ALTERFOR

ALTERFOR 3rd cross-project meeting

12-14 June 2018, Porto (Portugal)

Travellab

Case study area - Vale do Sousa

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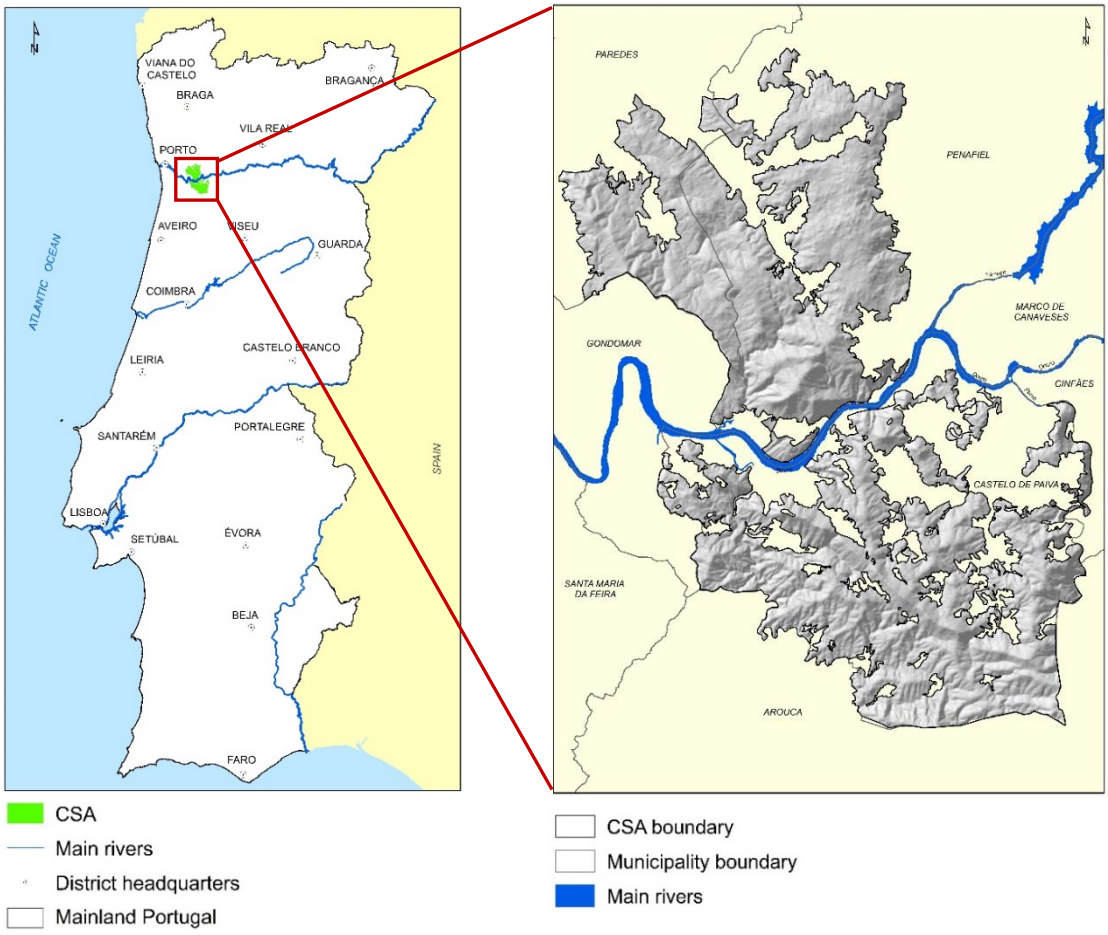
Case study area – Vale do Sousa

The case study area (CSA) of *Vale do Sousa* is located in North-Western Portugal, approximately 50 km East of *Porto*. The CSA extends over an area of 14,840 ha corresponding to two ZIF areas (joint collaborative management area)[1] separated by the Douro River: *Entre-Douro-e-Sousa* (north of the Douro River) and *Paiva* (south of the Douro River).

Figure 1: Location of the CSA - Vale do Sousa



Elevation varies between from 20 to 710 m in the South and to 400 m in the North. Its topography is very uneven, and slopes can be very steep. Soils are mostly poor, well drained and thin. This region is a rural area and has a Mediterranean climate with an Atlantic influence. Average annual precipitation is 1,240 mm but unevenly distributed throughout the year, with three very dry months (June, July and August) with average rainfall of 31.1 mm and three very humid months (October, November and December) with an average precipitation of 170.4 mm. The average temperature varies annually between 9.5 C in January and 20.8 C in August.

[1] ZIF was defined as "continuous forest areas with between 1000 and 30,000 ha, under a mandatory intervention plan and administered by a single managing entity". The ZIF law calls for establishing a multi-owner contiguous surface of at least 750 ha and prescribes that a minimum of half of this working area should belong to the forest owners who voluntarily become members of the ZIF and are willing to abide by the collective forest management rules they will define and approve. To be created, the ZIF should also have a managing body, responsible for drawing up a global Forest Management Plan (PGF) for the whole area.

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Land use and tree species

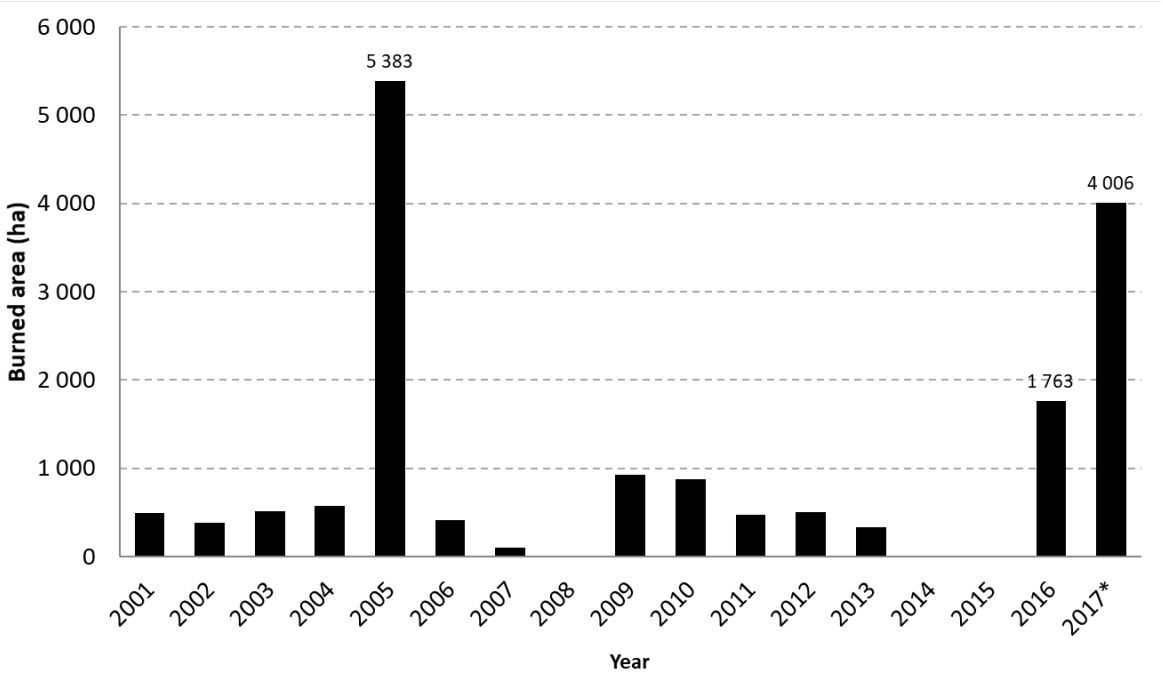
Forests are the main land use. The predominant forest species are eucalypt (*Eucalyptus globulus* Labill) and maritime pine (*Pinus pinaster* Aiton) in both pure and mixed stands. *Gonipterus platensis* pest constitutes a major problem for eucalypt forest in the CSA. Eucalypt pulpwood and maritime pine sawlogs rank very high in the list of ecosystem services provided by *Vale do Sousa*.

Forest fires

Forest fires have been very frequent in the three municipalities over which the *Vale do Sousa* CSA is distributed (Figure 3). There were years with particularly high incidence, such as 2005, 2016 and 2017, each of these years with more than 1,500 hectares of burned forest area in the CSA. The year of 2005 was particularly catastrophic, the total burned area in the CSA was 5,383 ha (Figure 2). Overall, over the period 2001 - 2017 the total forest burnt area in the CSA amounted to 16,756 ha.

These events have had a great influence on management decisions by forest owners. They prefer short rotation eucalypt stands, also because in the long run, the income loss is smaller in the case of wildfire. Other forest species with longer rotations, e.g. maritime pine, chestnut, rank lower in forest owners' preferences.

Figure 2: Burned area in the CSA - Vale do Sousa (2001-2017)



** Provisional data*

Source: ICNF, 2018b

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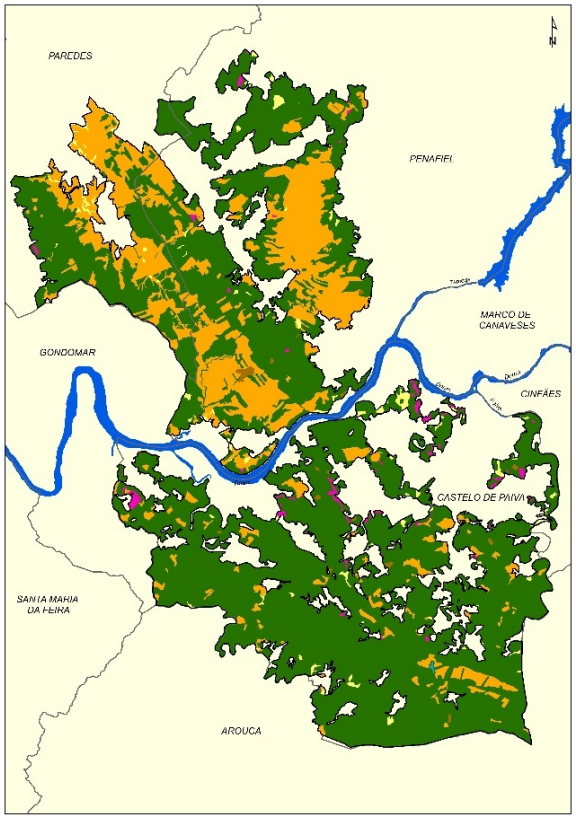
Figure 3: Land use and forest fires (2013-2017) in the CSA - Vale do Sousa

Land Use



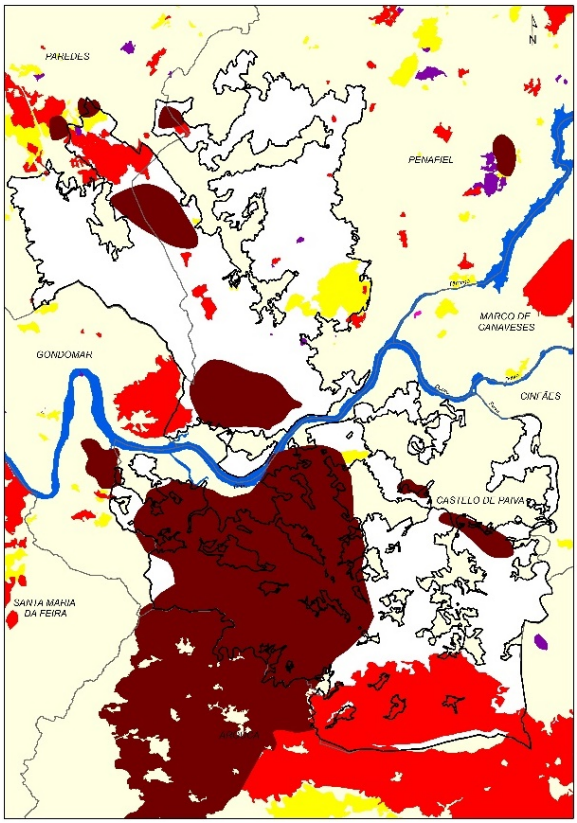
CSA boundary
Municipality boundary
River

LAND USE TYPE

Forest land
Shrub/ Grassland
Wetland
Cropland
Other land
Settlements

Source: INTEGRAL, 2011

Forest fires



CSA boundary
Municipality boundary
River

BURNED AREA (Year)

2017 (provisional data)
2016
2015
2014
2013

Source: adapted from ICNF, 2018b

Nature conservation

Nature conservation areas are residual in the CSA. There are only two Sites of Community Importance (SCIs) located in the CSA (ICNF, 2018 a):

a) ***Valongo*, with 7.5 ha,** situated in the Northwest;

b) ***Paiva River*, with 454.3 ha**, located in the East area of the CSA.

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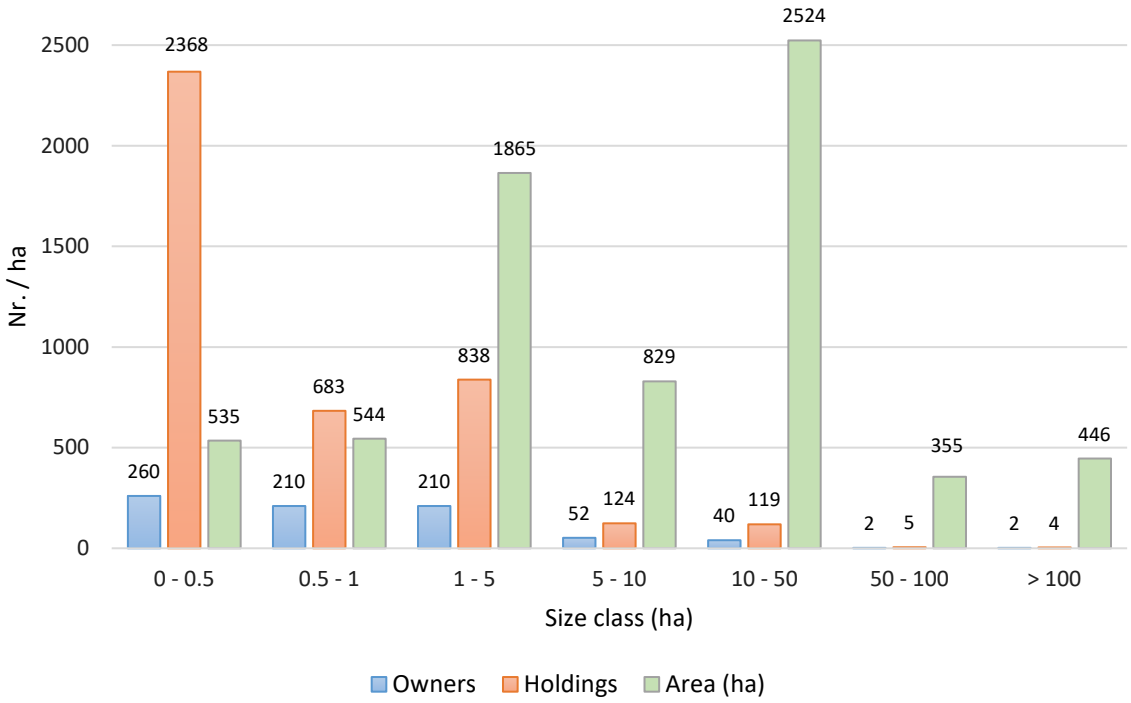
Management

The local forest owners' association - AFVS is the management entity of the two ZIF and the total number of forest owners who are members of these ZIF is 360. Nevertheless the area includes other forest owners who own stands within the ZIF that are not yet members. Vale do Sousa might be considered representative of forest management practices, and forest ownership structure, of the North-Western Portugal forestry sector. Forest holdings are typically of small scale, fragmented in multiple blocks, almost all being privately owned.

In the absence of official data on the current situation regarding the number and size of forest holdings for the region, an estimation based on the 318 founding members of the ZIF is illustrative of the fragmentation and small-scale features of the forest holdings in the CSA (Figure 4).

Figure 4: Forest holdings structure



Source: AFVS, 2014

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Forest management models

Eucalypt (*Eucalyptus globulus* Labill) is the most important species in terms of total area, both in Portugal and in the CSA. Out of the four FMMs in the Vale do Sousa CSA three encompass eucalypt. The fourth encompasses chestnut (*Castanea sativa* Mill). There are four alternative FMM for the CSA: pure stands of maritime pine (*Pinus pinaster* Aiton.), pure stands of pedunculate oak (*Quercus robur* L.), pure stands of cork oak (*Quercus suber* L.) and riparian species. All FMMs provide further carbon stock storage and may also contribute to standing volume at the end of planning horizon as well as to the supply of other ecosystem services (biodiversity and regulatory services). The maximum contiguous harvesting area is less than 50 ha to address environmental concerns with impacts of harvests.

Mixed eucalypt and maritime pine (FMM1 and FMM2)

These are two very similar models that distinguish themselves by the different mixtures between maritime pine and eucalypt. In the case of FMM1 maritime pine is dominant while in the case of FMM2 eucalypt is dominant. They both target the supply of pine sawlogs and eucalypt pulpwood.

FMM1: mixed maritime pine and eucalypt and FMM2: mixed eucalypt and maritime pine		
	Maritime pine	**Eucalypt**
Spacing plantation	2.25 m between lines and 2 m in the lines	3.5 m between lines and 2 m in lines
Density (trees/ha)	2200	1400
Fuel treatments	every 5 years	every 5 years
Pre-commercial thinning	10 years	-
Commercial thinning	every 5 years in the period from 20 to 50 years of age (up to 5 years before the clearcut) based on a spacing factor (Wilson) of 0.27	-
Stool thinning	-	leaving an average of 2 shoots per stool at year 3 of each cycle
Harvest ages	40, 45, 50, 55 or 60 years	-
Coppice cycle	-	10 to 14 years

Eucalypt grows fast and typically it is harvested three or more times during one rotation of maritime pine. Therefore, these mixed stands are uneven-aged over most of the planning horizon: only after plantation and during the first rotation of eucalypt do the trees of both species have the same age. In the mixed forest the harvests of eucalypt and maritime pine are performed independently, when the species reach the harvest age. Stakeholders suggested the conversion to other FMMs (pure even aged stands) to promote the management and enhance productivity. The area under the two FMMs is thus expected to decrease with conversions to pure stands (even-aged).

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Figure 5: FMM1 and FMM2: mixed maritime pine and eucalypt stands for production of pine sawlogs and eucalypt pulpwood

FMM1: Mixed maritime pine and eucalypt forest system, dominance of maritime pine

FMM2: Mixed eucalypt and maritime pine forest system, dominance of eucalyptus

Pure chestnut stands (FMM3)

This FMM targets the supply of chestnut timber. It has not been possible to carry out thinning's in the case study area. The reasons why stands are not thinned are: a) the high mortality of trees in mature stands, caused by *Phytophthora cinnamomi*, responsible for the ink disease, and by *Endothia parasitica* And & And., responsible for the chestnut cancer and b) incipient forest management by forest owners. The area of mixed eucalyptus and maritime pine stands (mostly uneven-aged) and shrublands may be converted to pure (even-aged) chestnut stands to increase the supply of hardwood sawlogs and the potential of the forest to provide recreational opportunities.

FMM3: pure chestnut stands	
Spacing plantation	4 m between lines and 2 m in the lines
Density (trees/ha)	1250
Fuel treatments	every 5 years
Commercial thinning	every 5 or 10 years in the period from 20 to 55 years of age, based on the diameter of the trees
Harvest ages	40, 45, 50, 55, 60, 65 or 70 years

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Pure eucalypt stands (FMM4)

Eucalypt grows in a coppice system. This FMM targets the supply of eucalypt pulpwood. The seedlings are genetically improved and/ or hybrid but no genetically modification is done. Pesticides are applied mainly in the eucalypt trees because of eucalypt weevil or eucalypt snout beetle pest (*Gonipterus platensis*).

FMM4: pure eucalypt stands	
Spacing plantation	3.5 m between lines and 2 m in the lines
Density (trees/ha)	1400
Fuel treatments	every 5 years
Stool thinning	leaving an average of 2 shoots per stool at year 3 of each cycle
Coppice cycle	10 to 14 years

Pure maritime pine stands (FMM5) - *alternative FMM*

The main reasons for considering this FMM are: a) there is a small area of the CSA occupied with unmanaged maritime pine stands; b) there is a strong internal demand for pine wood; c) technical know-how exists in the CSA. Maritime pine is the fastest growing alternative for most of the area within the CSA. Besides the income from the final cut, this FMM also provides revenues that result from several commercial thinning's.

FMM5: pure maritime pine stands	
Spacing plantation	3 m between lines and 3 m in the lines
Density (trees/ha)	1110
Fuel treatments	every 5 years
Pruning	10-15 and 15-20 years
Pre-commercial thinning	15 years
Commercial thinning	every 10 years in the period from 25 to 45 years of age, based on a spacing factor (Wilson) of 0.23
Harvest ages	35, 40, 45 or 50 years

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Pure pedunculated oak stands (FMM6) - *alternative FMM*

Pedunculate oak is a good alternative for abandoned agricultural land where the soils are fertile and deep with good water availability, conditions needed for oak growth. Because of stronger planting restrictions on eucalyptus the forest owners are looking for alternative species for wood production. However for forest owners this FMM might not be attractive because of the long-rotation periods.

FMM6: pure pedunculate oak stands	
Spacing plantation	3 m between lines and 2 m in the lines
Density (trees/ha)	1600
Fuel treatments	every 5 years
Pruning	23 years
Pre-commercial thinning	18 - 22 years
Commercial thinning	13 m (25-29 years); 16 m (35-39 years); 18 m (43-47 years)
Harvest ages	40, 50 or 60 years

Pure cork oak stands (FMM7) - *alternative FMM*

In the CSA there are several spots with spontaneous regeneration of cork oak suggesting that with proper guidance it could succeed and gradually replace mixed stands with maritime pine and eucalypt. Forest mosaics with cork oak and other broadleaves could help reduce fire and diseases risks. There is a strong internal market demand for cork because the supply is scarce.

FMM7: pure cork oak stands	
Spacing plantation	3 m between lines and 2 m in the lines
Density (trees/ha)	1600
Fuel treatments	every 5 years
Pre-commercial thinning	15 years
Commercial thinning	30, 40, 58 and 76 years
1st debarking	30 years
2nd debarking	40 years
3rd debarking	each 9 years

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Riparian species (FMM8) - *alternative FMM*

This FMM is not focused on the supply of wood but in alluvial ecosystems sustainability, nature conservation and watershed management. It encompasses several groups of plant communities, with an overstorey that is dominated by *Alnus glutinosa*, *Salix atrocinera*, *Salix alba*, *Fraxinus angustifolia*, *Populus nigra* and that contributes to the sustainability of riverine ecosystems and to the services they provide. Moreover, this FMM contributes to biodiversity by providing habitats for specific flora and fauna both on the tree itself and in the flooded root system. Moreover, it addresses water filtration and purification issues in waterlogged soils. The root system of this FMM species helps control floods and stabilize riverbanks.

Figure 6: FMM8: riparian species

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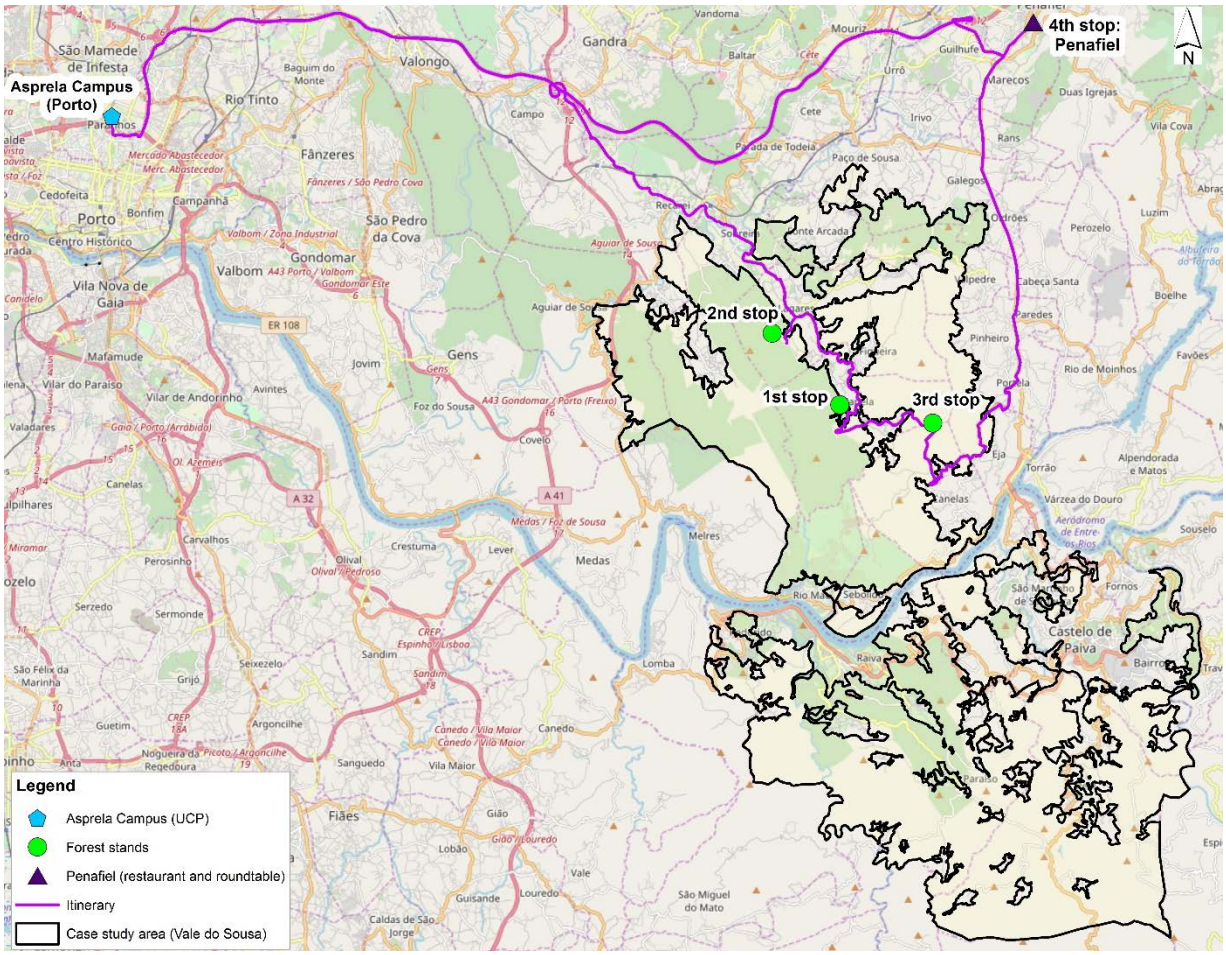
Field visit

Itinerary

Our trip begins in Porto from the cross-project meeting venue - Portuguese Catholic University and extends over 50 km to the East when we will reach the CSA. From then on, we will travel Southeast to the 3 forest stands to visit. Next we will travel to Penafiel to the Northeast.

Figure 7: Itinerary and location of the CSA - Vale do Sousa



Objective

The main objective of the visit is to promote the knowledge exchange among ALTERFOR partners in the context of the Portuguese CSA and also to learn directly from the CSA stakeholders.

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1st stop: young pure eucalypt stand

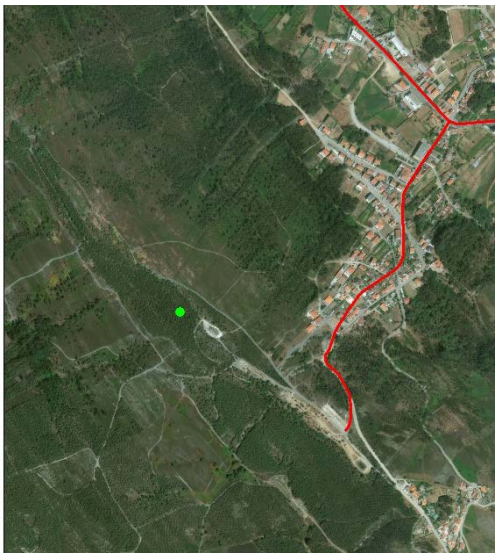
In this stop we will be accompanied by Mr. João Melo Bandeira from the Navigator Company, the largest forest owner and the biggest pulp and paper industry in Portugal. We will visit a six-year old, first coppice cycle eucalypt stand with an area of 2.93 ha. The management objective is the supply of pulpwood.

Young pure eucalypt stand	
Soil type	Humic Cambisols (shale - transition to granite)
Slopes	0-20% 1.22 ha; 20-35% 1.18 ha; >35% 0.53 ha
Plantation date	November 2012
Type of plants	Clonal
Plantation density (trees/ha)	In terraces: 1,000 Without terraces: 1,200
Fertilization	With planting Maintenance
Expected clear cut age	12 years
Expected volume at clear cut	200 m^3 ha^{-1}

2nd stop: adult pure maritime pine stand

In this stop we will be accompanied by Mr. Luís Unas from the Forest Management Fund - Floresta Atlântica. We will visit what remains of a 60.26 ha pilot area of a 22-year old maritime pine stand after the 2017 wildfires. The management objective is the supply of pine wood and the corresponding economic returns.

Pure maritime pine stand	
Soil type	Humic Cambisols (shale)
Plantation date	1996
Plantation spacing	4 x 1,5 m
Plantation density (trees/ha)	1667
Expected thinning age*	22 and 28 years
Expected clear cut age*	35 years
Expected yield *	7.5 m^3 ha^{-1} yr^{-1}



*Before the 2017 fire

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3rd stop: adult pure eucalypt stand

In this stop we will be accompanied by Mr. Teotónio da Silva Pereira, a small scale forest owner of the CSA. We will visit a 12-year old second coppice cycle eucalypt stand with 0.55 ha.

Adult pure eucalypt stand	
Soil type	Humic Cambisols (shale)
Plantation date	April 1997
First coppice cycle cut	2016
Plantation spacing	1.8 x 2.5 m
Plantation density (trees/ha)	2200
Expected clear cut age	12 year coppice

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Roundtable with stakeholders

Stakeholders will present their views on hot policy issues and current and alternative FMMs. We will have a debate between panel members and the audience focusing on the FMM and their implementation.

	Américo Mendes *AFVS - Sousa Valley Forest Owners Association* ALTERFOR non-academic partner www.afvs.ws
	João Melo Bandeira *The Navigator Company* Industrial forest owner http://en.thenavigatorcompany.com
	Luís Unas *Floresta Atlântica* Forest investment fund www.floresta-atlantica.pt
	Manuel Tavares Forest owner
	João Pinho *ICNF - Institute for the Nature Conservation and Forests* Forest National Authority www.icnf.pt
	João Branco *Quercus - National Association for Nature Conservation* Environmental NGO www.quercus.pt
	Paulo Bessa *Municipality of Penafiel* Forestry Municipal Office www.cm-penafiel.pt
	Miguel Rodrigues *Municipality of Paredes* Forestry Municipal Office www.cm-paredes.pt

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