Monetary valuation and ecosystem accounting: experiences in Spain

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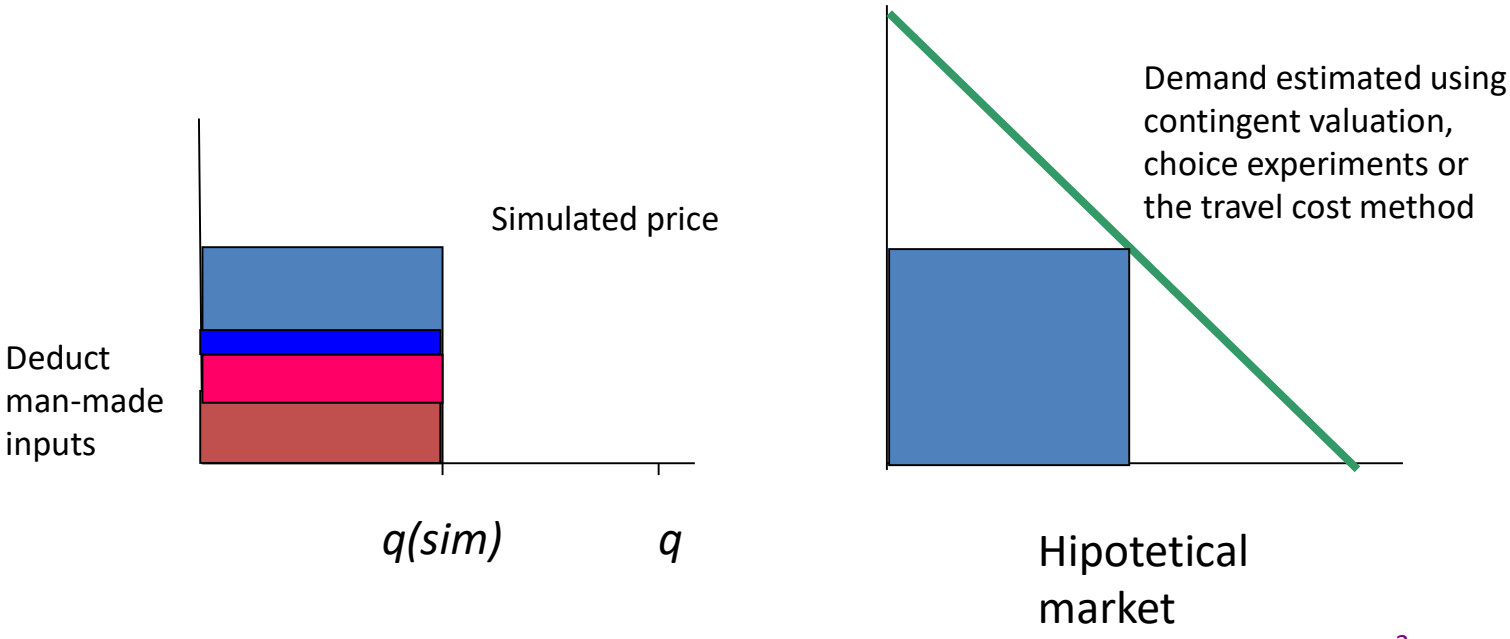
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817527

Exchange values based on the travel cost method, contingent valuation and choice experiments

- Travel cost, contingent valuation an and choice experiments all estimate a demand function. Typically, this is used to estimate the consumer surplus.
  - These estimates are not exchange values

- The simulated exchange value (SEV) method uses the estimated demand to calculate the price that would occur if the ecosystem service were actually marketed (Caparrós et al., 2003, 2017).
  - Combining the information on the demand with a supply function and the appropriate market structure (institutional context)

Simulated Exchange Value (SEV)



SEV: previous applications in Spain

- Previous applications, already published and used in several of the MAIA publications:
  - Free access recreation (Caparrós et al., 2017)
    - Ten national or natural parks in Andalusia
    - Monopolistic competition
    - Each natural park acts as a monopolist in the short term
    - Contingent valuation
  - Biodiversity and landscape values applied to Andalusia, using a choice experiment (Campos et al., 2019)

SEV: new MAIA applications in Spain

- New MAIA applications:
  - Survey done under MAIA
  - Calculation partially completed, publications pending

- SEV for monetary “condition” accounts (CSIC+URJC)
  - Condition instead of landscape: better connection to biophysical accounts in SEEA EA
  - Biodiversity focused on threatened species

- SEV for free access recreation to ten National Parks in Spain (CSIC)
  - Not all parks act as monopolists, there is competition when setting the price
  - In some areas, determined empirically, National Parks would compete between them to set an exchange price
  - Travel cost
  - Not included in original MAIA DoW

Survey: General characteristics

- Objective: recreational use of National Parks in Spain and preferences about the conditions of Spanish forest
- Random sample of Spanish adults (>18 years old)
- The survey was conducted through a computer application, omitting cell phones
- The objective of the survey was to obtained 1100 valid questionnaires (4400 choice observations)

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This survey is carried out with the framework of the MAIA project, led by a team of researchers from Spanish National Research Council (CSIC) in collaboration with Rey Juan Carlos University of Madrid (URJC).

The objective of this survey is to obtain information on the use that is made of the national parks of Spain and the opinion of the citizens of for the conservation of Spanish forests.

The questionnaire is anonymous and your participation is voluntary. We appreciate you taking a few minutes of your time. When answering, keep the following in mind:

1) Try to answer all the questions. There is no right or wrong answers. We just want your opinion.
2) To pass the screen, press the "next" button located at the bottom right of the screen.
3) This survey DOES NOT ALLOW pressing the browser's "back" or "refresh" button. If you do, you will leave the survey.
4) Eliminate any source of distraction (mobile, magazines, conservations…) during the completion of the questionnaire.
5) Take as much time as you need, although the questionnaire is estimated to take about 15 minutes.

Click "next" to start the questionnaire.

In the first part of this questionnaire, we are going to ask you questions about the Spanish national parks and the use they make them. Please, consider only the territory occupied by natural parks, excluding their areas of influence occupied by natural parks and the adjoining ski resorts.

In Spain, there are 16 national parks. In this survey, we are going to focus on the 10 national parks that are located on the peninsula, leaving out the six nationals parks located on islands (Teide, Garajonay, Caldera de Taburiente and Timanfaya in the Canary Islands, Cabrera in the Balearic Islands and Atlantic Islands in Galicia. The following map shows the 10 peninsular national parks:

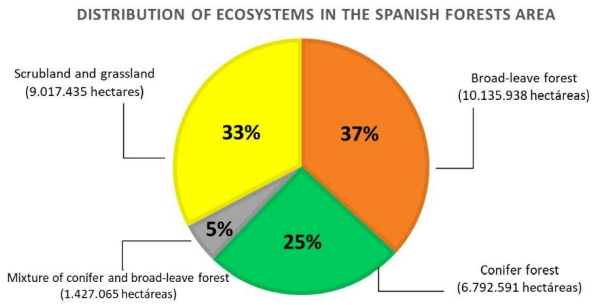
Survey: Information text

The objective of this text is to provide information about the current state of conservation of forest, and the number of species in danger of extinction in Spain, as well as the implications of carrying out of different programs proposed, or not carrying out any program

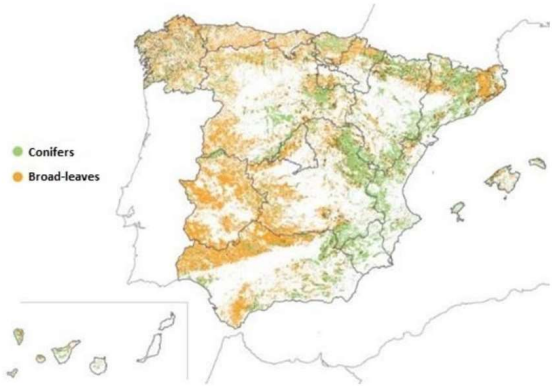
There is a minimum amount of time required for reading. If the person is below this minimum, the observation is excluded

In this part, we want to know your preferences about the conservation of Spanish forest and their species of fauna and flora.

In Spain, coniferous and broad-leaves forest predominate, occupying 67% of the forest area (pure and mixed mass), with the remaining 33% being treeless forest (scrubs and grasslands). The following graph shows the percentage distribution of these forest areas in Spain.



In the following questions we are going to focus on the coniferous and broad-leave forests of Spain. The following map shows the location of these forests in Spain (orange broad-leave surface and green coniferous surface).



Font: Mapa Forestal de España (MFE50), Ministerio Transición Ecológica y Reto Demográfico.

The main species of conifers in Spain are the pines, among which, the resin pines or *pinus pinea.* Other species of conifers, less abundant, are firs or junipers

Pinus pinaster

Pinus sylvestris

The main species of broad-leave in Spin are the holm oak, the cork oak, and rebollo. Other species of broad-leave, less abundant, are the oaks.

Holm oak

Cork oak

According to experts, forest conservation is measured through a condition index. This represents the quality of an ecosystem measured in terms of its abiotic (physical and chemical), biotic (structural, functional and compositional) and landscape characteristics. This index is evaluated based on the capacity of the ecosystem to maintain its characteristics over time.

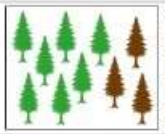
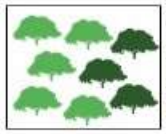
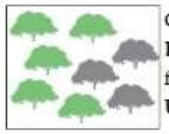
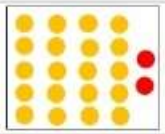
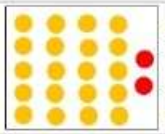
The current state of the condition of the forests in Spain is subject to various pressures, among which the risk of fires and the threats associated with climate change stand out. There are four condition:

Level	Description
FAVORABLE	Optimum level of condition and high integrity
MEDIUM	Acceptable level of condition and integrity
REGULAR	Low level of condition and risk of integrity being degraded
UNFAVORABLE	Low level of condition and integrity

For Spanish forests, the CURRENT STATE of condition is MEDIUM for conifers and REGULAR for broad-leave.

These forests are also the habitat of various species of fauna and flora that depend on their state of condition. According to the list of threatened species of the Ministry of Ecological an Transition and Demographic Challenge, there are 20 species that are "in danger of extinction" in these forest: 4 mammals, 2 birds and 14 plants. These species are show below:

Condition: Sample choice card

Program characteristics	Program A	Program B	Program C
Conifer	 **DON'T CHANGE** the condition level **(MEDIUM)**	 **DON'T CHANGE** the condition level **(MEDIUM)**	 Condition level **DETERIORATE** from **MEDIUM** to **REGULAR**
Broad-leave	 Condition level **IMPROVEMENT** from **REGULAR** to **MEDIUM**	 Condition level **DETERIORATE** from **REGULAR** to **UNFAVORABLE**	 Condition level **DETERIORATE** from **REGULAR** to **UNFAVORABLE**
Threatened species	 **INCREASE IN 2** the threatened species **(from 20 to 22)**	 **DON'T CHANGE** the number of threatened species **(20)**	 **INCREASE IN 2** the threatened species **(from 20 to 22)**
Payment	 **200 euros**	 **100 euros**	**0 euros**
MARK THE OPTION YOU WOULD CHOOSE	○	○	○

- For the presentation of the cards, several experiments designs were made, choosing the one that had the least dominance

Condition: Conditional Logit

Atribute	Parameters
Conifer no change	0.6032***
	(0.0855)
Conifer improvement	0.7122***
	(0.0719)
Broadleave no change	0.4890***
	(0.0782)
Broadleave improvement	0.8379***
	(0.0637)
Biodiversity no change	0.5975***
	(0.0867)
Biodiversity improvement	1.0705***
	(0.0659)
Bid	-0.0023***
	(0.0002)
N	4400

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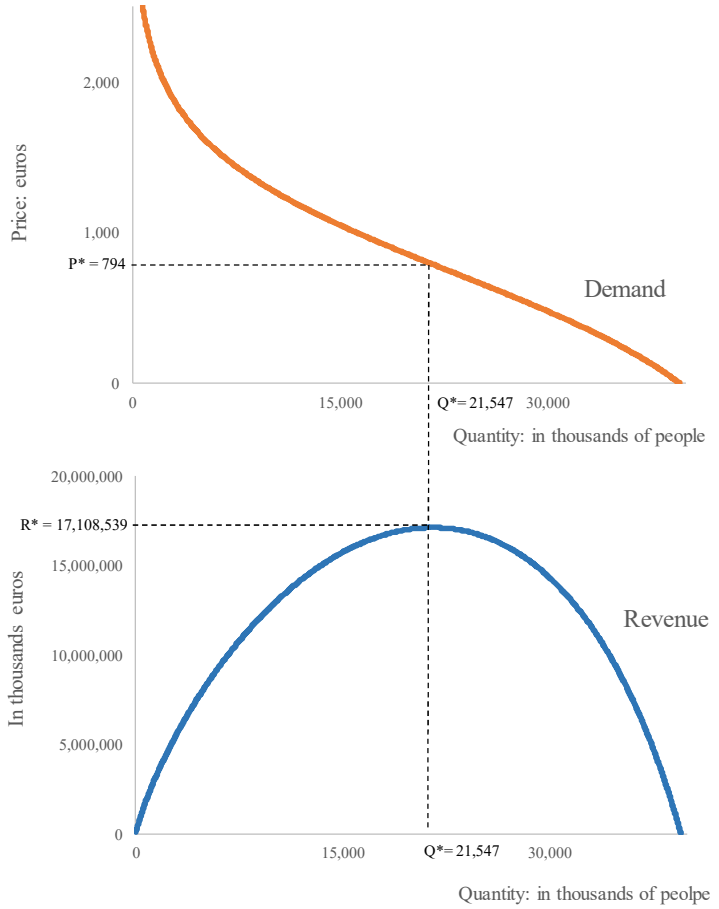
Condition: Results (CL)

Atributes	Walligness to pay (WTP)
Conifer no change	283€
Broadleave no change	230€
Bio no change	281€
Total	794€

46% of the Spanish population would pay 794€ in 30 years, that is, 29.6€ per year so that conifers, broadleave and biodiversity species are maintained under current conditions



Condition: Mixed Logit

Atribute	Mean parameters	Standard deviation parameters
Conifer no change	5.7614***	7.0657***
	(1.0453)	(1.1538)
Conifer improvement	0.9755***	1.6376***
	(0.1154)	(0.1363)
Broadleave no change	1.4010***	2.0111***
	(0.2265)	(0.2752)
Broadleave improvement	1.2782***	1.3234***
	(0.1099)	(0.1278)
Biodiversity no change	1.7581***	2.6152***
	(0.2805)	(0.3253)
Biodiversity improvement	1.5402***	2.1435***
	(0.1280)	(0.1736)
Bid	-0.0039***	
	(0.0004)	
N	4400	

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Condition: Latent Class

Atribute	Parameters in class 1	Parameters in class 2
Conifer no change	0.8056***	-0.1204
	(0.1430)	(1.1605)
Conifer improvement	1.9141***	1.9217*
	(0.2876)	(1.0620)
Broadleave no change	1.2377***	-5.5985***
	(0.1964)	(1.8018)
Broadleave improvement	1.6540***	4.1902***
	(0.2740)	(1.3270)
Biodiversity no change	0.7355***	5.3349***
	(0.1729)	(1.3418)
Biodiversity improvement	1.1299***	6.7427***
	(0.1888)	(1.7550)
Bid	-0.0129***	0.0027
	(0.0027)	(0.0031)
N	4400	

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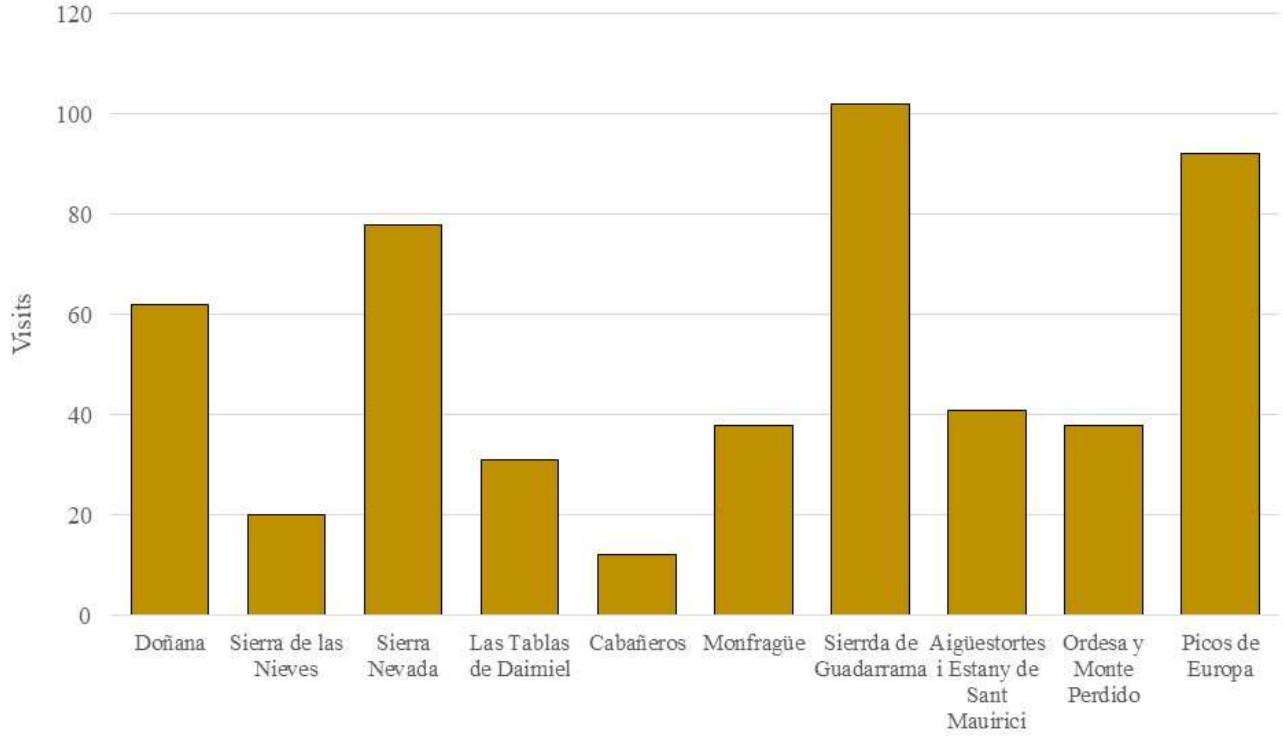
Recreation: Travel cost model

In Spain, there are 16 national parks. In this survey, we are going to focus on the 10 national parks that are located on the peninsula, leaving out the six nationals parks located on islands (Teide, Garajonay, Caldera de Taburiente and Timanfaya in the Canary Islands, Cabrera in the Balearic Islands and Atlantic Islands in Galicia. The following map shows the 10 peninsular national parks:

Recreation: Travel cost model

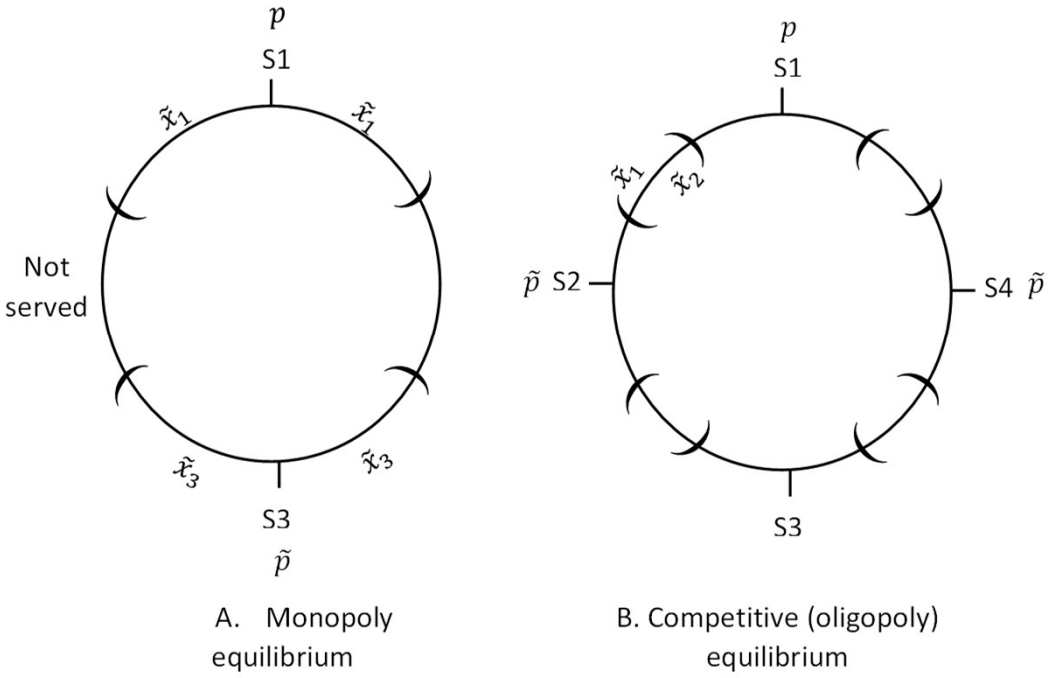


- 46.6% of our sample (514 out of 1100) visited at least one National Park during the last year.
  - Out of those, 66.5% made a day-visit and the rest stayed longer.

SEV and recreation: Theory

Caparrós (2022):

- SEV in a pure Salop circle: identifies area where, under monopolisitic competition, the Ecosystem Trustee of the National Park would act as a monopolist, and area where it would set the price taking into account the competition of other areas
- SEV in a Salop circle with
  - count data travel cost models
  - discrete choice models



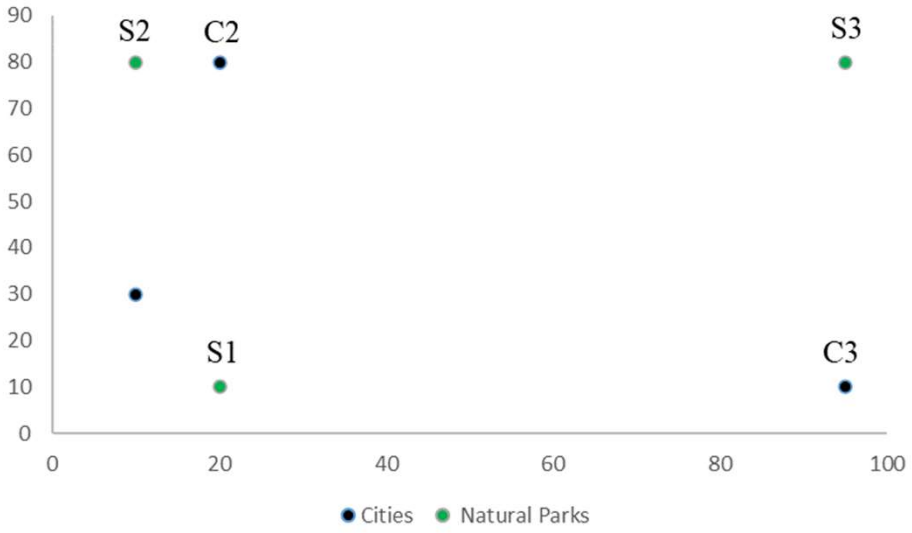
A. Monopoly equilibrium

B. Competitive (oligopoly) equilibrium

SEV and recreation: Theory

Caparrós (2022):

- SEV in a general economy with discrete choice models (travel cost or choice experiment)



	Option chosen				
Origin	Stay at home	Visit S1	Visit S2	Visit S3	Total
City C1	34	19	6	1	60
City C2	30	6	20	4	60
City C3	45	6	2	7	60

Results: p_1=42, p_2=44, p_3=39

Conclusions

- Published applications have used the Simulated Exchange Values in Spain for
  - Nature based recreation in Andalusian National and Natural Parks
    - Assuming that the Ecosystem Trustee of all Parks act as monopolists
  - Landscape and biodiversity values in Andalusia

- Recent applications have used the Simulated Exchange Values in Spain for
  - Nature based recreation in Andalusian in National
    - Assuming that competition between Parks is endogenously determined, yielding regions where:
      - the Ecosystem Trustees act as monopolists
      - The Ecosystem Trustees set prices under a competitive equilibrium
  - Forest condition and biodiversity values in Spain

- All estimates are compatible with SEEA EA

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817527