Expert Meeting on Ecosystem Valuation
in the context of Natural Capital Accounting
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Ecosystem services and asset valuation in the RECAMAN project: integrating market and simulated exchange values

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- Caparrós, A., Oviedo, J.L., Álvarez, A. and Campos, P., 2017. Simulated Exchange Values and Ecosystem Accounting. *Ecological Economics* 139: 140–149.

- Campos, P., Caparrós, A., Oviedo, J. L., Ovando, P., Álvarez-Farizo, B., Díaz-Balteiro, L., Carranza, J., Beguería, S., Díaz, M., Herruzo, A.C., Martínez-Peña, F., Soliño, M., Álvarez, A., Martínez-Jáuregui, M., Pasalodos-Tato, M., de Frutos, P., Aldea, J., Almazán, E., Concepción ,E.D., Mesa, B., Romero, C., Serrano-Notivoli, R., Fernández, C., Torres-Porras, J., Montero,G., 2017. *Bridging the gap between national and ecosystem accounting*. Instituto de Políticas y Bienes Públicos (IPP) CSIC, Working Paper. 2017-04.

Index

- Agroforestry Accounting System (AAS)
- Simulated Exchange Values Method (SEV)
- RECAMAN – Results
  - Large scale application to Andalusia
  - Before, only farm-scale applications (Campos et al. 2001, Caparrós, 2001, Caparrós et al, 2003, Campos and Caparrós, 2006)

Agroforestry Accounting System

- Focuses on the economic activities and products generated on the territory
- Private and public outputs and costs are considered
- Does not follow institutional sectors
  - Net value added and income for each activity
  - Info for Payment for Ecosystem Services
- Total income includes capital gains

Manufactured and environmental values

Accounting for

- Flows: price x quantity
- Capital: market prices or future discounted capital income flows

Commercial values:

. Timber growth and felling (age structure)
- Cork growth and stripping
- Natural grass and acorn fodder
- Game
- Mushrooms
- Livestock and crops (at micro scale)
- Others

Environmental values:

- Public recreation
- Private owner's amenities
- Forest landscape
- Threatened biodiversity
- Carbon sequestration
- Others

Agroforestry Accounting System

- **Production account**
  - Total output
    - *SNA outputs*
    - *Non-SNA forest outputs*
  - Total cost
    - *SNA costs*
    - *Non-SNA costs*

- **Capital balance**
  - Work in progress (inventories)
  - Fixed capital
    - *Land*
    - *Biological resources*

Values are obtained …

- Directly from markets:
  - Timber, cork, …
- From other existing markets:
  - Carbon sequestration
  - Private amenities
  - Forest water
  - Mushrooms gathering
- By simulating markets (SEV):
  - Public recreation
  - Threatened biodiversity
  - Landscape conservation

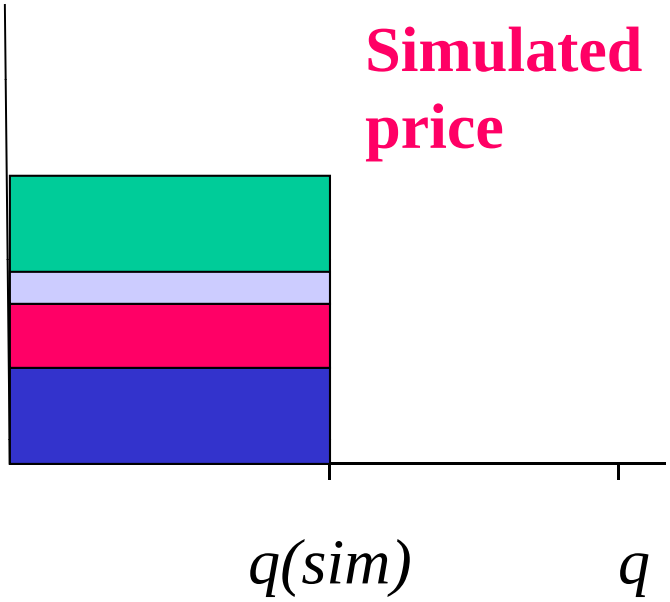
Simulated Echange Values (SEV)

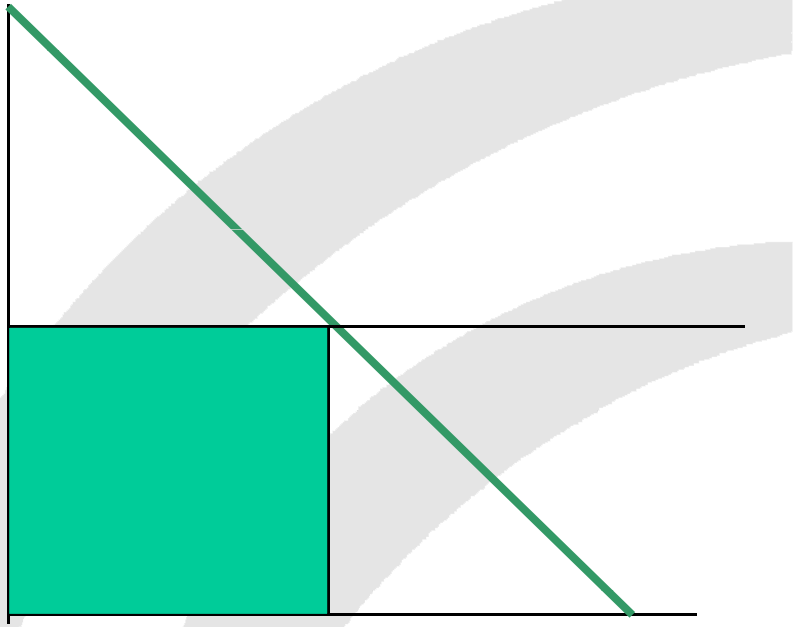
- Using SEV the goal is to estimate
  - the price that would be realistically implemented if ecosystem services were internalized.
  - the income obtained for this price, taking into account costs

- National accounts do not only include values obtained in perfect markets, hence:
  - simulated exchange values are not restricted to perfect markets either.

Simulated Exchange Value (SEV)

- For non marketed goods and services: the income *if* all ecosystem services were internalized





Hipotetical market

Market structure

- Perfect competition:
  - infinite number of producers, homogenous products, no limits to new entries

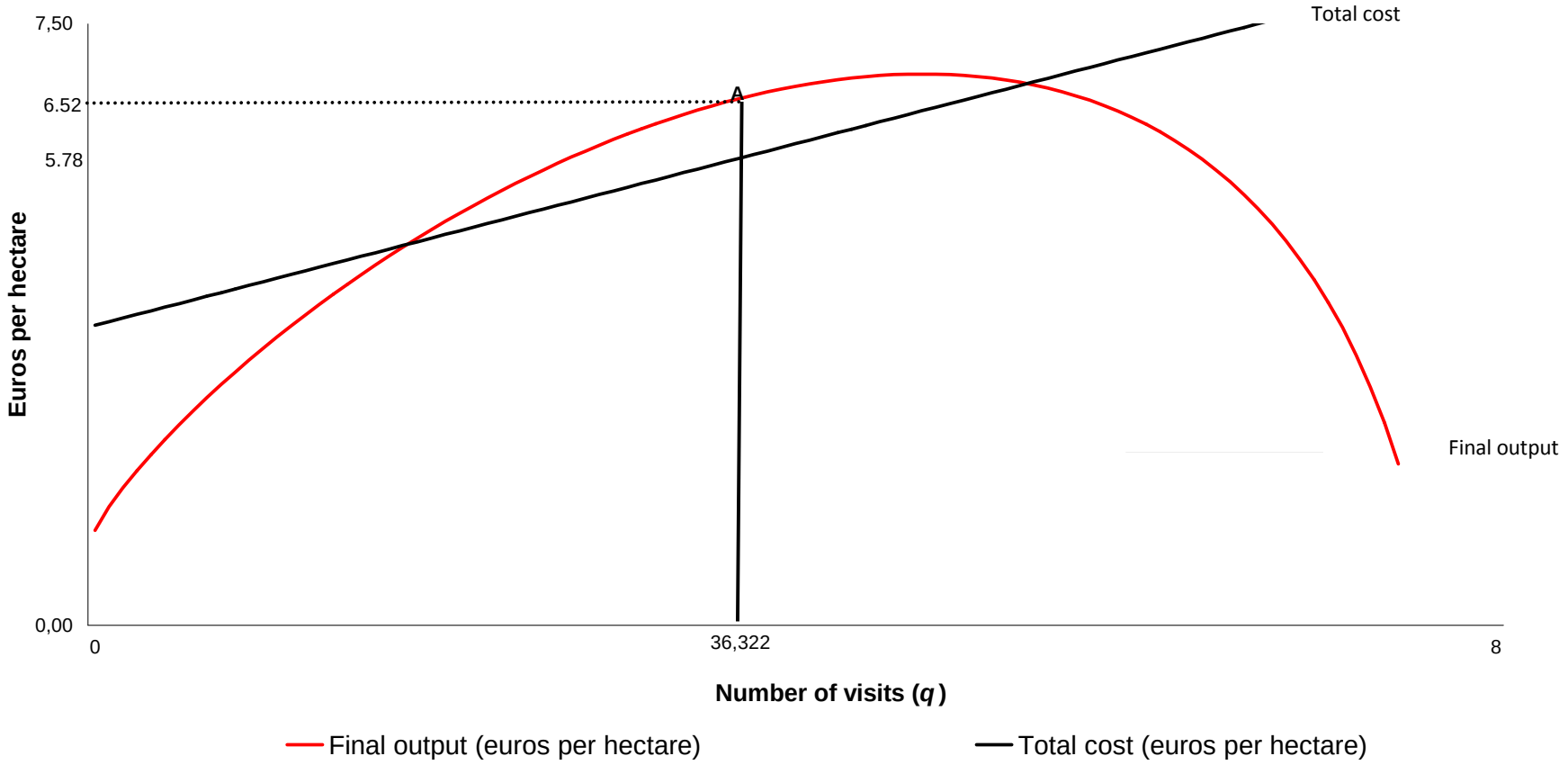
- Monopolistic competition:
  - imperfect competition, many producers sell products that are differentiated from one another (e.g. by quality) and are not perfect substitutes.
  - in the short run, the number of producers is fixed and each one has a producer-specific demand function, producers behave as monopolists
  - in the long-run, new entries are possible, and no benefits

Market structure (N.B.Recreation)

- Perfect competition:
  - Infinite number of recreational areas, all have the same characteristics and there are no limitation to new entries of recreational sites

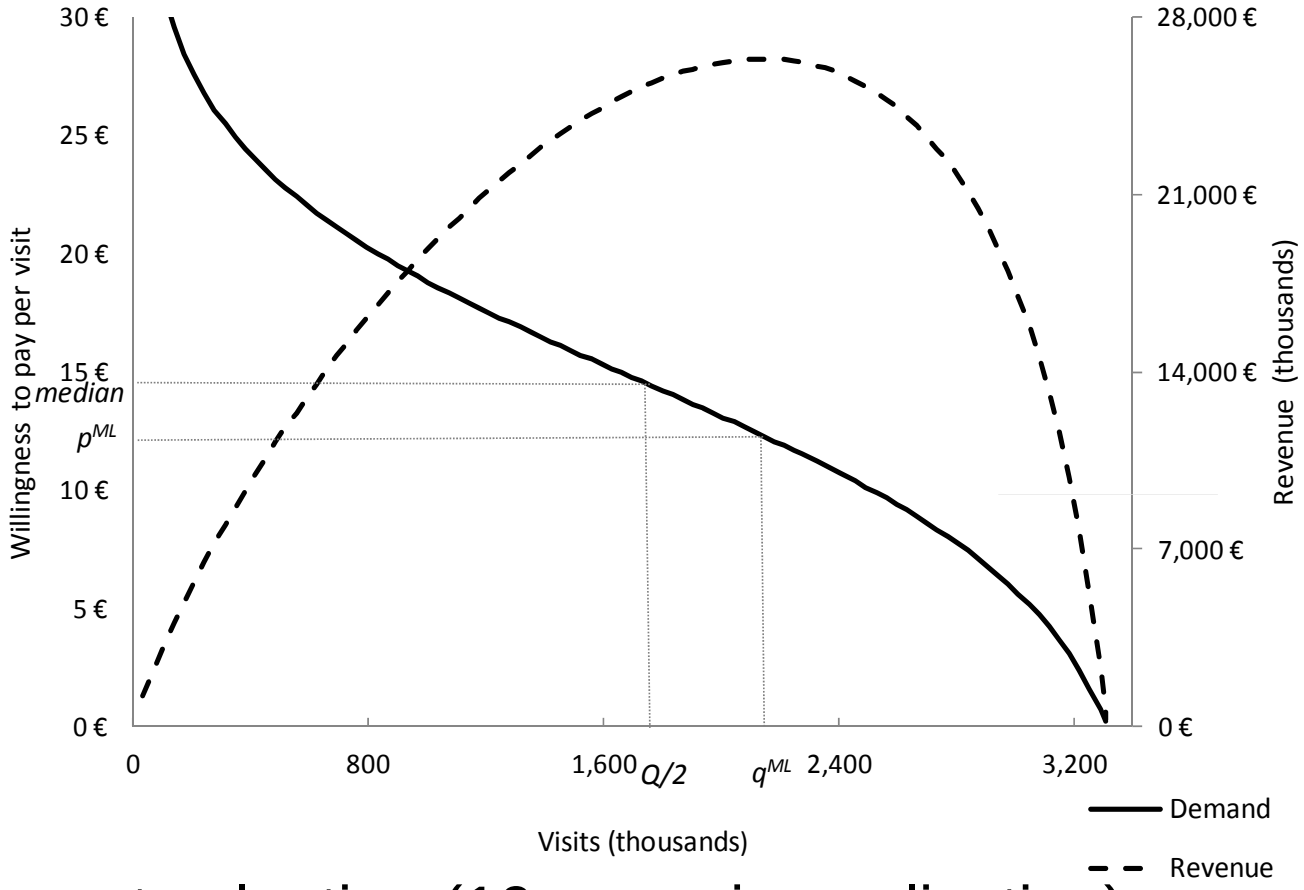
- Monopolistic competition:
  - There is a given number of recreational areas, new entries are possible but difficult.
  - In the short run, the number of recreational area is fixed and each area has a site-specific demand function (estimated using valuation methods).
  - The long-run is relevant for capital, but not for current-year estimations.

Simulated Exchange Value (SEV)



- **Simulated market: demand and cost functions**
  - Monopolistic competition (short term)

Simulated Exchange Value (SEV)

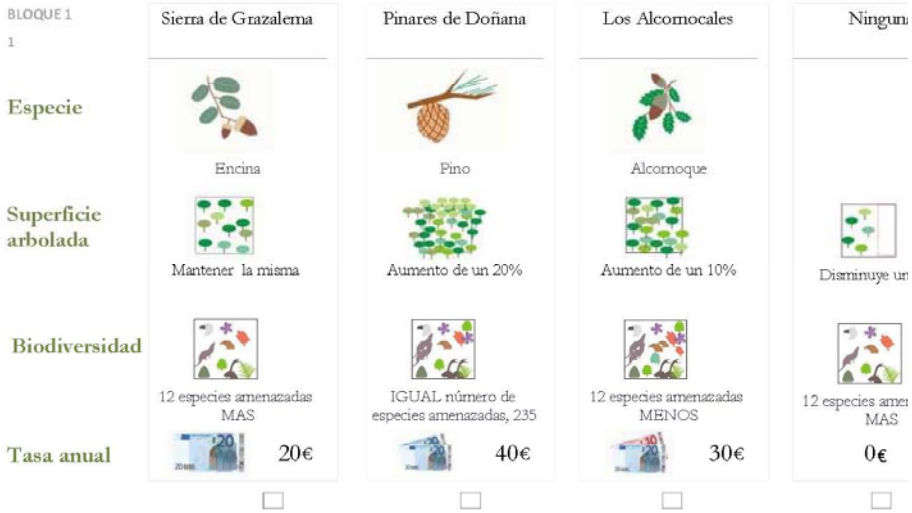


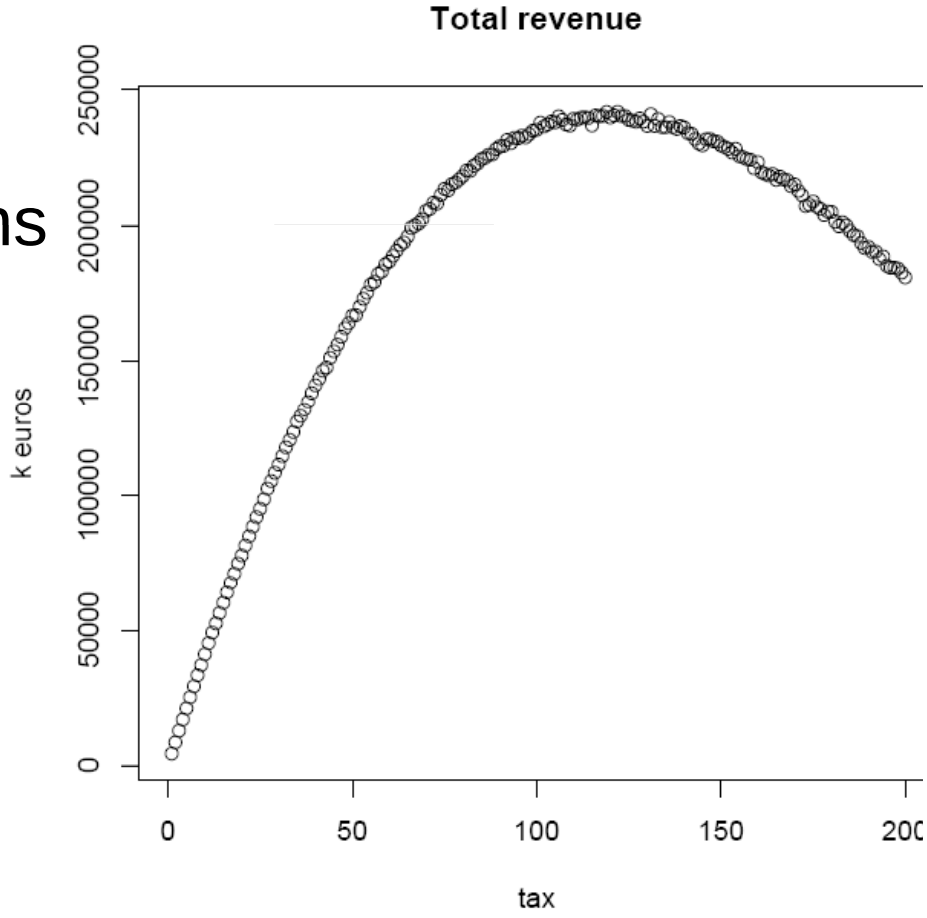
- Contingent valuation (10 areas in application)
- Costs are assumed to be constant
- Site-specific demand functions (Fig. Demand and revenue for recreation in Cazorla)

Landscape and threatened biodiversity

- The income that a PES would obtain if implemented
  - e.g. for landscape conservation and threatened biodiversity preservation

- Choice experiment
  - mixed logit and simulations





RESULTS - RECAMAN

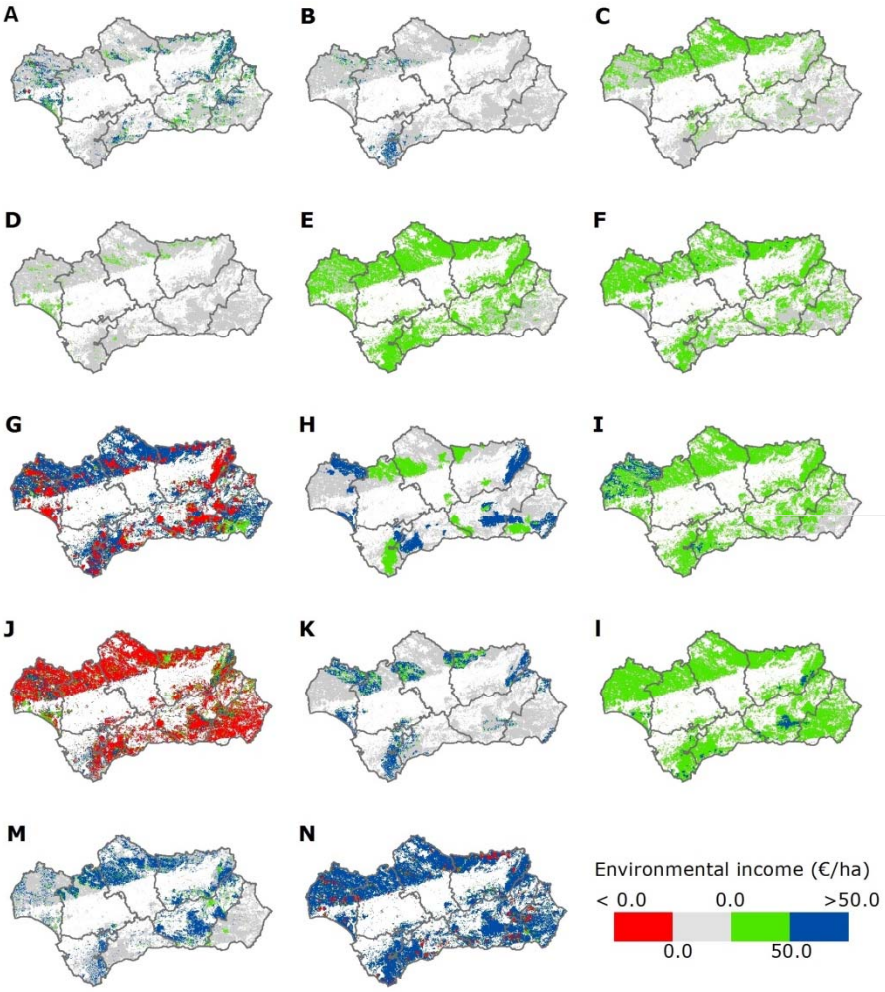
RECAMAN: Highlights

- Integrates commercial and environmental outputs and costs
- Macro (regional) and micro (estates) scales
- Covers 4.7 million hectares of *montes*: forests (61%), shrublands (21%), natural grassland (10%) and other forestlands (8%).
- Andalusia (Spain)
- Data for 2010
- Spatially explicit results

Primary Data

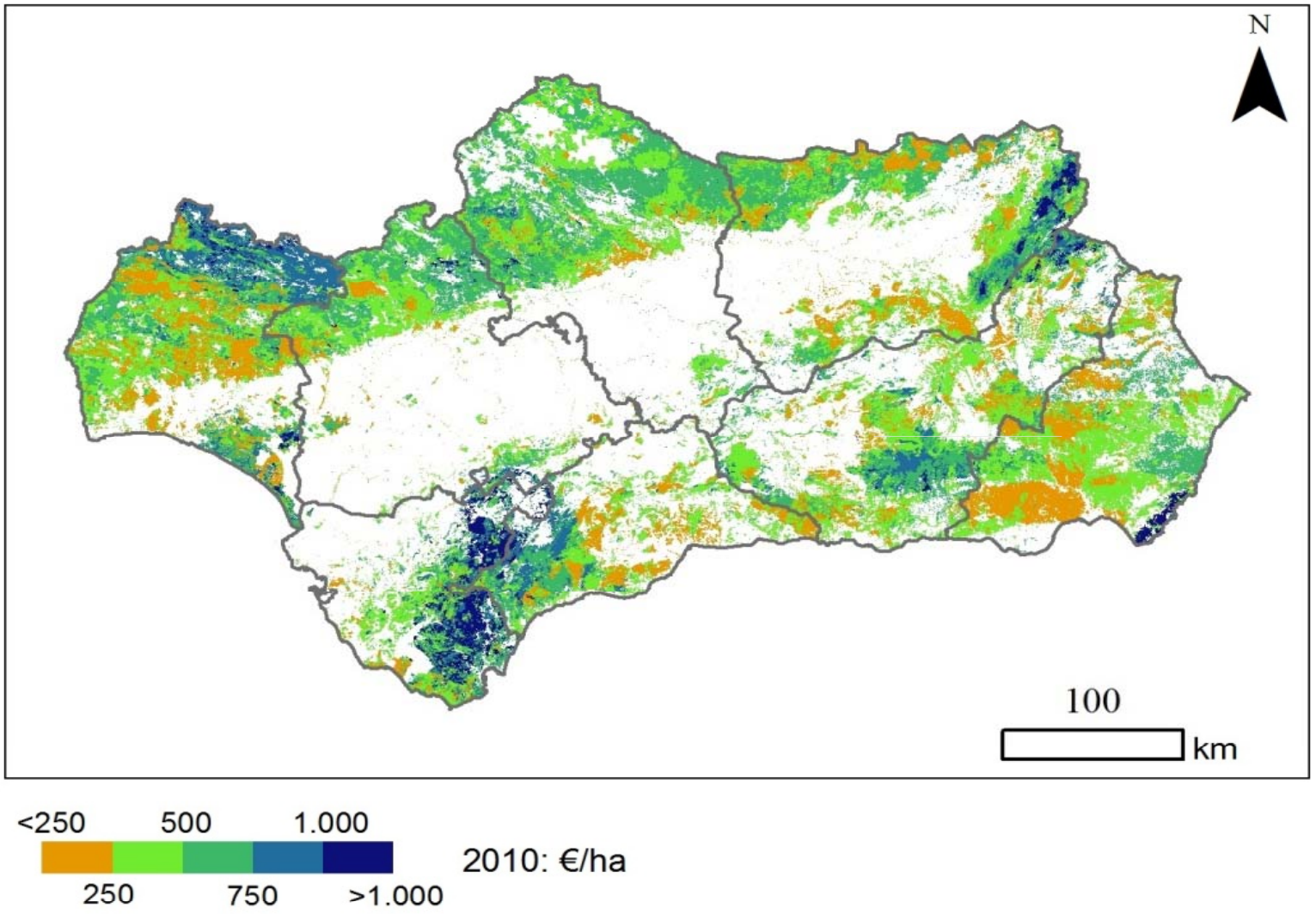
- Forest National Inventory for forests and woodlands (age structure)
- Land cover and land use data GIS
- Prices of over 4,000 transactions per year on forest products
- 58 revenues and costs in depth analysis of *montes* estates (including crops and livestock)
- 800 interviews to *montes* non-industrial landowners
- 4,000 interviews to free access visitors (CV and choice exp)
- 5,600 interviews to households (CV and choice exp)
- 800 interviews to hunters
- 800 interviews to *montes* hunting estates
- 4,000 interviews to mushroom gatherers
- Public expenditures on *montes* disaggregated by montes activities
- Threatened biodiversity index by vegetation type
- Green water consumption by vegetation type

Environmental incomes by individual products



(**A)** timber, (**B)** cork, (**C**) firewood, (**D)** nuts, (**E)** grazing, (**F)** hunting, (**G)** private amenity, (**H)** public recreation, (**I)** mushrooms, (**J)** carbon, (**K**) landscape, (**L**) biodiversity, (**M)** water, (**N)** all products.

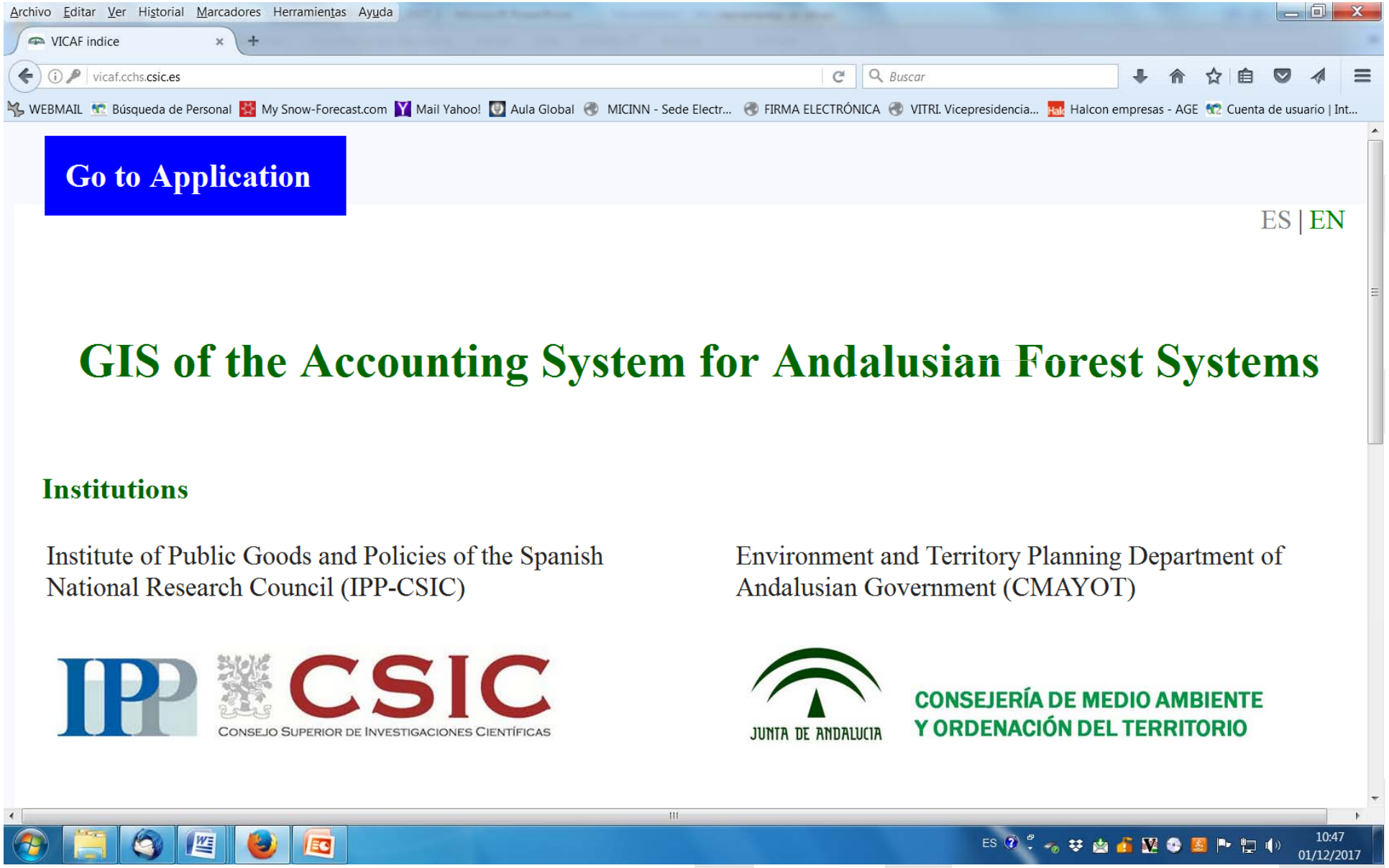
Ecosystem services



SEV for N.B. Recreation

Model and estimated values	Per visit (€)	Aggregated values (€)	€/ha
Logit (bid)			
Compensating variation	12.91	345,723,904	78.82
Simulated exchange value *(median as proxy)*	12.91	172,861,952	39.41
Simulated exchange value *(short-term monopolistic competition)*	11.38	177,865,907	40.55
Log-logit (log bid)			
Compensating variation	38.52	1,031,783,830	235.22
Simulated exchange value *(median as proxy)*	15.14	202,712,988	46.21
Simulated exchange value *(short-term monopolistic competition)*	25.31	216,934,005	49.46

Web app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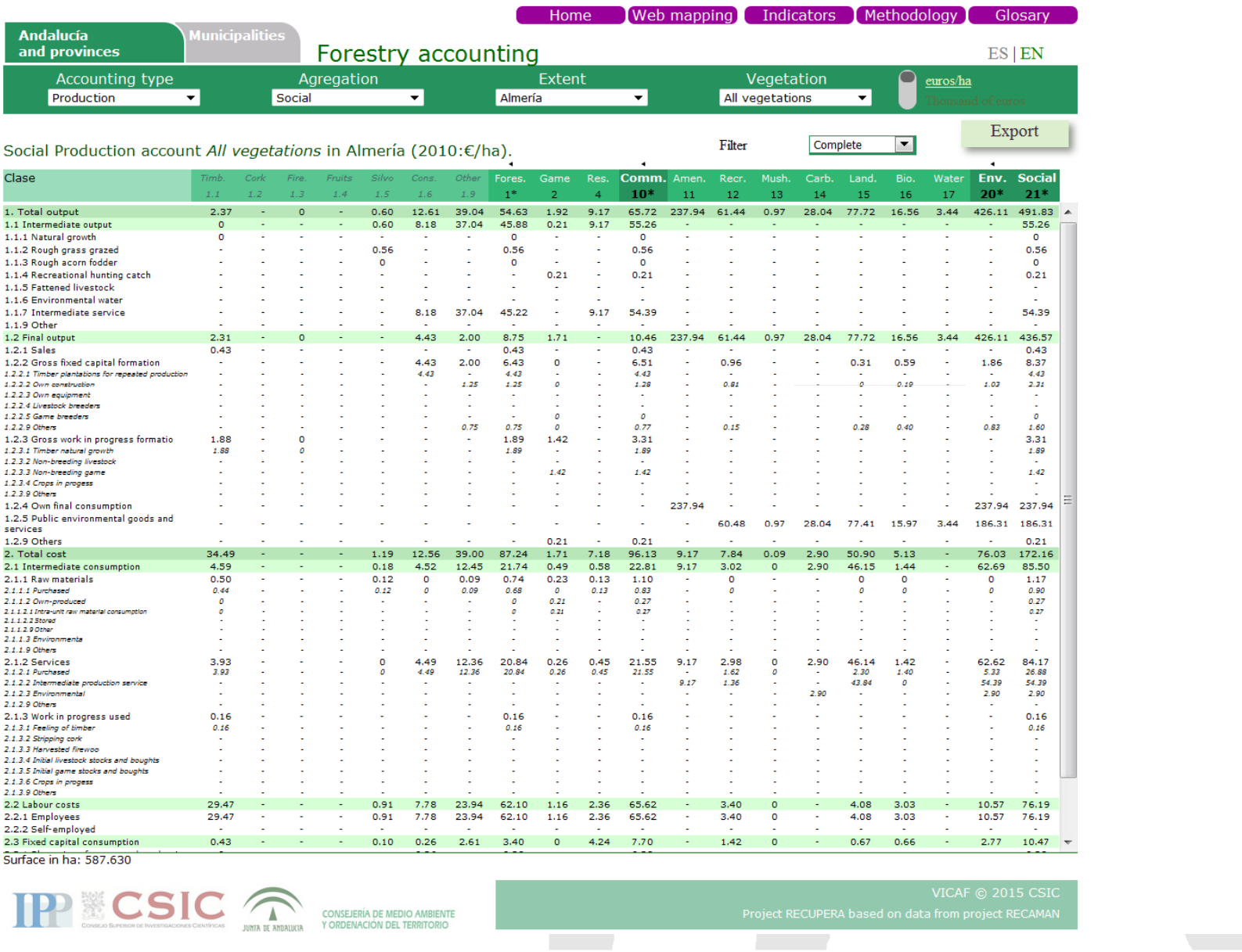
Accounting



Home | Web mapping | Indicators | Methodology | Glosary

Andalucía and provinces | Municipalities

Forestry accounting

ES | EN

Accounting type: Production | Agregation: Social | Extent: Almería | Vegetation: All vegetations | euros/ha | Thousand of euros

Export

Social Production account *All vegetations* in Almería (2010:€/ha).

Filter: Complete

Clase	Timb. 1.1	Cork 1.2	Fire. 1.3	Fruits 1.4	Silvo 1.5	Cons. 1.6	Other 1.9	Fores. 1*	Game 2	Res. 4	**Comm. 10***	Amen. 11	Recr. 12	Mush. 13	Carb. 14	Land. 15	Bio. 16	Water 17	**Env. 20***	**Social 21***
1. Total output	2.37	-	0	-	0.60	12.61	39.04	54.63	1.92	9.17	65.72	237.94	61.44	0.97	28.04	77.72	16.56	3.44	426.11	491.83
1.1 Intermediate output	0	-	-	-	0.60	8.18	37.04	45.88	0.21	9.17	55.26	-	-	-	-	-	-	-	-	55.26
1.1.1 Natural growth	0	-	-	-	-	-	-	0	-	-	0	-	-	-	-	-	-	-	-	0
1.1.2 Rough grass grazed	-	-	-	-	0.56	-	-	0.56	-	-	0.56	-	-	-	-	-	-	-	-	0.56
1.1.3 Rough acorn fodder	-	-	-	-	0	-	-	0	-	-	0	-	-	-	-	-	-	-	-	0
1.1.4 Recreational hunting catch	-	-	-	-	-	-	-	-	0.21	-	0.21	-	-	-	-	-	-	-	-	0.21
1.1.5 Fattened livestock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.6 Environmental water	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.7 Intermediate service	-	-	-	-	-	8.18	37.04	45.22	-	9.17	54.39	-	-	-	-	-	-	-	-	54.39
1.1.9 Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2 Final output	2.31	-	0	-	-	4.43	2.00	8.75	1.71	-	10.46	237.94	61.44	0.97	28.04	77.72	16.56	3.44	426.11	436.57
1.2.1 Sales	0.43	-	-	-	-	-	-	0.43	-	-	0.43	-	-	-	-	-	-	-	-	0.43
1.2.2 Gross fixed capital formation	-	-	-	-	-	4.43	2.00	6.43	0	-	6.51	-	0.96	-	-	0.31	0.59	-	1.86	8.37
1.2.2.1 Timber plantations for repeated production	-	-	-	-	-	*4.43*	-	*4.43*	-	-	*4.43*	-	-	-	-	-	-	-	-	*4.43*
1.2.2.2 Own construction	-	-	-	-	-	-	*1.25*	*1.25*	*0*	-	*1.28*	-	*0.81*	-	-	*0*	*0.19*	-	*1.03*	*2.31*
1.2.2.3 Own equipment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.2.4 Livestock breeders	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.2.5 Game breeders	-	-	-	-	-	-	-	-	*0*	-	*0*	-	-	-	-	-	-	-	-	*0*
1.2.2.9 Others	-	-	-	-	-	-	*0.75*	*0.75*	*0*	-	*0.77*	-	*0.15*	-	-	*0.28*	*0.40*	-	*0.83*	*1.60*
1.2.3 Gross work in progress formatio	1.88	-	0	-	-	-	-	1.89	1.42	-	3.31	-	-	-	-	-	-	-	-	3.31
1.2.3.1 Timber natural growth	*1.88*	-	*0*	-	-	-	-	*1.89*	-	-	*1.89*	-	-	-	-	-	-	-	-	*1.89*
1.2.3.2 Non-breeding livestock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.3.3 Non-breeding game	-	-	-	-	-	-	-	-	*1.42*	-	*1.42*	-	-	-	-	-	-	-	-	*1.42*
1.2.3.4 Crops in progess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.3.9 Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.4 Own final consumption	-	-	-	-	-	-	-	-	-	-	-	237.94	-	-	-	-	-	-	237.94	237.94
1.2.5 Public environmental goods and services	-	-	-	-	-	-	-	-	-	-	-	-	60.48	0.97	28.04	77.41	15.97	3.44	186.31	186.31
1.2.9 Others	-	-	-	-	-	-	-	-	0.21	-	0.21	-	-	-	-	-	-	-	-	0.21
2. Total cost	34.49	-	-	-	1.19	12.56	39.00	87.24	1.71	7.18	96.13	9.17	7.84	0.09	2.90	50.90	5.13	-	76.03	172.16
2.1 Intermediate consumption	4.59	-	-	-	0.18	4.52	12.45	21.74	0.49	0.58	22.81	9.17	3.02	0	2.90	46.15	1.44	-	62.69	85.50
2.1.1 Raw materials	0.50	-	-	-	0.12	0	0.09	0.74	0.23	0.13	1.10	-	0	-	-	0	0	-	0	1.17
2.1.1.1 Purchased	*0.44*	-	-	-	*0.12*	*0*	*0.09*	*0.68*	*0*	*0.13*	*0.83*	-	*0*	-	-	*0*	*0*	-	*0*	*0.90*
2.1.1.2 Own-produced	*0*	-	-	-	-	-	-	*0*	*0.21*	-	*0.27*	-	-	-	-	-	-	-	-	*0.27*
2.1.1.2.1 Intra-unit raw material consumption	*0*	-	-	-	-	-	-	*0*	*0.21*	-	*0.27*	-	-	-	-	-	-	-	-	*0.27*
2.1.1.2.2 Stored	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.1.2.9 Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.1.3 Environmenta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.1.9 Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.2 Services	3.93	-	-	-	0	4.49	12.36	20.84	0.26	0.45	21.55	9.17	2.98	0	2.90	46.14	1.42	-	62.62	84.17
2.1.2.1 Purchased	*3.93*	-	-	-	*0*	*4.49*	*12.36*	*20.84*	*0.26*	*0.45*	*21.55*	-	*1.62*	*0*	-	*2.30*	*1.40*	-	*5.33*	*26.88*
2.1.2.2 Intermediate production service	-	-	-	-	-	-	-	-	-	-	-	*9.17*	*1.36*	-	-	*43.84*	*0*	-	*54.39*	*54.39*
2.1.2.3 Environmental	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*2.90*	-	-	-	*2.90*	*2.90*
2.1.2.9 Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.3 Work in progress used	0.16	-	-	-	-	-	-	0.16	-	-	0.16	-	-	-	-	-	-	-	-	0.16
2.1.3.1 Feeling of timber	*0.16*	-	-	-	-	-	-	*0.16*	-	-	*0.16*	-	-	-	-	-	-	-	-	*0.16*
2.1.3.2 Stripping cork	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.3.3 Harvested firewoo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.3.4 Initial livestock stocks and boughts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.3.5 Initial game stocks and boughts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.3.6 Crops in progess	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.1.3.9 Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.2 Labour costs	29.47	-	-	-	0.91	7.78	23.94	62.10	1.16	2.36	65.62	-	3.40	0	-	4.08	3.03	-	10.57	76.19
2.2.1 Employees	29.47	-	-	-	0.91	7.78	23.94	62.10	1.16	2.36	65.62	-	3.40	0	-	4.08	3.03	-	10.57	76.19
2.2.2 Self-employed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.3 Fixed capital consumption	0.43	-	-	-	0.10	0.26	2.61	3.40	0	4.24	7.70	-	1.42	0	-	0.67	0.66	-	2.77	10.47

Surface in ha: 587.630

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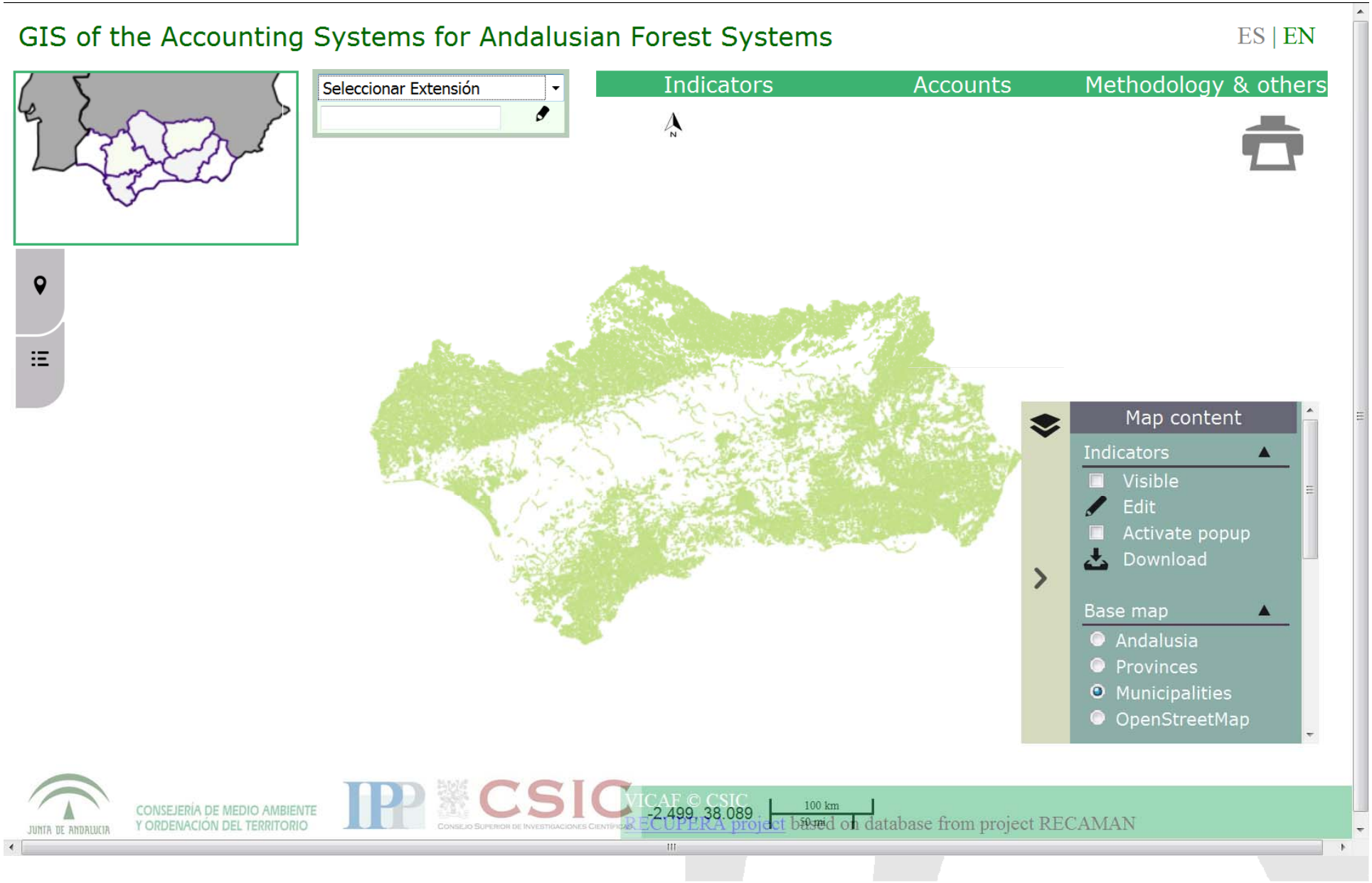
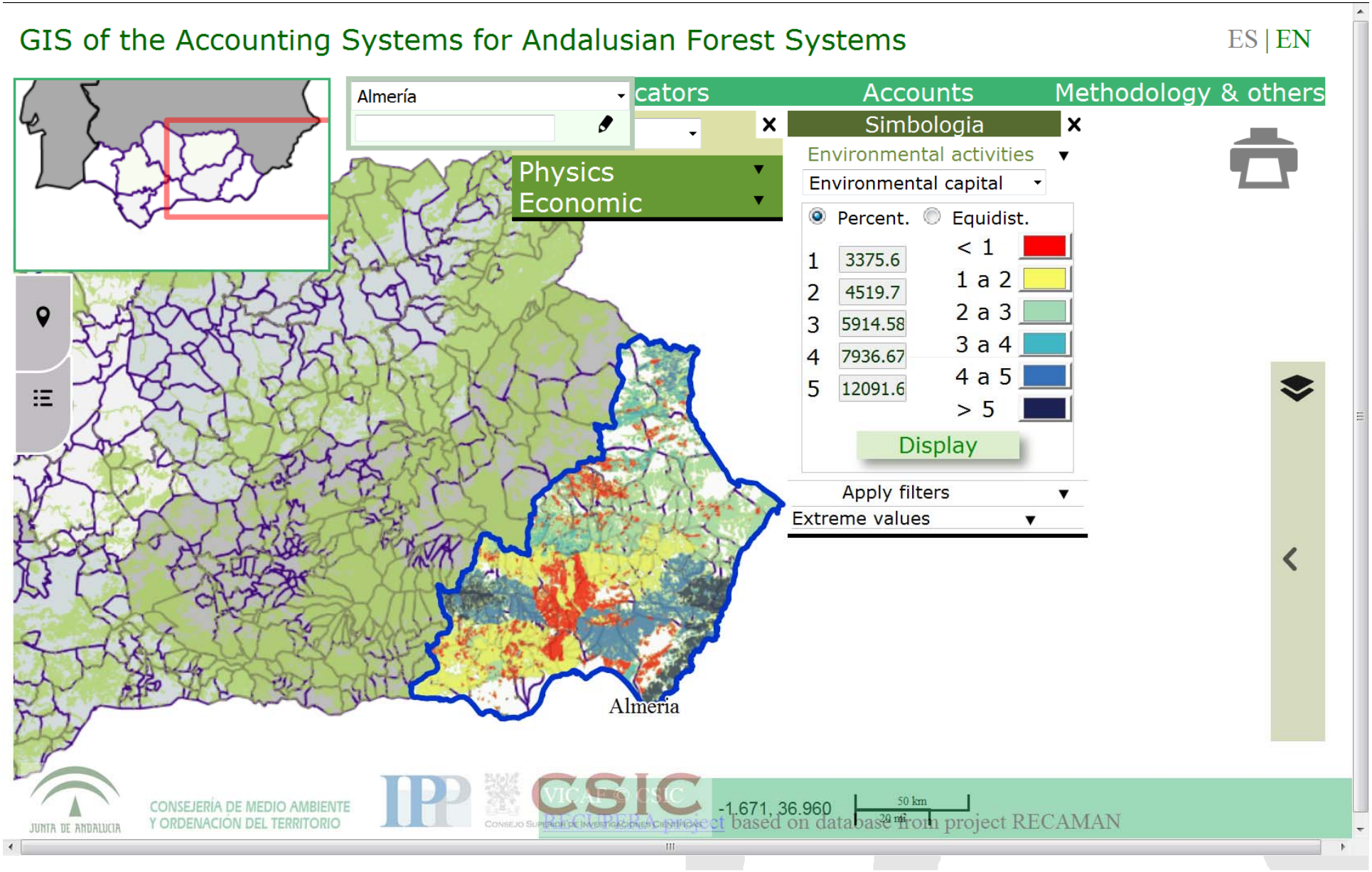
Project RECUPERA based on data from project RECAMAN

GIS – Web mapping



Environmental capital map for Almería



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Scientific institution responsible: Spanish National Council for Scientific Research (CSIC).

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Thank you for your attention

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