

Deliverable N^o 35

SOCIOECONOMIC REPORT

UPV
3/31/2023

SOCIOECONOMIC REPORT

ACTION D.1: Monitoring of the impacts of the project actions



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Action D1: *Monitoring of the impacts of the project actions*

From month 9 – month 48

Name of the Deliverable	Number of associated action	Deadline
Socioeconomic report	Monitoring of the impacts of the project actions	31/03/2023

1. 1. Introduction

This report is developed to identify the significant impacts on the local economy of Serra with the LIFE Resilient Forests project implementation. The natural environment (Natural Park Sierra Calderona) where Serra is located makes that most of the socioeconomic activities are related to or depend on the forest services, which makes it imperative to carry out sustainable forest management, guaranteeing ecosystem services provision. Making forest planning using the Decision Support System C.A.F.E., developed in the project, allows for optimizing ecosystem services (carbon, water, fire risk, and eco-resilience) to enhance the socioeconomic benefits of these local ecosystem services. This report presents a rough socioeconomic characterization of Serra municipality, including information about its population, natural and cultural heritage, and main socioeconomic activities.

To carry out this characterization, it has been using different sources of information such as Serra's Forest Management Plan, Data Territorial Bank of the Valencian Statistical Institute, and the municipal web page. Additionally, this statistical data has been complemented by the results of participatory activities, workshops, and personal interviews with local stakeholders.

From the participatory activities, some socioeconomic indicators were proposed by the stakeholders' participants, and in this report, those for which a source of information is available were included. These indicators are related mainly to the following:

- Forest management, including people employed in forestry, biomass management, and pellet production and grazing activities.
- Watershed services, including water supply reliability, population served, irrigated area, and irrigated crops.
- Recreation values, including wilderness recreation and hunting.
- Non-timber commercial products (mushrooms).
- Cultural values, including aesthetic values, endangered species, and cultural heritage.
- Population data
- Economic activities and employment.

The final part presents some conclusions from analysing the collected information and participatory activities mentioned concerning the relevance of sound forest management interventions to protect and improve the natural ecosystems in Serra and the Sierra Calderona that make possible the social and economic benefits for the local population.

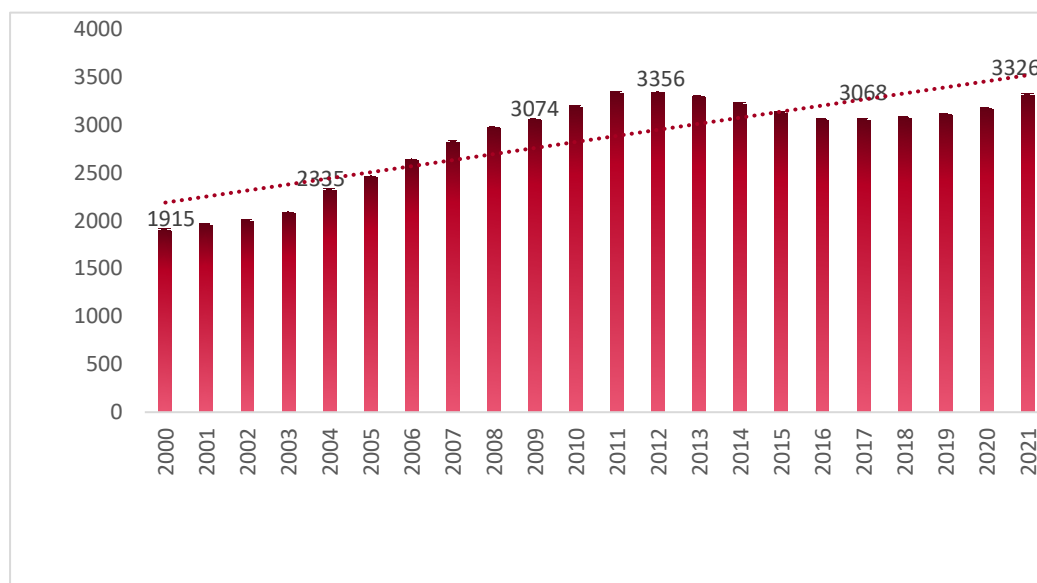
2. Socioeconomic context of Serra Municipality.

Serra is part of the Comarca of Camp del Turia, province of Valencia, with a surface of 57,30Km², and located 26,5km from the city of Valencia with an altitude of 330m. It is in the Sierra Calderona, declared a natural park in 2002 with an extension of 18.019 hectares. More than 90% of Serra territory is Natural Park.

2.1. Population

This municipality has maintained its population above 3000 inhabitants for over a decade and showed an increase of 6,43% only from 2020 to 2021 as it is show in Figure 1. In 2021 the number of inhabitants was 3, 326 of which 51% were men and 49% were women.

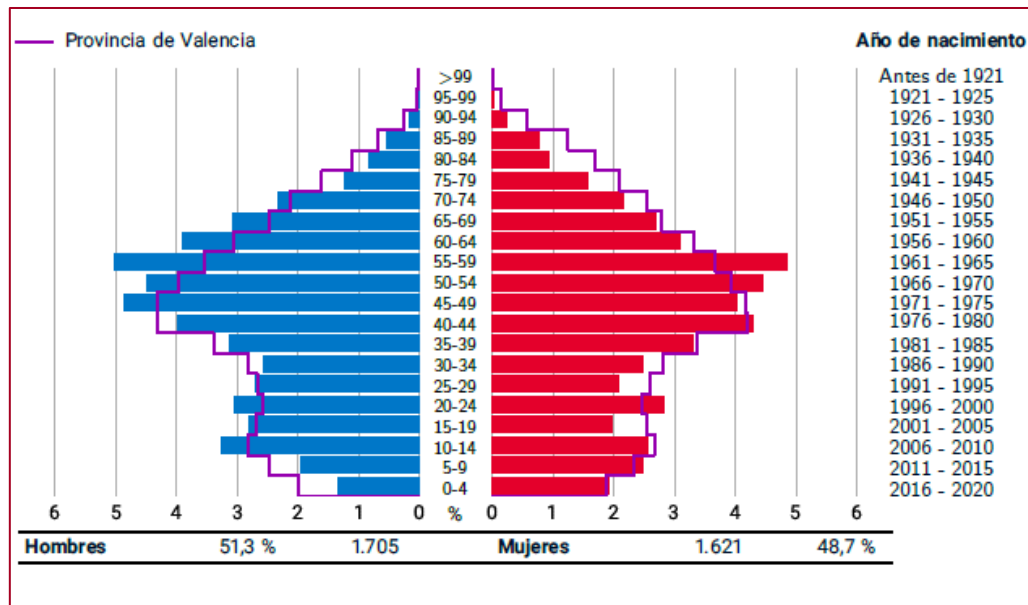
Figure 1. Serra: Population 2000-2021



Source: Own elaboration based on Banco de Datos Territoriales. Instituto Valenciano de Estadística.2023. <https://pegv.gva.es/es/bdt>

Most of the population is between 45 and 59 years old, as it is shown in Figure 2, with an ageing index of 113%, below the provincial index (126,9%) for the same year, 2021. The dependency ratio is 45,7%, lower than the provincial (53,1%).

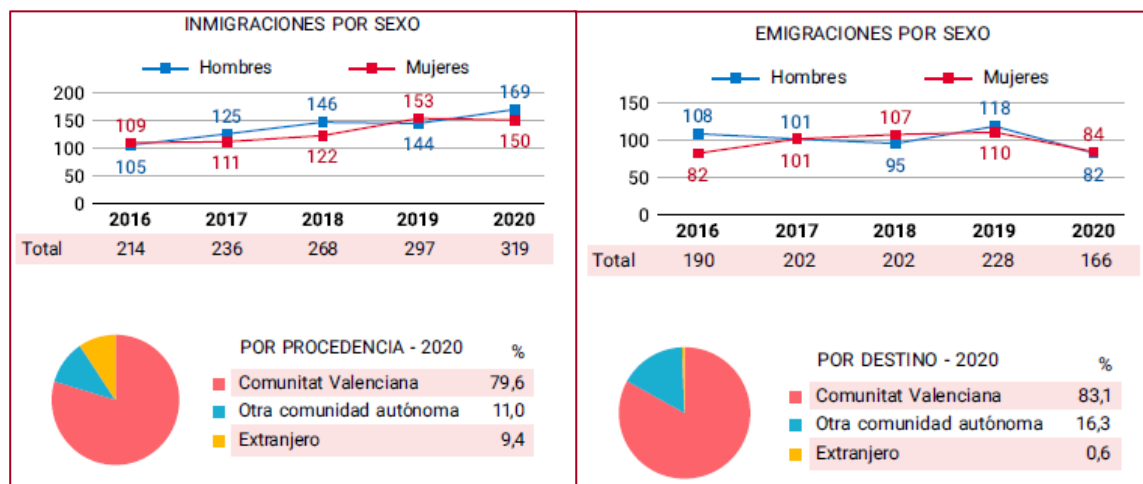
Figure 2. Serra: population by sex and age. 2021.



Source: Banco de Datos Territoriales Instituto Valenciano de Estadística.2023.
<https://pegv.gva.es/es/bdt>

Regarding residential population variation, Figure 3 migrations have shown an increasing trend since 2017 and emigrations have declined since 2019, which shows people's preferences for moving to this municipality for its natural landscape and proximity to Valencia city, as was expressed by the stakeholders in the workshop.

Figure 3: Serra: residential population variation (migrations and emigrations by sex) 2016-2020



2.2. Environmental resources

2.2.1. Forest resources

Serra holds the mount "El Alto del Pino y sus Agregados" with 2.696,425 hectares, from which 1.346,3 hectares are public. Also, this surface is part of the Natural Park Sierra Calderona. According to the municipal forest management plan, the natural vegetation is composed mainly Pinus halepensis and pinaster, rainfed trees, fruits, scrub, wooded and treeless mosaic on cultivated land, agricultural and artificial grassland and an area cleared by fires (185,17 ha).

Located in the Sierra Calderona gives Serra unique characteristics due to the ecosystem services derived from this forest area, which has different socioeconomic uses. Social use (the primary use) focuses on playful and recreational activities thanks to the mountain's existing paths, roads, and tracks. Forest use involves customary usage to collect forestry products (asparagus, fruit, mushrooms, and seeds) for self-consumption. The productivity of this forest area does not involve wood; only the use of biomass from the forest management residues currently used. Hunting use (large and small wild game) is carried out in a hunting ground. Livestock use (mainly sheep) is hardly practiced on the surface of the forest. Also, beekeeping use is developed with scattered settlements in the forest area (Forest Management Plan of Serra's Forest, 2019).

2.2.2. Water resources

This "Alto del Pino and its aggregates" is part of a significant hydrographic network; its northeastern belongs to the Palancia river basin, and the southwestern half is part of the interfluvium of the Palancia and Turia basins. The sub-basins to which the mountain belongs are, in order of representation: Náquera, El Pla and Morvedre. The main drainage network comprises various non-permanent watercourses whose main axes are the Barrac de l'Horta, the Barranc de Deula and the Barranc dels Tramussos, which spring into the Barranc de Náquera. In addition, the hydrographic network is characterized by many ravines, boulevards and other minor watercourses. Some contain water seasonally, evacuating it to larger ones. The Sabater Barranc, the Castell Barranc, the Penya Roja Barranc, the Potrillos Barranc and the Ombria Barranc stand out. Also, there is a presence of fountains or springs, most of which have water for almost the entire year, such as the Font de la Horteta, the Font del Pedregal, the Font del Pardo, the Font de la Prunera, the Font de Deula, the Font de Potrillos or the Font del Manyo (Forest Management Plan of Serra's Forest, 2019).

2.2.3. *Flora and Fauna*

In addition to the pine forest vegetation mentioned above, the shrubs include mastic, strawberry tree, kermes oak, juniper, myrtle, and the palmetto, a palm tree native to the Iberian Peninsula. Also, there are 175 species of medicinal plants and herbs, from rosemary to chamomile, thyme, and lavender (Serra tot natura, 2023).

There are more than 140 species of birds, including breeding and wintering. The Bonelli's eagle is the most representative bird of prey of the Mediterranean mountains and is a highly endangered and declining species. Regarding the terrestrial, the badger and the civet cat stand out. Squirrels, foxes, and wild boar are also present in the mountains.

2.2.4. *Landscape*

The landscape is diverse and attractive to many activities, comprises pine forest, cliffs, rocky outcrops, rock outcroppings, scrub areas and sparse trees, agroforestry mosaics, traditional dryland agriculture. Land use has changed due to the abandonment of agricultural activity has evolved towards unifying the diversity of landscapes.

2.3. *Cultural heritage*

Cultural heritage is composed of one monument (Portaceli charterhouse) and other assets of cultural and local relevance described based on Serra tot natura (2023) and presented as follows:

Castle of Serra. From the VIII-IX century of the Arabic period, it was built at of 536 meters of altitude near the town. It has a plant of 600 square meters with a square tower preserved and remains of a second one with fragments of the perimeter walls. Its altitude allows us to observe part of the Valencian coast, the regions of l'Horta and Sierra Calderona. It has been declared an Asset of Cultural Interest.

Tower of Hermitage, Tower of Ria and Tower of Satarenya: the two first from the IX were a defensive and surveillance element of the Islamic period. The third tower is from the siglos VIII-IX, it is currently in ruins and only the first floor remains. All three towers have been declared an Asset of Cultural Interest.

Calvary and Hermitage: it is in the upper part of the urban nucleus. It comprises avenues of cypress trees and elegant white chapels that imitate the Gothic style. The hermitage of Sant Josep i la Creu is at the top of the hill. The Calvary was finished building in 1893, and the hermitage in 1894. The two constructions are Assets of Local Relevance.

Church of Mare Deu dels Àngels: the parish church was completed in 1800 and resulted from successive extensions. Neoclassical in style, it has a single nave with pilasters, semicircular arches and a barrel vault in the central nave, transept arms and a main altar. The church is presided over by the image of the Mare de Déu dels Àngels to which the

people of Serra have great devotion. The church is considered an Asset of Local Relevance.

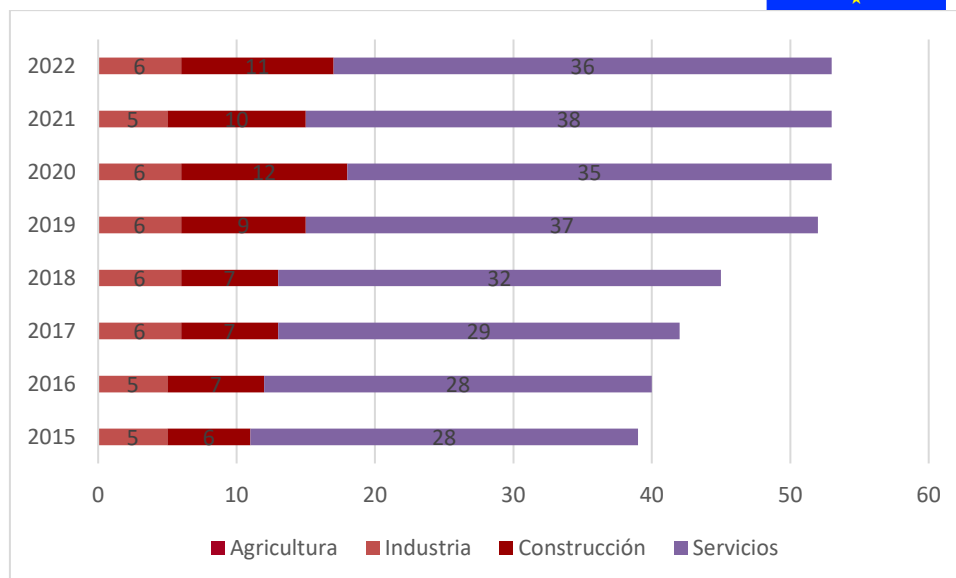
Portaceli charterhouse. It was the first monastery of the Carthusian religious order founded in Valencian lands in 1272. Portaceli was built on the remains of a small Andalusian town in the Lullén valley, acquired by Andreu Albalat, confessor of King James I and monastery founder. Initially built in the Gothic style, it has been reformed according to the architectural styles of each era: Renaissance, Mannerism, Baroque and Neoclassical. It has a Gothic aqueduct from the 15th century. The Carthusian monks remain in the monastery and cannot be visited. In 2006, it was declared an Asset of Cultural Interest with the monument category.

El Ventisquer del Rebalsadors is located at an altitude of 785 m, at the head of the La Nevera ravine that drains the northern slope of the western top of the Rebalsadors mountain. It is circular and has an approximate capacity of 1,100 m³. It was constructed in 1706. The snowfield, 20 meters in diameter, did not have a brick roof and was made annually with branches, tarpaulins, earth, and stones to protect the snow from the outside. It was used, indeed, until the beginning of the s. XIX. It has been declared an Asset of Local Relevance.

2.4. Economic activities

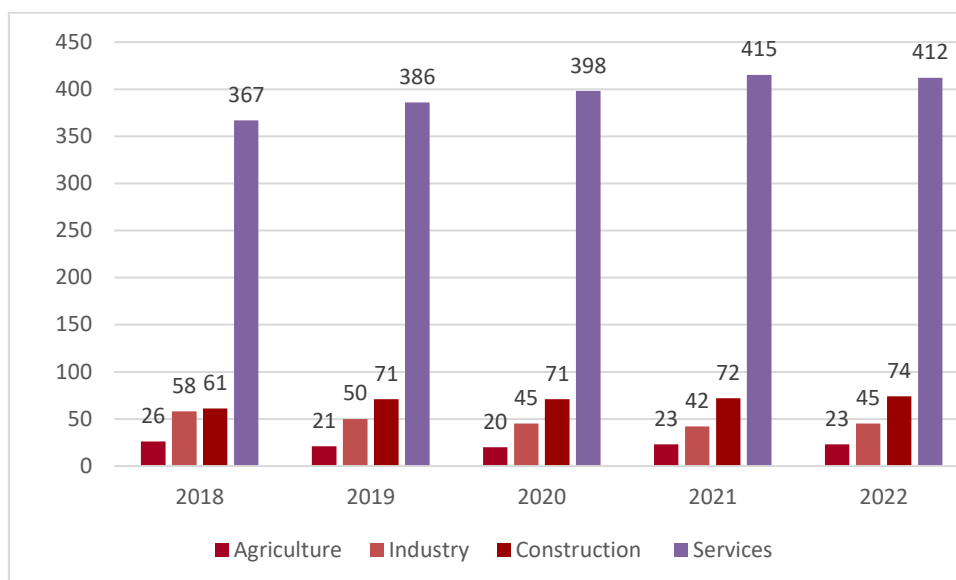
The economy in Serra is mainly based on tourism and the restaurant industry. As it is shown in Figure 4, there were 36 companies in the service sector in 2022. In the construction sector, 11 companies appeared affiliated with Social Security. In the industry sector, six companies related to mechanical carpentry were registered. Also, agriculture is still important. Although agricultural companies do not appear in the data because figures under five are not given, it is possible to find people affiliated with social security working in the agricultural sector, as is shown in figure 5. Serra's main crops include citrus, cherry, olive trees, and vineyards (See Figure 6).

Figure 4. Serra: Number of companies registered with social security by activity sector 2015 -2022 (data for the fourth semester)



Source: Own elaboration based on Banco de Datos Territoriales Instituto Valenciano de Estadística.2023. <https://pegv.gva.es/es/bdt>

Figure 5. Serra: Number of people with Social Security by activity sector. 2018-2022. (Data for the fourth semester)



Source: Own elaboration based on Banco de Datos Territoriales Instituto Valenciano de Estadística.2023. <https://pegv.gva.es/es/bdt>

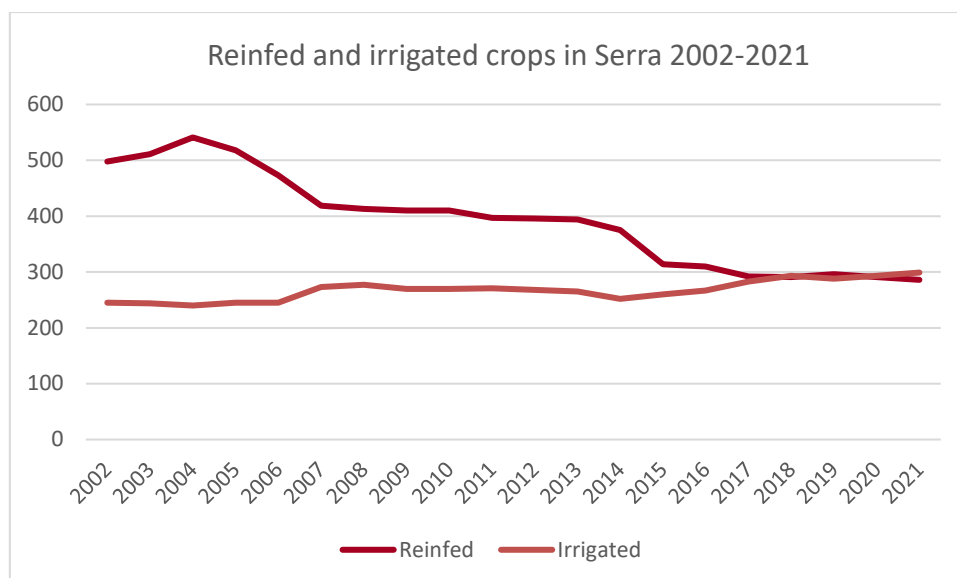
2.4.1. Agricultural activity

The local socioeconomic system has been related to the use of natural resources linked to the Sierra Calderona, such as stonecutters, watermen, charcoal burners,

woodcutters, farmers, and beekeepers that have been disappearing due to the low profitability and with the declaration of Natural Park that constraints diverse uses. Despite the abandonment of agriculture, Serra maintains mainly rainfed and small orchards of Islamic origin, such as the Ria and the Tóixima. This small farming is basically for self-consumption. There is an Irrigators community in Serra with a water concession from Jucar Hydrographic Confederation (CHJ). The water supply comes from four water sources in the municipality and is used in local orchards, which water consumption is presented in point 4.

Regarding rainfed and irrigated crops, the Territorial Bank Date of the Valencian Community reports figures from 2002 to 2021. The trend of these crops is shown in Figure 6.

Figure 6. Serra: rainfed and irrigated crops evolution (hectares). 2002-2021.



Source: Own elaboration based on Estimations from the Banco de Datos Territoriales Comunidad Valenciana.2023. <https://pegv.gva.es/es/bdt>

Crops (rainfed and irrigated) were mainly citrus and non-citrus fruit (cherry) and olives. According to these estimations, rainfed crops have presented a decreasing behavior until they match the irrigated ones which present a slightly increasing trend.

The major surface cultivated are in citrus (39,7%), following to fruits crops (22%) as is shown in figure 7.

Figure 7. Serra: Area cultivated by type of crop (%). 2022.



Source: Banco de Datos Territoriales Instituto Valenciano de Estadística.2023.
<https://pegv.gva.es/es/bdt>

2.4.2. *Tourism and recreational activities*

The Natural Park Sierra Calderona and its proximity to the capital of Valencia allow Serra to develop diverse tourism activities. They have two types: Cultural Tourism, related to cultural routes to know the assets of cultural interest and local relevance, and Active tourism, thanks to its infrastructures, such as roads, tracks, trails, and areas for rest and recreation that backbone the mountain, makes it possible develops activities such as trekking, cycle touring and BTT, trail running, and Nordic walking. Furthermore, natural resources like springs and caves, geological wonders, natural viewpoints, and many animal and plant species let activities such as speleology and beekeeping tourism, making Serra's tourism one of the main activities.

In Serra also, some tourist activities related to bees are carried out. There are few beekeeping settlements dedicated mainly to producing artisan honey that is commercialized in some local shops and online. Also, there is a possibility to enjoy the bees' world through workshops and routes offered by the entrepreneurship called Beenatura.

Serra has many kilometres of paved roads and forest tracks to practice cycling. This sport is strictly regulated to conserve the park and protect biodiversity. Mountain sports must be practiced exclusively on a forest track and never on a path or cross-country, and always respecting the rights and priorities of walkers.

The subsoil of the Sierra Calderona is also very attractive; it has more than fifty underground cavities, caves, and chasms, distributed throughout the municipality of Serra. They are the habitat of different types of animals, from bats to insects, arachnids and crustaceans, that make possible activities of speleology. In addition to natural cavities, there are also artificial cavities, mines, and water mines. Serra is home to the

largest cave in the Sierra Calderona and one of the largest, in length, in the province of Valencia, Cave of Soterranya, with about two kilometers. We also have the deepest cavity in the Sierra Calderona, the Sima del Muladar, which exceeds 137 meters deep (Serra tot natura, 2021).

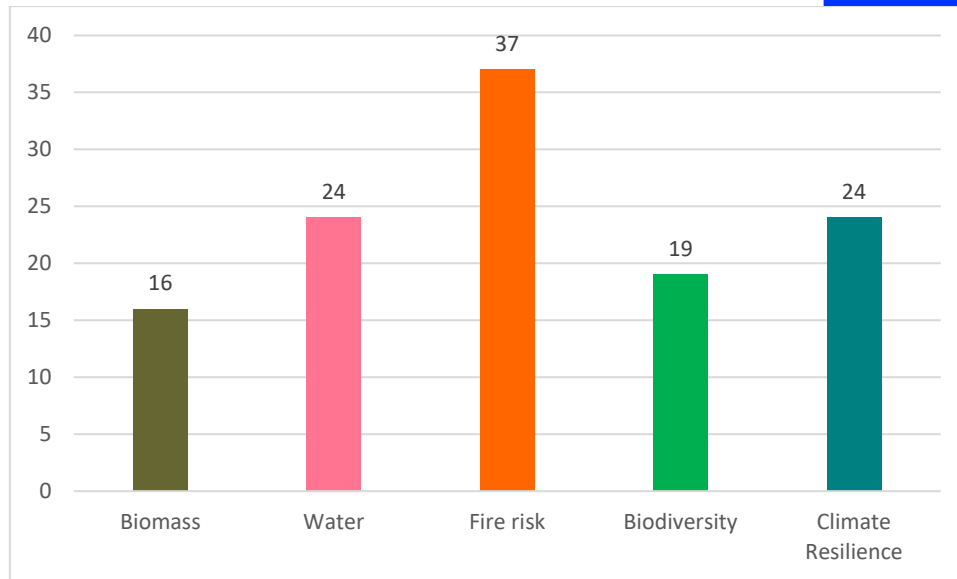
3. Forest Ecosystem services and its relationship with socioeconomic benefits

A clear definition of ecosystem services (ES), their characteristics and the benefits derived from them is needed to understand how sustainable forest management is essential to protect ES and ensure their provision. Fisher et al., (2009:645) called ecosystem services the aspects of ecosystems utilized (actively or passively) to produce human well-being. The benefit is that point at which human welfare is directly affected, but obtaining a gain in welfare likely requires other inputs such as labour, knowledge, or equipment. For instance, soil formation and water regulation are intermediate services derived in constant stream flow (final service) that provide water for irrigation, hydroelectric power, and drinking water (the same ES can generate multiple benefits). In this case, to obtain these benefits, other inputs such as capital (build) and resources (labour) are required to make possible its delivery to beneficiaries. Also, some functions and processes of ecosystems are considered services if there are human beneficiaries, such as the carbon sequestration process from which humans have a direct benefit. Pollination is another service from which humans' benefit. However, they do this indirectly by providing food, which is the good or benefit we can apply in an economic valuation. Benefits lead to the generation of socioeconomic activities, which include the production, distribution and or consumption of these material or immaterial benefits. These socioeconomic activities impact some socioeconomic variables, which can be measured through indicators.

In this sense is a priority to know and quantify ES at the local level to make sound forest planning management guaranteeing their protection and sustainable provision. It is the aim of the Decision Support System C.A.F.E., allowing to optimization ES by offering different forest management options.

These concepts' clarification guides the participatory activities in which stakeholders were invited to prioritize Ecosystem Services included in the DSS C.A.F.E in their local area and then analyse and identify the socioeconomic activities most dependent on these Ecosystem Services. The results are shown as follows:

Figure 8. Serra: prioritization of Ecosystem Services.



Source: Own elaboration based on the Serras' Local workshop. 2021.

From the five ES included in the DSS C.A.F.E, participants considered that reducing fire risk is the main service to be prioritize through forest management. Climate resilience and biodiversity were prioritized at the same level.

The identification of socioeconomic activities most dependent of these ES are show in the following figure.

Figure 9. Serra: Socioeconomic activities related to ES and its suggested indicators.

Ecosystem Services (C.A.F.E.)	Socioeconomic Activities	Indicators
Biomass	Pellet production, planed logging, Forestry cooperatives	Kg/pellets Number of biomass companies Number of jobs Number of forestry uses
Water	Urban provision, Nuclear power plant, Agriculture and livestock uses, hunting	Liters / aquifers Water bill reduction Number of water concessions M ³ / irrigators' community
Fire Risk	Rural tourism, trekking, sport activities, recreational activities. Awareness-rising paths. Horse riding through livestock trails, Astro tourism	Number of visitors Number of business licences
Biodiversity	Management of cultural, historical and architectural heritage Protection of heritage and human life	Number of protected heritage elements Number of jobs
Climate Resilience	Rain-fed Agriculture (olive, truffle, grapevine)	Number of productive/farms Kg/olives Kg/truffles Number of agricultural cooperatives
Landscape/environment	Retail, restaurants, hotels	Number of room/bed availability Number of overnights Numbers of jobs Number of business licences
	Educational activities about the natural species of the Natural Park	Number of activities/year
	Forestry uses: beekeeping, medicinal plants, grazing, hunting	Number of beekeeping boxes. Kg/honey Kg medicinal herbs Km ² /Managed hunting area
	Real estate investment (second homes), attraction of new business related to building activities	Number of people registered by year Number of business licences
	Masonry (reconstruction of dry stone walls).	Number of companies/business

Source: Serras' Local workshop. 2021.

This participatory identification showed the level of awareness that local stakeholders have about the relevance of the Ecosystem Services to allow to set up of the main socioeconomic activities presented in their territory and the need for forest management to prioritize these ES, especially the fire risk as some of them expressed “if the forest burns there is nothing.” Also, they recognized the importance of biodiversity and landscape since Serra's socioeconomic activities are related to the forest uses of the Sierra Calderona.

In the following epigraph, we presented the indicators for which it was possible to find a source of information to determine the impact of socioeconomic benefits.

4. Project impact on the local economy (indicators)

This section presents indicators that show the dimension of the socioeconomic benefits derived from the main ecosystem services in the Serra's municipality that allow local people to develop socioeconomic activities. Most of these indicators also were proposed by stakeholders in the local workshop to measure impact of local socioeconomic activities of the municipality and the surrounding areas.

These indicators have been measured to the year 2018, when the Resilient Forests projects started, and the year 2021 as far as it was possible to find data.

4.1. Indicators related to forest management.

The forest management activities carried out by the own municipal brigades include shorts felling (cortas policia), and removal of dead pine trees due to abiotic or abiotic damage; the material is transformed into pellets that are used in the boilers that the municipality has in the nursery, school, and town hall. These activities employed four people. The data on biomass is the amount planned in the Forest Management Plan.

Indicator name	Indicator	2018	2021	Source
No people employed in forestry	No. people employed	0	4	Serras' Municipality
Biomass management and Pellet production	Biomass Tn/year		443	Serra Forest Management Plan
Grazing activities	Head/ year	0	160	Serra Forest Management Plan

Grazing activity is proposed in the Forest Management Plan with more environmental objectives than economics. The appropriate charge is one (1) head/ 8,4 hectares and the type of livestock should be goats due to its ecological function and the adequacy of existing pastures.

4.2. Indicators related to watershed services.

Serra has an irrigator community with a Jucar Hydrographic Confederation (CHJ) water concession. The water supply comes from four municipal water sources and is used in local orchards.

The water supply for the municipality is carried out by the company Aguas de Valencia.

Indicator name	Indicator	2018	2021	Source
Water supply	m3	72.847		
Population served	No inhabit	3.091	3. 326	ARGOS Portal-GVE
irrigated crops	ha/year	293	299	https://bdt.gva.es
rainfed crops	ha/year	291	286	https://bdt.gva.es
Agricultural cooperatives	No. Coop.	1	1	
Irrigators community	No. Irrigators communities	1	1	irrigators Community
Members irrigators community	No. Members	180	180	
No. Irrigated hectares	ha/year	22,15	22,15	
Concession by Confederation Hydrographic of Júcar	M3/year	121.000	121.000	

4.3. Indicators related to recreation values.

Serra's local workshop, participants identified the natural landscape traits described above as the most influencing factor in developing socioeconomic activities. These include nature tourism and recreational and sports activities that considerably impact the number of visitors.

Hunting is another recreational activity identified that depends on the provision of Forest ecosystem services in Serra. Data were directly obtained through an interview with the manager of the hunting area.

Indicator name	Indicator	2018	2021	Source
Trekking routes	No. Routes	8	5	PRUG 2006
Mountain Biking Trails	No. trails	1	1	PRUG 2006
Visitors	No. visitors /year	1.651	4.785	Municipality
Tourism infrastructure				
Pension	No. Pension	1	1	pegv.gva.es/bdt
beds	No. Beds	12	12	
Apartments	No. Apt.	6	11	
beds	No. Beds	31	78	
Rural houses	No. Houses	3	3	
beds	No. Beds	19	19	
Jobs	No. Jobs/year	69	64	
Hunting and fishing				Municipal Hunting Technical Plan
Managed Hunting area	ha/year	2.700	2.700	Municipal Hunting Technical Plan
Small wild game	No. Pieces	579	962	
Large wild game	No. Pieces	38	62	
Members of hunting area	No. members	81	80	
Incomes by hunting activity	€/annual	8.616	8.454	
Expenses by hunting activity	€/annual	10.193,79	4.823,57	
Non -timber commercial products				
Beekeeping	Beehives/year	20	20	Forest Management Plan
Mushrooms	Kg/ha	5	5	

Restaurants also benefit from tourists and sports activities. There are nine restaurants with a capacity of 802 customers.

Regarding non-timber commercial products, beekeeping is proposed to increase with the installation of 400 beehives in order to obtain economic benefits. As forestry improves, mycology activity could also increase, and it would need to be regulated by establishing a mycological reserve.

4.4. Indicators related to cultural values.

These indicators were proposed to measure the passive cultural values that could disappear in case of forest fire and could negatively impact the currently local socio-economic activities. Living preferences in a landscape and natural environment such as Serra's municipality could be measured by the number of inhabitants, which increased by 7% from 2018 to 2021.

Indicator name	Indicator	2018	2021	Source
Aesthetic Values	Viewpoints	4	4	Municipal Forest Management Plan
Endangered animal species (birds, reptiles, and mammals)	No. Endangered animal species	75	75	
Endangered vegetal species	No. vegetal species	7	7	
Cultural heritage (4 towers, 1 castle, 1 monastery)	No. Protected Monuments	6	6	pegv.gva.es
Natural heritage (2 coves, 4 floral micro reserve, 1 Natural Park)	No. Protected Places	7	7	
Landscape/environment	No Inhabitants /year	3.091	3.326	Argos.gva.es/Padron

5. Conclusions

This socioeconomic report has been constructed based on the contributions made by local actors, who are very knowledgeable about the environmental and socio-economic dynamics of the municipality of Serra. Therefore, we can say that the characterisation of this report includes a bottom-up approach through the workshops and personal interviews to local stakeholders, and it was complemented with public sources of information.

Considering the results obtained about the socioeconomic dynamic and environmental characteristics of Serra municipality and the analysis of participatory activities with local



stakeholders, it has been “proved” how the living conditions of local people depend on most of the benefits derived from the forest services of the Sierra Calderona. The population dynamics in terms of a growing trend in recent years have been largely attributed to the environment and natural services offered by the municipality.

In terms of socioeconomic benefits tourism and recreational activities linked to forest ecosystem services is the backbone of the economic activities such as restaurants and other services which present the major number of employs. The increasing number of visitors also show the tourism dynamic.

In addition, there is still an opportunity to boost the socioeconomic benefits through the increase of ES provided by sound decisions-making in forest management that let to the improvement of biomass production, grazing activities that help to reduce fire risks, and the increasing of beekeeping, and regulated mycologic activity.

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