

CASE STUDY AREA: Chamusca, Portugal

Case study description

The Zona de Intervenção Florestal (ZIF) Chouto Parreira (ZIF_Ch) is located in a rural area of the Chamusca county with a Mediterranean climate in Central Portugal. The ZIF_Ch area extends over 21,978 ha and was classified into 5,887 stands. It is dominated by cork-oak (*Quercus suber*) and eucalypt (*Eucalyptus globulus* Labill) stands - 57% and 29% of the ZIF_Ch area, respectively. Maritime pine (*Pinus pinaster* Ait.) and Umbrella pine (*Pinus pinea*) stands occupy about 6% of the ZIF_Ch area. It is a privately owned.

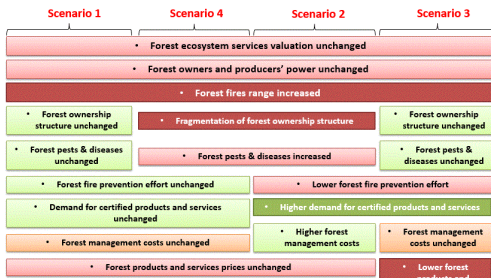
Cork and eucalypt pulpwood rank very high in the list of ecosystem services provided by ZIF_Ch. Recreation and carbon storage are also important services. The list of ecosystem services includes cork oak fuelwood, Maritime pine sawlogs and Umbrella pine cones (pine nuts).

| Ecosystem Services Tradeoffs | Cork oak | Eucalypt pulpwood | Mpine Sawlogs | Cones | Carbon stock |
|------------------------------|-------------|-------------------|---------------|-------------|--------------|
| Cork oak | Competitive | Competitive | Competitive | Competitive | Neutral |
| Eucalypt pulpwood | Competitive | Competitive | Competitive | Competitive | Competitive |
| Mpine Sawlogs | Competitive | Competitive | Competitive | Competitive | Neutral |
| Cones | Competitive | Competitive | Competitive | Competitive | Neutral |
| Carbon stock | Neutral | Competitive | Neutral | Neutral | Neutral |

- ### KEY DRIVERS
- Risk of fires
 - Pine nematode
 - Certification procedures
 - Conflict of legislation
 - Joint management
 - Lack of knowledge
 - Afforestation vs new plantations

POSSIBLE FUTURE DEVELOPMENTS

Scenarios:



Scenario effects on ES:

| Ecosystem service/other | Scenario 1/3 | Scenario 2/4 |
|-----------------------------------|--------------|--------------|
| Cork | ↑ | ↑ |
| Eucalypt pulpwood | ↑ | ↑ |
| Recreation (hunting services) | = | = |
| Carbon storage | ↑ | ↑ |
| Cork oak fuelwood | ↑ | ↑ |
| Maritime pine saw logs | - | ↓ |
| Pine cones (pine nuts) | - | ↑ |
| Cork oak inventory | ↑ | ↑ |
| Carbon storage in cork oak stands | ↑ | ↑ |

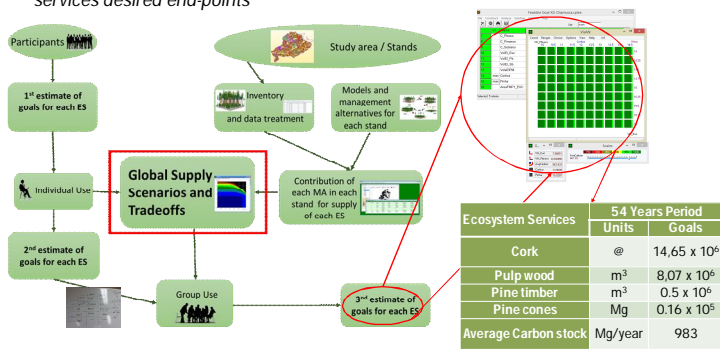
| Ecosystem service/other | Scenario 1/3 | Scenario 2/4 |
|--|--------------|--------------|
| Eucalypt inventory | ↑ | ↑ |
| Carbon storage in eucalypt stands | ↑ | ↑ |
| Carbon storage in pine stands | = | = |
| Carbon storage in maritime pine stands | ↓ | ↓ |
| Carbon storage in umbrella pine stands | ↑ | ↑ |

Legend - cases: = no change; ↑ increases; ↓ decreases [single arrow = moderate; double arrow = important; (*) Services not included in the back-casting process discussions due to E3SE tool limitations

| Tradeoffs | Scenarios | Volume of ending inventory (m³) (in 2098) | | 54 years period (2044-2098) | | | | | | | | | |
|---------------|-----------|---|-------------------------|---------------------------------|------------------------|------------------------|------------------------|------------|---------|----------------------|---------|------------------------|------------------------|
| | | 1 and 3 | 2 and 4 | Thinned + Harvested Volume (m³) | | Cork (@) | | Cones (Mg) | | Avg Carb (Mg) (Year) | | | |
| | | | | 1 and 3 | 2 and 4 | Young | Mature | 1 and 3 | 2 and 4 | 1 and 3 | 2 and 4 | | |
| Cork oak | | 38,97 x 10 ⁴ | - | - | - | 6,45 x 10 ⁵ | 81,8 x 10 ⁵ | - | - | - | - | 81,8 x 10 ⁴ | - |
| Eucalypt | | 83,01 x 10 ⁴ | - | 76,5 x 10 ⁵ | 0 | - | - | - | - | - | - | 67,5 x 10 ⁴ | - |
| Maritime pine | | 5,34 x 10 ⁴ | 0 | 0,06 x 10 ⁵ | 0 | - | - | - | - | - | - | 3,4 x 10 ⁴ | 0 |
| Umbrella pine | | 2,92 x 10 ⁴ | 12,11 x 10 ⁴ | 13,9 x 10 ⁵ | 13,9 x 10 ⁵ | - | - | - | - | 18,06 | 30,23 | 14,7 x 10 ⁴ | 19,7 x 10 ⁴ |

DESIRED COMMON FUTURE

- Two sequential participatory workshops (PW),
- 1st PW involving 7 participants (environmentalist (1), forest owner association (1), cork industry (1) and Integral researcher (4)) aiming at setting the ecosystem services desired end-points
- 2nd PW aiming at the elicitation of robust policies, involving 19 participants representing several sector as: environment (4), forest owner association (2), Forest owners (2), Pulp industry (2), Cork industry (3), Pine industry (1), municipality (1) and Integral researcher (4)
- Policies pool elicitation in two parallel sections each with a different scenario background (scenario 3 and 4), followed by a plenary section for robust policies identification



| Management Programs | As is | Scen1 | Scen2 | Scen3 | Scen4 | Goals |
|--|-------------|-------------|-------------|-------------|-------------|---------------|
| 1 - Agroforestry system ("montado") with cork oak (<i>Quercus suber</i>) as dominant species. Multifunctional system with cork production as main activity | 55.0% | 50.4% | 50.4% | 50.4% | 50.4% | 63.1% |
| 2 - Blue gum (<i>Eucalyptus globulus</i>) plantations (short rotation) for short wood production | 40.0% | 45.2% | 45.2% | 45.2% | 45.2% | 30.1% |
| 3 - Umbrella pine (<i>Pinus pinea</i>) forest for pine nuts production | 3.0% | 2.6% | 4.4% | 2.6% | 4.4% | 4.6% |
| 4 - Even-aged maritime pine (<i>Pinus pinaster</i>) forest managed for wood production | 2.0% | 1.8% | 0.0% | 1.8% | 0.0% | 2.2% |
| Total | 100% | 100% | 100% | 100% | 100% | 100.0% |

RECOMMENDATIONS FOR ACTIONS

Scenario 3 Parallel Section Results:

| Policies in need | Obstacles, opportunities | ES Targets |
|---|---|---------------------------|
| Formal and informal educational services | Forest owners' conformism | Pulp wood and pine timber |
| Policy incentives to applied research locally relevant | High unitary production costs <- Deficit of technological innovation <- deficit of applied research suited to local forest conditions | |
| Incentives to better articulation between forest stakeholders, particularly forest owners and managers, and applied researchers | | |
| Production of educational materials (paper copies, digital copies) | Low levels of forest fire prevention measures | |
| Policy incentives to adopt certification schemes | Demand for certified wood products | |
| Increased number of active forest fire rangers | Absence of carbon stock payments | Carbon stock |

Scenario 4 Parallel Section Results:

| Policies in need | Obstacle, opportunities | ES Targets |
|---|--|---|
| Policy incentives to adopt certification schemes | High unitary production costs <- low yields <- Deficit of technological innovation | All targets |
| Policy incentives to applied, locally relevant, research (Government, industry) | Fiscal incentives to estate concentration | |
| Governmental programs directed to rural estates concentration (swaps and selling) | Reinforcement of existent legislation | |
| Changes to current legislation | Increased preventive & dissuasive police patrolling | Forest estate fragmentation |
| More dissuasive legislation | More policy support to Forestry Intervention Zones | Theft of rural resources, equipment |
| Policy incentives to applied research locally relevant | Forest fires | All targets, but particularly pulp wood and pine timber |
| | Pests & diseases | Pulp wood, pine timber, pine cones, cork |

Plenary Section Results:

| Actions | Responsibility | Type of action | Time frame | Influences |
|--|-------------------------------|---------------------------------|---------------|--|
| Policy incentives to applied, locally relevant, research | Government, industry networks | Financial | 5 to 30 years | National government, University, local Forest Owners' association, Paper pulp and pine industry associations |
| Policy incentives to the adoption of certification schemes | Government | Financial, laws and regulations | 5 to 30 years | National government, local Forest Owners' associations |

Conclusions and Discussion:

- Participants without necessary skills and information to reliably discuss and decide preferred ecosystem services targets, major obstacles and opportunities for targets, and needed policies;
- Problem partially overcome supplying participants with a decision support tool such as the Pareto Frontier one, as we did;
- Even with participants with right skills and information, length of time of a two day session (end-points setting + back casting) too little to arrive at reliable results;
- Methodological option of retaining only policies elicited simultaneously in all scenario discussions put aside policies that might be also relevant, as acknowledged by participants;
- What if policies advocated by participants were not consistent with the scenario itself, as was the case for the carbon stock payments policy? An implication is that the earlier factors and manifestations identification stages should not include forest policies.