerman and Stanton<sup>8</sup> will be used.

**Step 2 – Data analysis:** The calculation method and the assumptions generated by the Directorate are used all around the country to estimate the above and below ground carbon sequestration amount. The coefficients used in this method is generic. Unfortunately the sequestration data specific to the pilot site will not be produced in the framework of the Component 4 in advance, therefore we will not be able to use it to assess the carbon sequestration potential of the forest.

Using the current and future (under scenarios) carbon sequestration potential of the site, demand and supply functions will be produced, a potential consumer surplus will be estimated. The expected decreases in sequestered carbon will be incorporated into the assessment through the impacts of driver and lever under the scenario.

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<sup>8</sup> [http://www.e3network.org/papers/Climate\\_Risks\\_and\\_Carbon\\_Prices\\_executive-summary\\_full-report\\_comments.pdf](http://www.e3network.org/papers/Climate_Risks_and_Carbon_Prices_executive-summary_full-report_comments.pdf)

#### 4.3.2. Valuation method implementation of the good or service

Steps/sub-steps	Description and details	Tools (surveys, software...)/data to obtain	Stakeholders involved /population target (if survey)	Resources (humans, logistics, technical, time, period...)	Expected results and deliverable	Main risks and contingency plan
<b>Step 1 – Data collection and verification</b>						
Sub-step 1.1 – Data collection	Carbon sequestration estimates for coniferous and broad-leaved forests at the national scale (if present specifically for the site), SCC estimates in OECD or USA or figures according to Ackerman and Stanton.	Data purchase; face to face, telephone, fax and emails	General Directorate of Forestry Antalya Regional Directorate of Forestry experts, Carbon credit experts, certificate companies, academicians	Human: Communications and data collection, Logistics: GIS software and data, Technical: internal resource Work time: 6-8 weeks	Full dataset	Missing data or integral errors to GIS based data, Contingency Plan: Data verification through the aid of carbon credit experts and academicians
Sub-step 1.2 - Data verification	Control and completion of data	Face to face, telephone, fax and emails	General Directorate of Forestry Antalya Regional Directorate of Forestry experts, Carbon credit experts, certificate companies, academicians	Human: Communications and data collection, Logistics: GIS software and data, Technical: internal resource Work time: 2 weeks	Corrected and completed dataset	Errors or missing information which can not be completed, Contingency plan: Data completion with extrapolation through the aid of experts on the ground
<b>Step 2 – Data analysis</b>						
Sub-step 2.1 – Data analysis	Estimates on the above and below ground carbon sequestration	Telephone calls, emails, reports	General Directorate of Forestry Antalya Regional Directorate of	Human: internal and external, Logistics: GIS software and analysis tools,	Analysis outcomes	Insufficient input from the experts. Contingency Plan: To request external support

<b>Steps/sub-steps</b>	<b>Description and details</b>	<b>Tools (surveys, software...)/data to obtain</b>	<b>Stakeholders involved /population target (if survey)</b>	<b>Resources (humans, logistics, technical, time, period...)</b>	<b>Expected results and deliverable</b>	<b>Main risks and contingency plan</b>
	potential in the pilot site and corresponding and corresponding SCC.		Forestry experts, Carbon credit experts, certificate companies, academicians	Work time: 2 months		from other stakeholders.

## 5. Cost benefit analysis

### 5.1. Step 1: Definition of the event, project or policy

**Goal of CBA:** The goal of the cost benefit analysis in Düzlerçamı pilot site is to assess impacts of different management activities on the ecosystem goods and services supplied by the forest ecosystem. Different management activities with a significant impact of the ecosystems goods and services will be assessed to identify their impacts and to use this information towards sustainable use of natural resources in the site.

**Scenario:** The base case is the situation existing on the ground where there exists (i) moderate recreation activities and (ii) moderate impacts of climate change. The alternative scenario is based upon expected changes to occur in the use of the good and services, i.e. (i) increased allocation of the forest sites to recreation activities, and (ii) increase in fire risk, alterations of the growth rate of trees due to climate change.

**Time horizon and discount rate:** Time horizon of the project is selected as 40 years taking into account the production plans (to be prepared for 20 years periods in the future for Turkish pine species) and 2050 climate change projections. Given that investment risk is accepted as high in Turkey, discount rate will be chosen as 5%. In the sensitivity analysis different discount rates will be employed.

### 5.2. Step 2: Identification of relevant project impacts

#### **Industrial wood**

Climate change: There exists an M.Sc. thesis (Yalçın, S. 2012) completed in the Middle East Technical University (METU) Biology Department, titled: Modeling the current and future ranges of Turkish pine (*Pinus brutia*) and Oriental beech (*Fagus orientalis*) in Turkey in the face of climate change. Ways to incorporate the outcomes of this study can be explored. Furthermore major impacts of climate change on the industrial wood production at pilot site can be quantified through two indicators: (i) annual increment wood (growth rate; to be delivered by Comp. I following a literature survey), (ii) projected changes in the fire risk (to be produced under the framework of the Component I, will be used if delivered at an early phase of the assessments). The production amount depends on many factors and not only the annual increment, i.e. management decisions, intensity of demands, managers' approach at the local level, etc. Therefore the impact of climate change on industrial wood production will not be deducted through changes in production amounts but through the annual increment and fire risk. In the assessment, together with forest experts and literature data, the amount of decrease in annual increment wood and expected increases in fire risk will be incorporated. Accordingly changes in the industrial wood production will be estimated.

Increased allocation of forest sites to recreation activities: We will try to use expert opinion on the new recreations spots which can be delineated in the pilot site to deal with the increasing demand from Antalya citizens. We will estimate the decreased harvest due to increased allocation of production sites to recreation activities. We were informed on the ground that it was mainly the old stands (requiring less maintenance work) which are delineated as recreation spots. We will explore the industrial wood production in such stands and try to come up with projected decreases in the harvest accordingly.

#### **Recreation and Tourism:**

Climate change: The recreation activities are expected to be negatively influenced by climate change in the pilot site and in more general terms in the Mediterranean Region. Together with the experts of Component I, discussions will be held to assess whether the pilot site will continue to serve as a recreation hotspot offering colder temperatures to Antalya people.

Increased allocation of forest sites to recreation activities: A direct positive relationship is expected between increased allocation of forest sites to recreation activities on the recreation and tourism activities ecosystem good and service in the pilot site. Together with the forest experts, alternatives on future coverage of recreation spots in the pilot site will be developed.

#### **Carbon sequestration:**

Climate change: The information on the carbon sequestration and how this is influenced by climate change will be gathered from the literature surveys to be carried out under the Component I and 4.

Increased allocation of forest sites to recreation activities: The forest experts in the pilot site have explained the possible negative influence of recreation activities and human presence due to compressing the soil on the growth rate of the forest. However, the recreation spots are mainly delineated at old forests – expected to have lower carbon sequestration potential than young stands, in literature – this negative impact might be negligible. Further research will be carried out to come up with a conclusion on this topic.

### 5.3. Step 3: Physical quantification of relevant impacts

	Expert to contact	Available data or studies	Approach (qualitative, quantitative, modeling)	Resources (humans, financial, time,...)
<b>Climate change</b>				
Industrial wood	Forest experts at the local and national scale, academicians	Projections towards Turkish pine, climate projections at the national scale	Quantitative	Human: Consultants and national expert Financial: Travel costs, communication costs Time: 1 months
Recreation and tourism	Tourism experts, forest experts	Existing use of the pilot site as recreation spot	Qualitative	Human: Consultants and national expert Financial: Travel costs, communication costs Time: 1 months
Carbon sequestration	Forest experts at the local and national scale, academicians	Climate projections at the national scale, Literature data from Component 1 and 4	Quantitative	Human: Consultants and national expert Financial: Travel costs, communication costs Time: 1 months
<b>Increased Allocation of Forest Sites to Recreation Activities</b>				
Industrial wood	Forest experts at the local and national scale, academicians	Existing use of the pilot site as recreation spot, annual harvest	Qualitative	Human: Consultants and national expert Financial: Travel costs, communication costs Time: 1 months
Recreation and tourism	Tourism experts, forest experts	Existing use of the pilot site as recreation spot	Quantitative	Human: Consultants and national expert Financial: Travel costs, communication costs Time: 1 months
Carbon sequestration	Forest experts at the local and national scale, academicians	Existing use of the pilot site as recreation spot	Qualitative	Human: Consultants and national expert Financial: Travel costs, communication costs Time: 1 months

### 5.4. Step 4: Monetary valuation of relevant impacts

In this step of the assessment, impacts will all be valued in euros. Marginal social costs and benefits will be identified for all drivers and levers and the priority ecosystem goods and services. Given the time constraints of the project, we will focus on the impacts which are quantifiable in terms of costs and benefits and those which cannot be quantifiable will be excluded from the analysis. The market prices and social cost of carbon will thus be used to come up with marginal social costs and benefits. Finally, the time periods when the costs and benefits will occur be identified.



### **5.5. Step 5: Discounting of costs and benefits**

The discount rate for the Düzlerçamı pilot site will be chosen as 5%. Furthermore alternative discount rates of 4 and 6 % will also be applied. In the assessment, declining discount rates will be employed over a time period of 40 years.

### **5.6. Step 6: Calculating the CBA performance indicators**

Net present value (NPV) and/or Benefit-cost ratio will be chosen as the CBA performance indicator in the assessment. Alternative time frames and discount rates will be considered in the assessment.

### **5.7. Step 7: Performing sensitivity analysis**

The sensitivity analysis will be performed using scenario analysis. Potential future states for the site will be identified (best, worst and most-likely scenarios). Different discount rates (4%, 5% and 6%) will be used over a period of 40 years to assess the cumulative impacts of (i) climate change, and (ii) increased allocation of forest sites to recreation activities.

### 6. Provisional planning of activities (timetable)

The timetable includes activities in relation with the implementation of the socio-economic assessment of forest goods and services, meeting, etc., as well as activities in relation with deliverables & milestones and synthesis report on work and results in the pilot site.

	2014												2015												2016				
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M
Identification of the assessment context			X	X																									
Description of the priority goods and services for the study			X	X																									
Scenario preparation				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Method definition				X	X																								
Implementation				X	X	X	X	X	X	X	X	X	X	X															
Global Analysis of levers and drivers of change					X	X	X	X	X	X	X	X	X	X															
Socio-economic valuation of goods and services selected			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Description of goods and services and available data analysis			X	X	X	X																							
methods Choice and implementation					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
results Analysis															X	X	X	X	X	X	X	X							
Cost benefit analysis										X	X	X	X	X	X	X	X	X	X	X	X	X							
S1: event, project or policy definition									X	X	X	X	X																

	2014												2015												2016													
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M									
S2: Identification of relevant project impacts									X	X	X	X	X	X																								
S3: Physical quantification of relevant impacts										X	X	X	X	X	X	X	X																					
S4: Monetary valuation of relevant impacts												X	X	X	X	X	X	X																				
S5: Discounting of costs and benefits																X	X	X																				
S6: Calculating the CBA performance indicators																	X	X	X																			
S7: Performing sensitivity analysis																	X	X	X	X	X	X																
Progress report						X	X	X	X																													
Synthesis report																			X	X	X	X	X	X														
Presentation of results																			X	X	X	X	X	X														
Regional synthesis workshop																											X	X										