from Nexus Thinking to Nexus Doing

REXUS

REXUS Technical Solutions: Water, Land, Energy and Climate

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Isonzo Meeting 3rd march 2022

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101003632.

Objectives

Provide data and information together with tools to generate that data for the pilots but that will be used for further analysis.

- This includes methodologies/tools to generate and harmonize the required data.
- Data refer to both in-situ and remote sensing biogeophysical data and indicator products as well as socio-economic indicators relating to Nexus (and in support of SDGs).

- Named **REXUS Observatory** for internal use of the project but it is **different** than **Citizen Observatory**

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Land Use

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- Soil Maps
- Biophysical Variables
- Land Use
- Land Suitability

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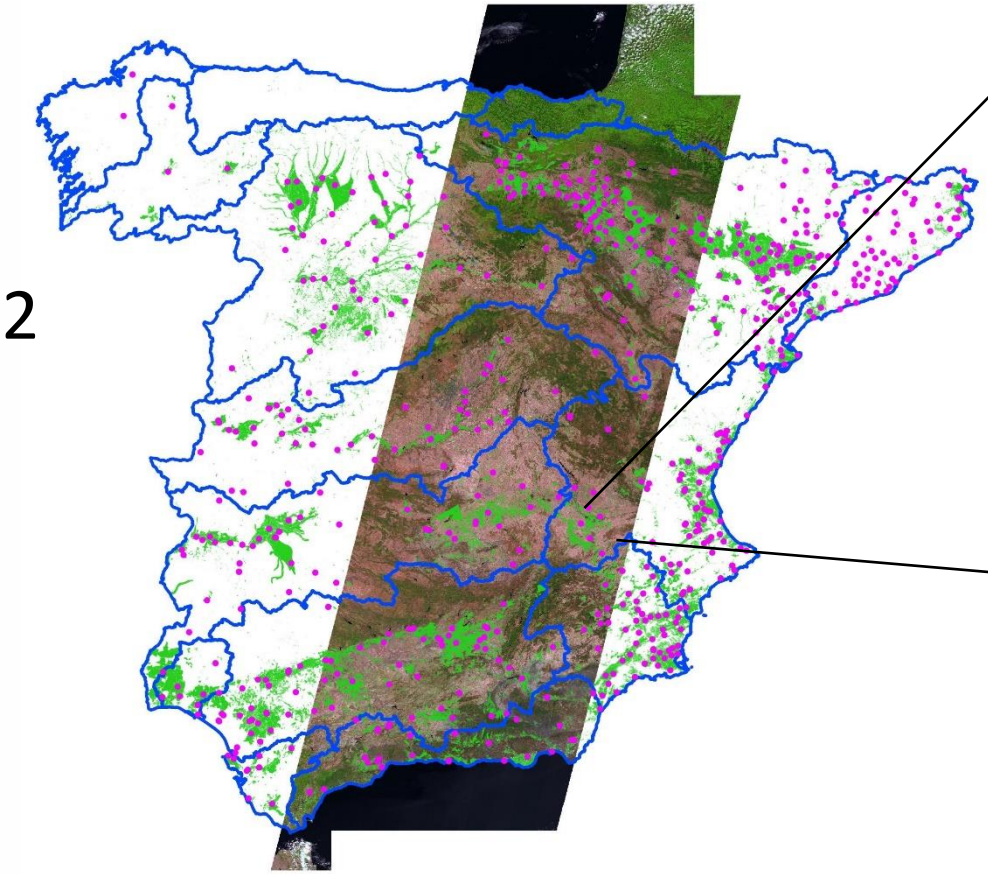
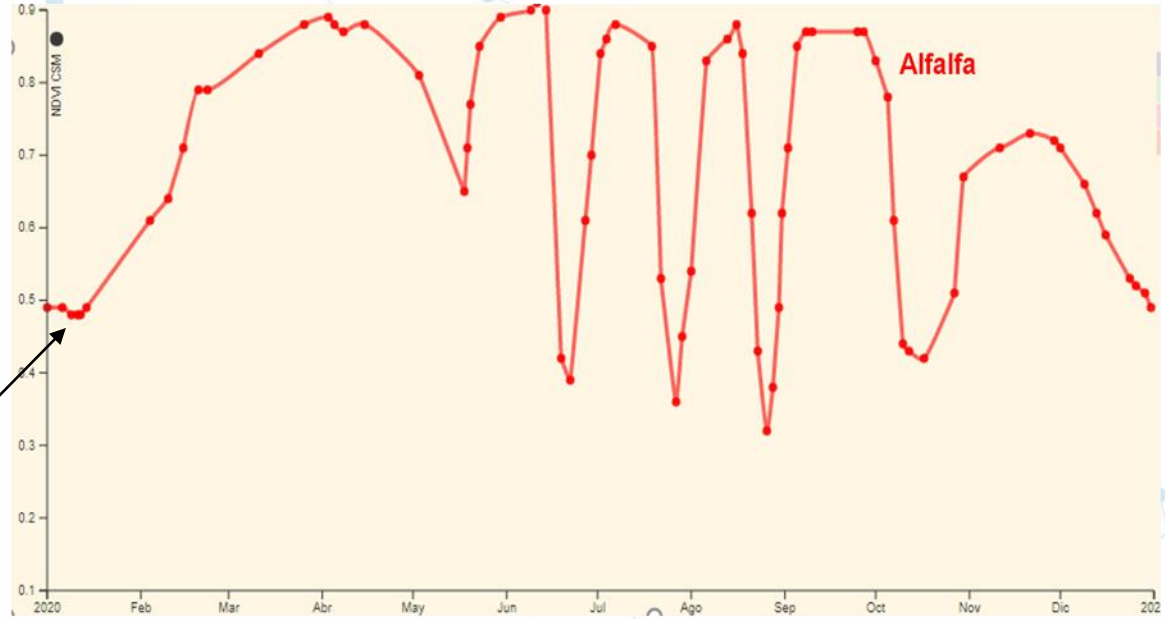
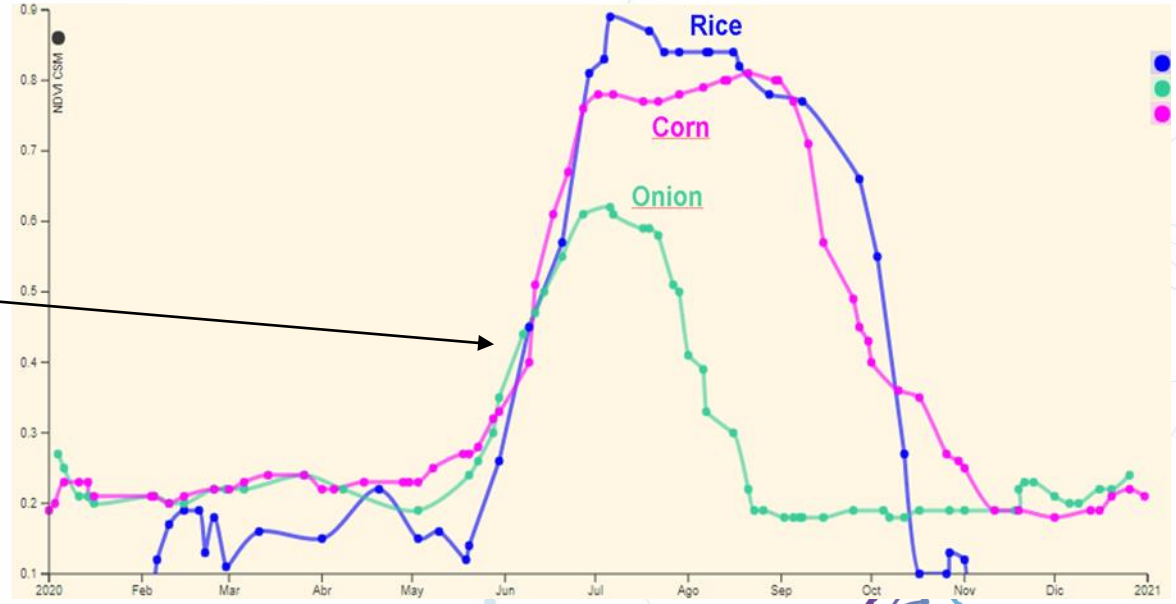
Methodology

Sentinel 2







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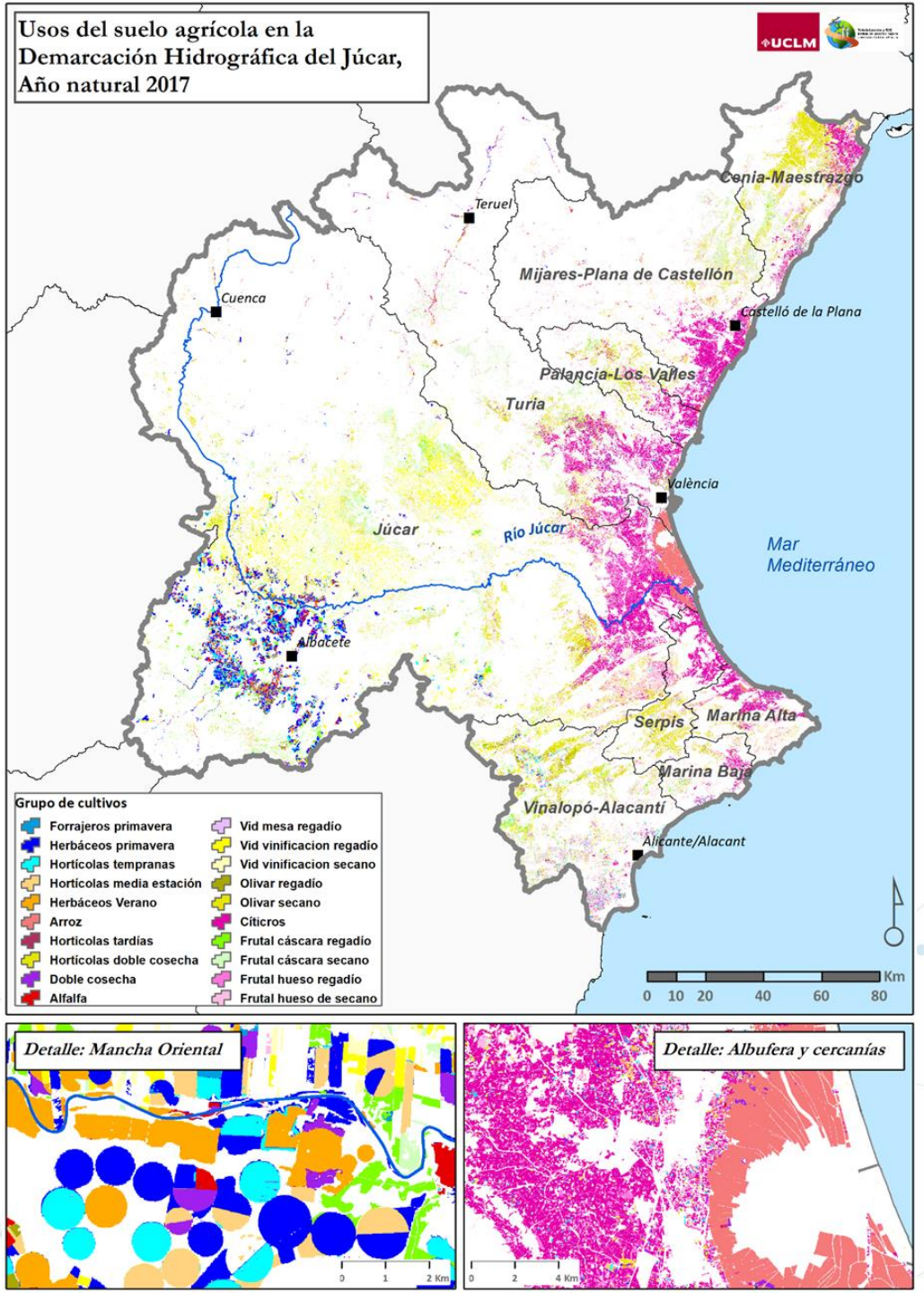
Land Use assessment exercise (Júcar River Spanish sub-pilot area)



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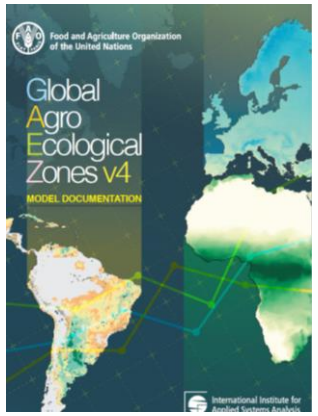
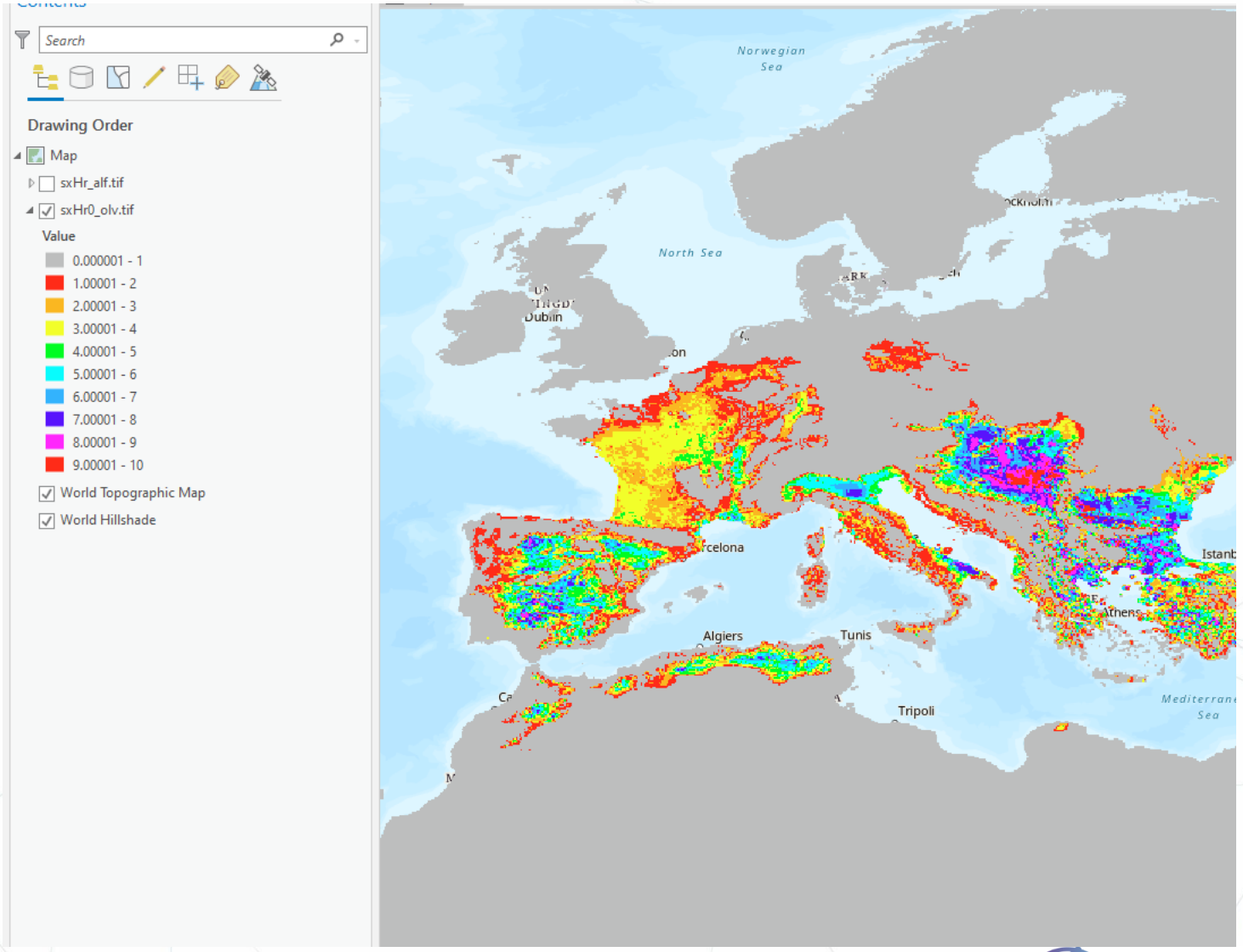
Land Use Suitability



https://gaez.fao.org/

Olive Tree sutability Index



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Water Accounting & Footprint

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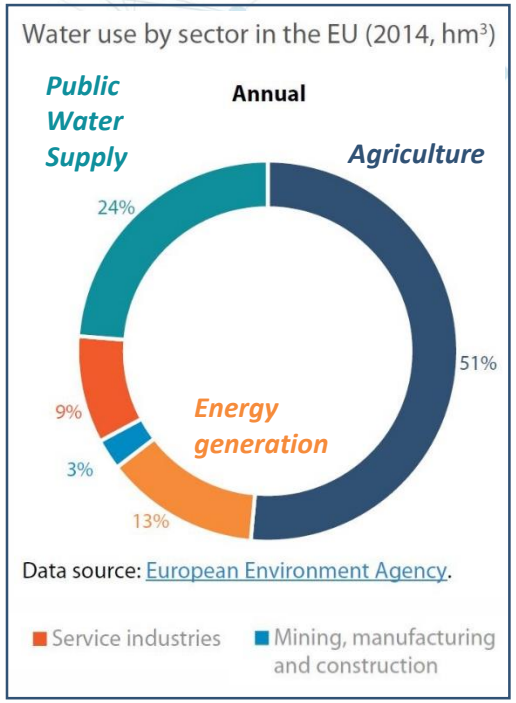
Modelling and Outcomes



Agricultural Water Footprint satellite assisted

$$WF_{proc} = WF_{proc,green} + WF_{proc,blue} + WF_{proc,grey} \quad \text{[volume/mass]}$$

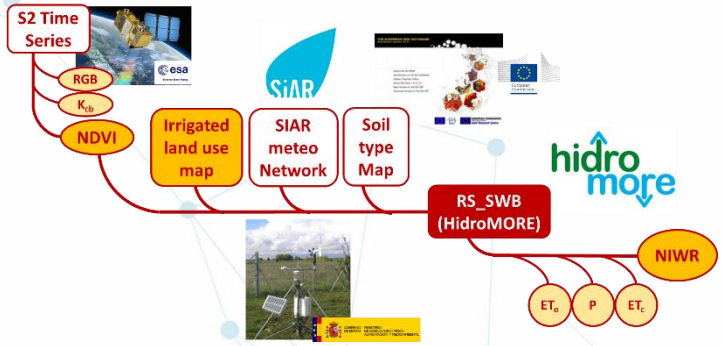
Water accounting

$$CWU = 10 \times \sum_{d=1}^{lgp} ET \quad \text{[volume/area]}$$

Associated water footprint

$$WF_{proc} = {}^{CWU}/_{Y} \quad \text{[volume/mass]}$$

Remote Sensing assisted



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Universidad de Castilla-La Mancha

Teledetección y SIG
Instituto de Desarrollo Regional
Universidad Castilla-La Mancha

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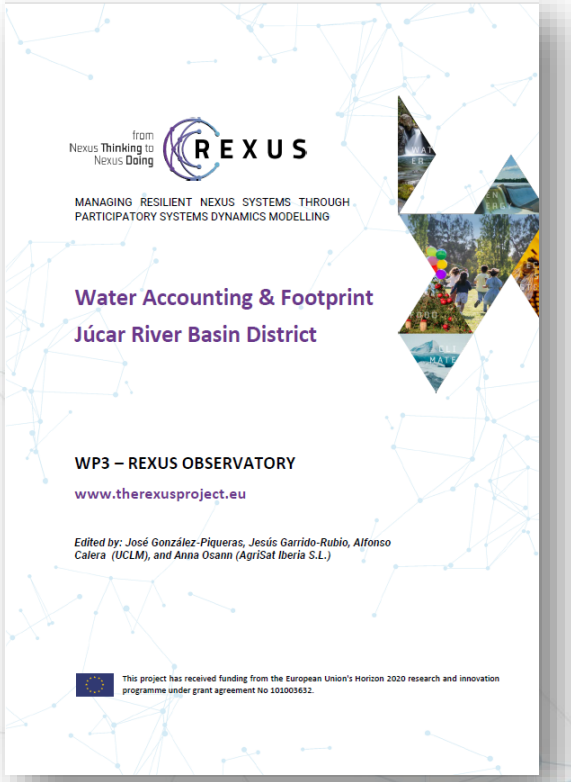
Task 3.2 Water Accounting & Footprint

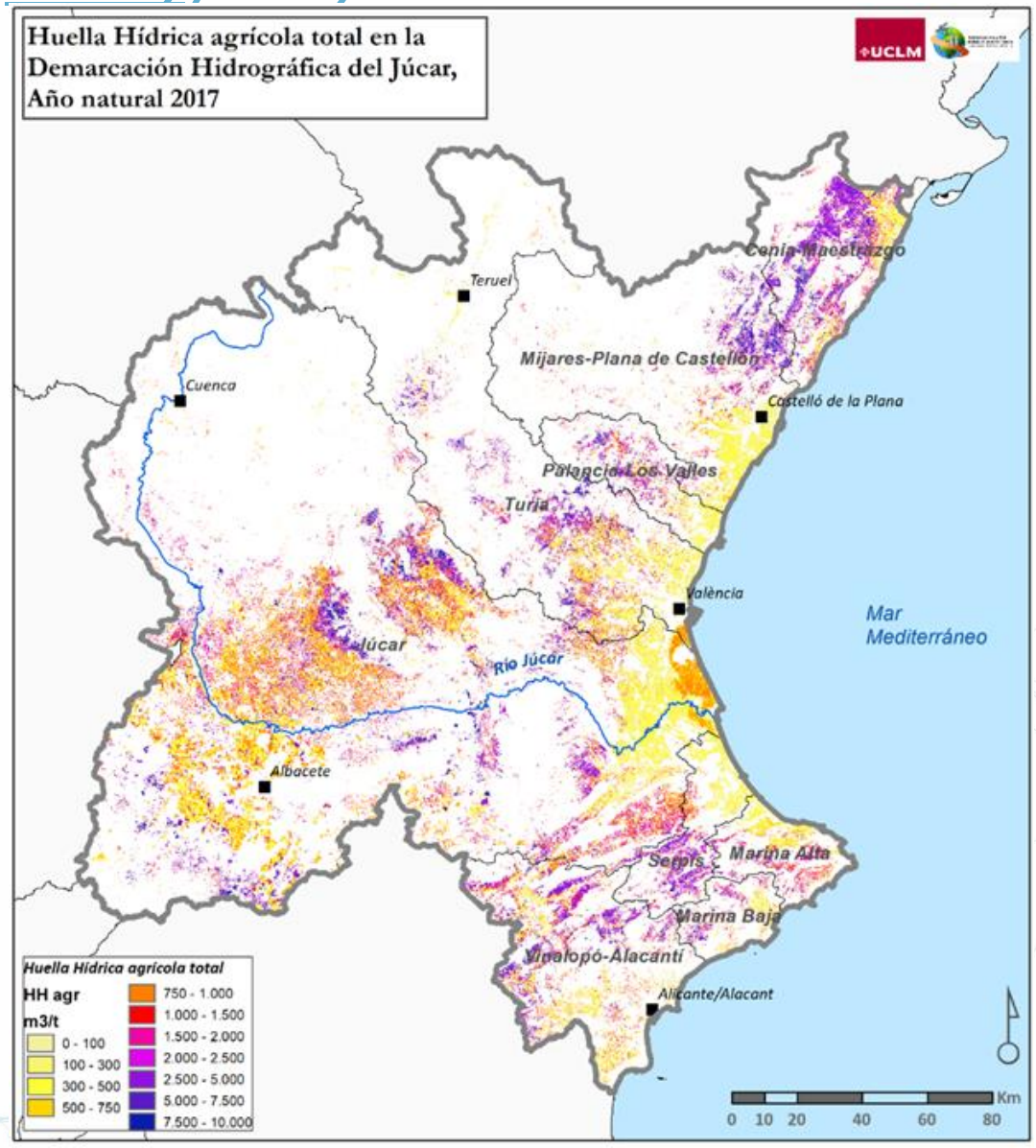
Modelling and Outcomes

Water Accounting and Footprint assessment exercise (Júcar River Spanish sub-pilot area)



Period: 2017 – 2020 Pixel scaled information

Data temporal frequency aggregation: Monthly / Yearly



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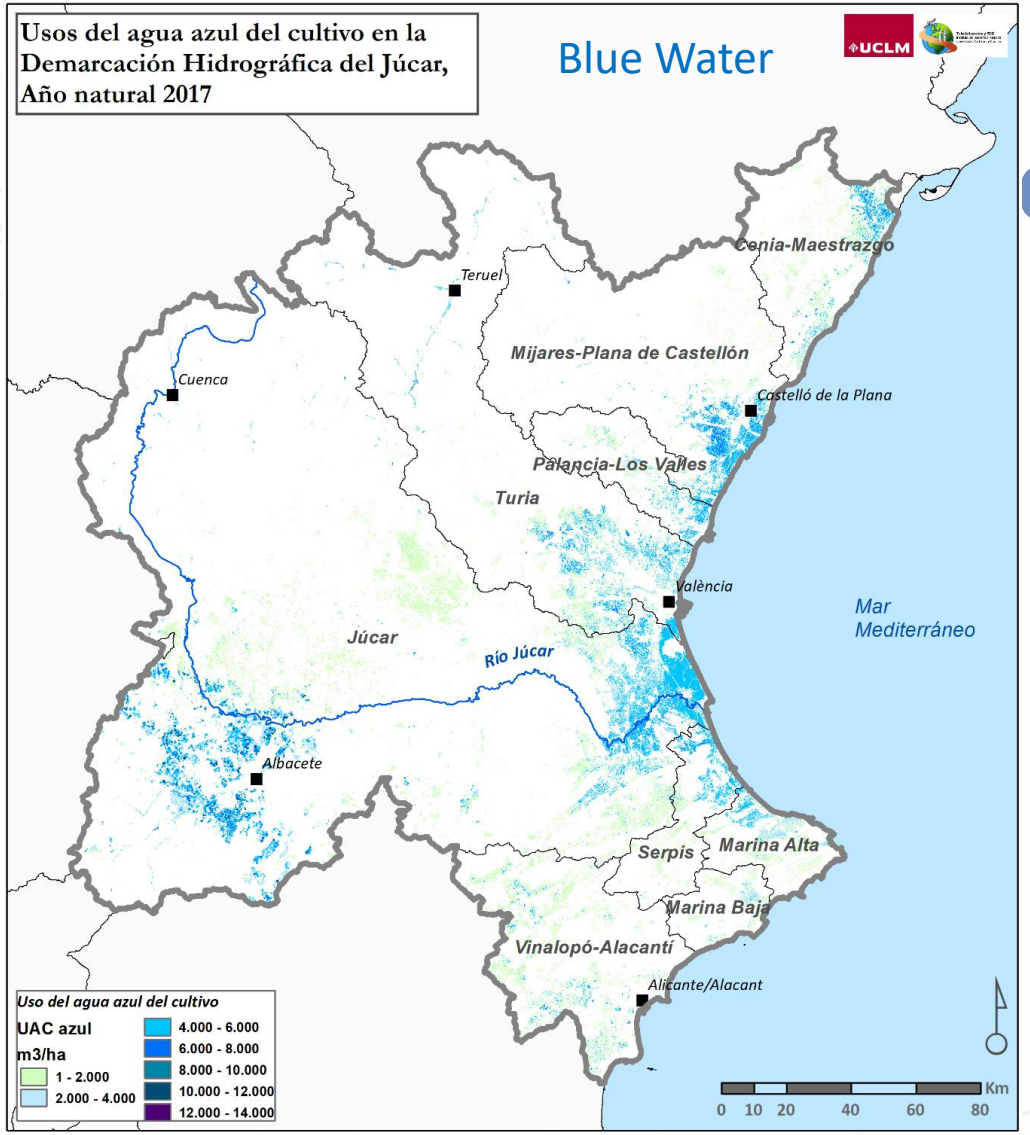
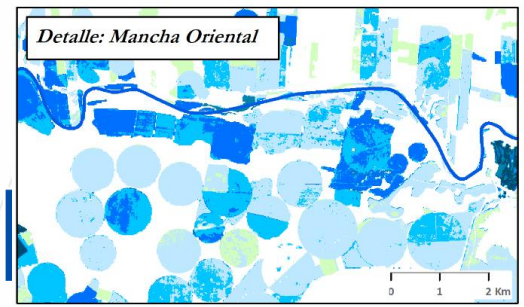
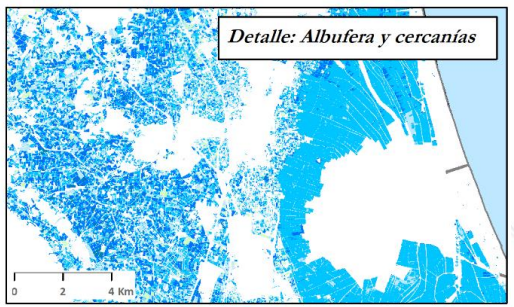
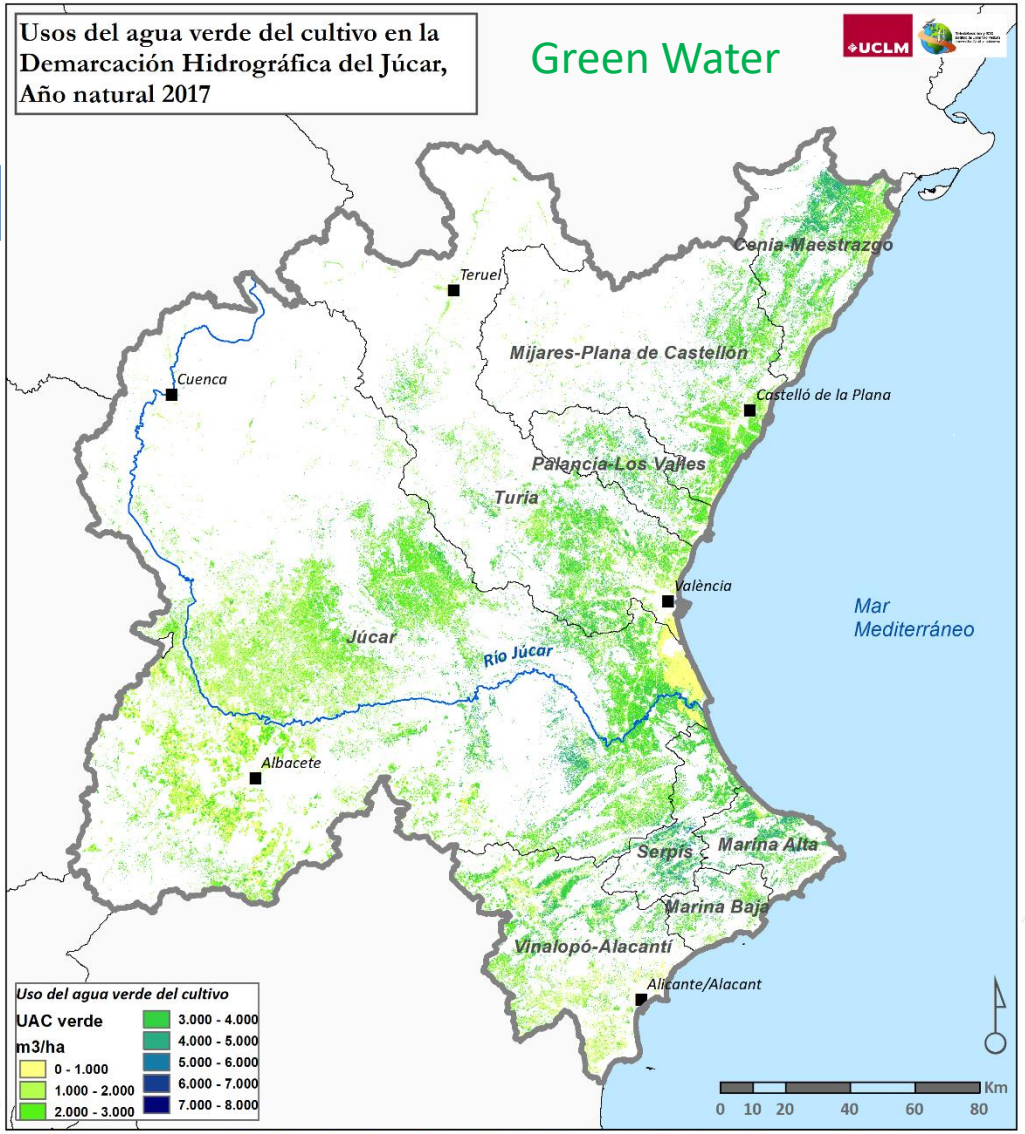
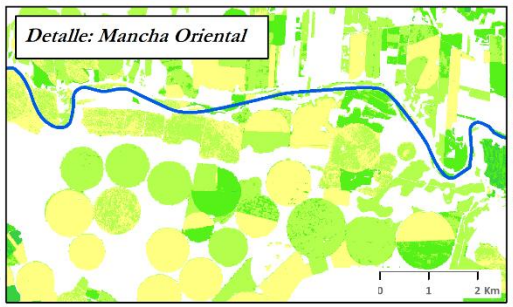
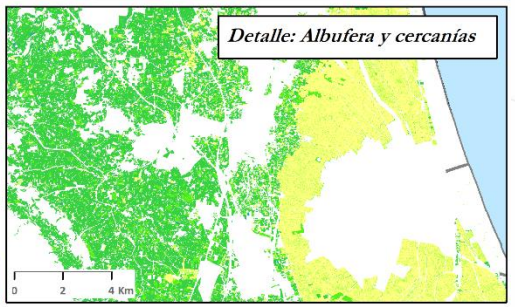

Usos del agua azul del cultivo en la Demarcación Hidrográfica del Júcar, Año natural 2017
Blue Water
Cenia-Maestrazgo
Teruel
Mijares-Plana de Castellón
Cuenca
Castelló de la Plana
Palancia-Los Valles
Turia
València
Júcar
Río Júcar
Mar Mediterráneo
Albacete
Serpis
Marina Alta
Marina Baja
Vinalopó-Alacantí
Alicante/Alacant
Uso del agua azul del cultivo
UAC azul
m3/ha
1 - 2.000
2.000 - 4.000
4.000 - 6.000
6.000 - 8.000
8.000 - 10.000
10.000 - 12.000
12.000 - 14.000
Km
0 10 20 40 60 80


Detalle: Mancha Oriental
0 1 2 Km


Detalle: Albufera y cercanías
0 2 4 Km

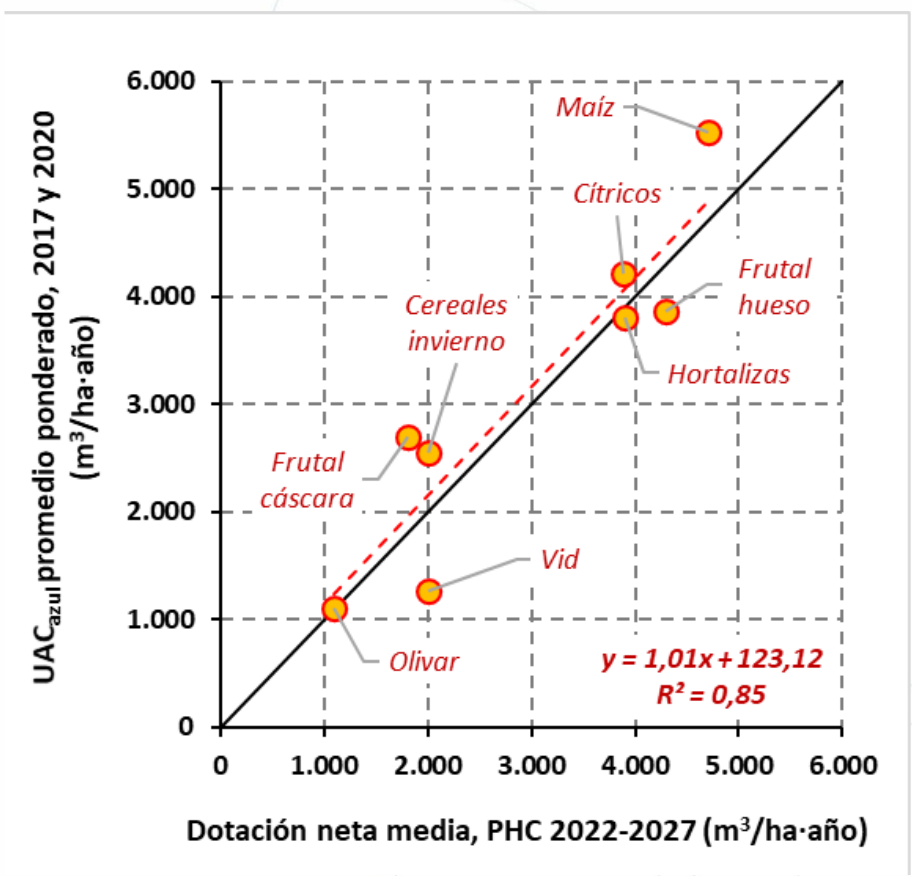

Usos del agua verde del cultivo en la Demarcación Hidrográfica del Júcar, Año natural 2017
Green Water
Cenia-Maestrazgo
Teruel
Mijares-Plana de Castellón
Cuenca
Castelló de la Plana
Palancia-Los Valles
Turia
València
Júcar
Río Júcar
Mar Mediterráneo
Albacete
Serpis
Marina Alta
Marina Baja
Vinalopó-Alacantí
Alicante/Alacant
Uso del agua verde del cultivo
UAC verde
m3/ha
0 - 1.000
1.000 - 2.000
2.000 - 3.000
3.000 - 4.000
4.000 - 5.000
5.000 - 6.000
6.000 - 7.000
7.000 - 8.000
Km
0 10 20 40 60 80

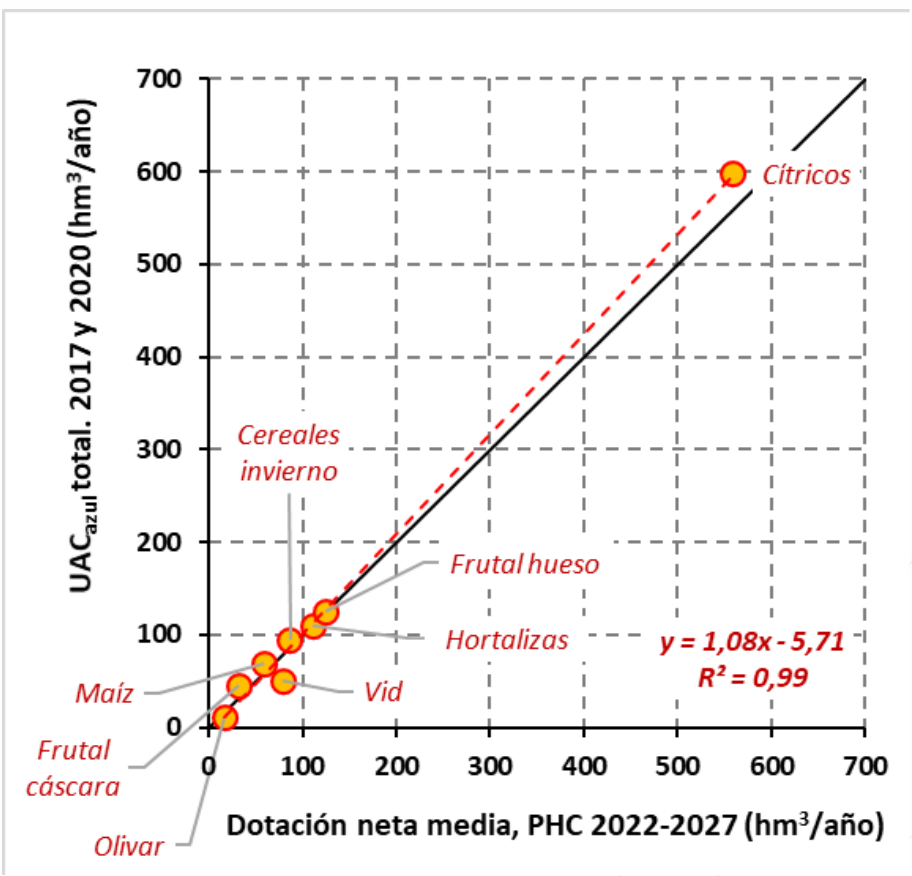

Detalle: Mancha Oriental
0 1 2 Km


Detalle: Albufera y cercanías
0 2 4 Km

Delivered Water Footprint DH Júcar

Validation





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Energy and carbon accounting and footprints

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101003632.

Aim

- To assess the current status for energy sources and their link to the food and water systems by analysing synergies and trade-offs.

  - **Types of energy** production (for example, fossil fuels replaced by hydropower or biofuels) and **demands** in energy usage **affect water usage and availability** and **impact agricultural production.**
  - **Allocation of sources (water, energy, soil)** cause conflicts and concerns for the sustainable management of these sources, especially the **transboundary ones**.
  - Understanding climate-water-energy-food nexus help **to optimize the use of resources.**
  - **Energy and carbon accounting and footprints contribute to** analyse and optimize synergies and trade-offs of the energy sources and their links to the food and water systems.

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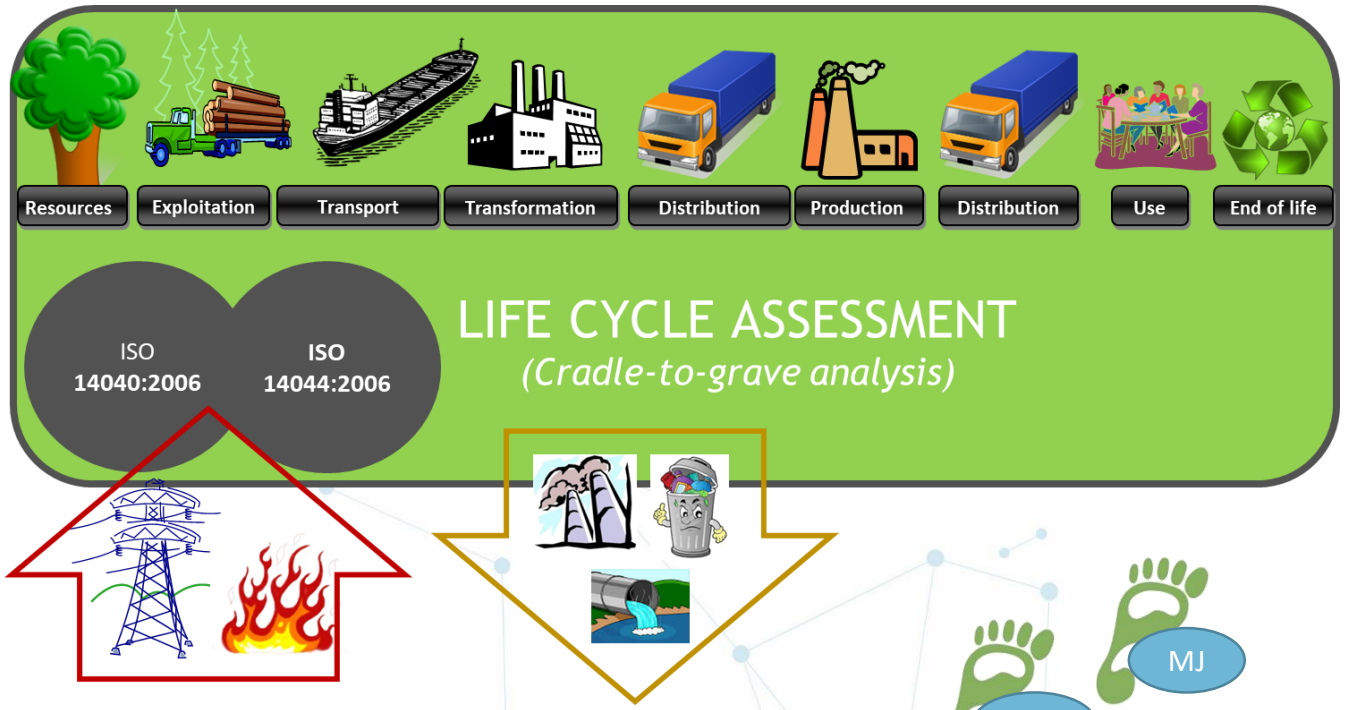
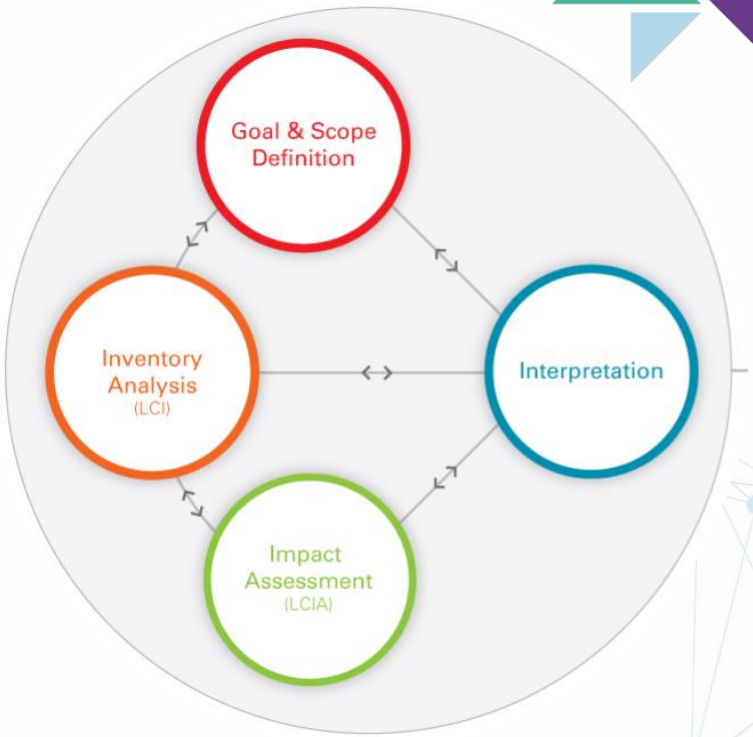
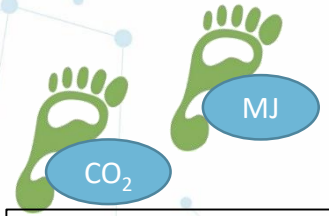
Carbon footprints is the total amount of greenhouse gas emissions that come from the life cycle assessment of a product, activity, or process.







Software: SimaPro
Databases: Ecoinvent 3.0, etc.

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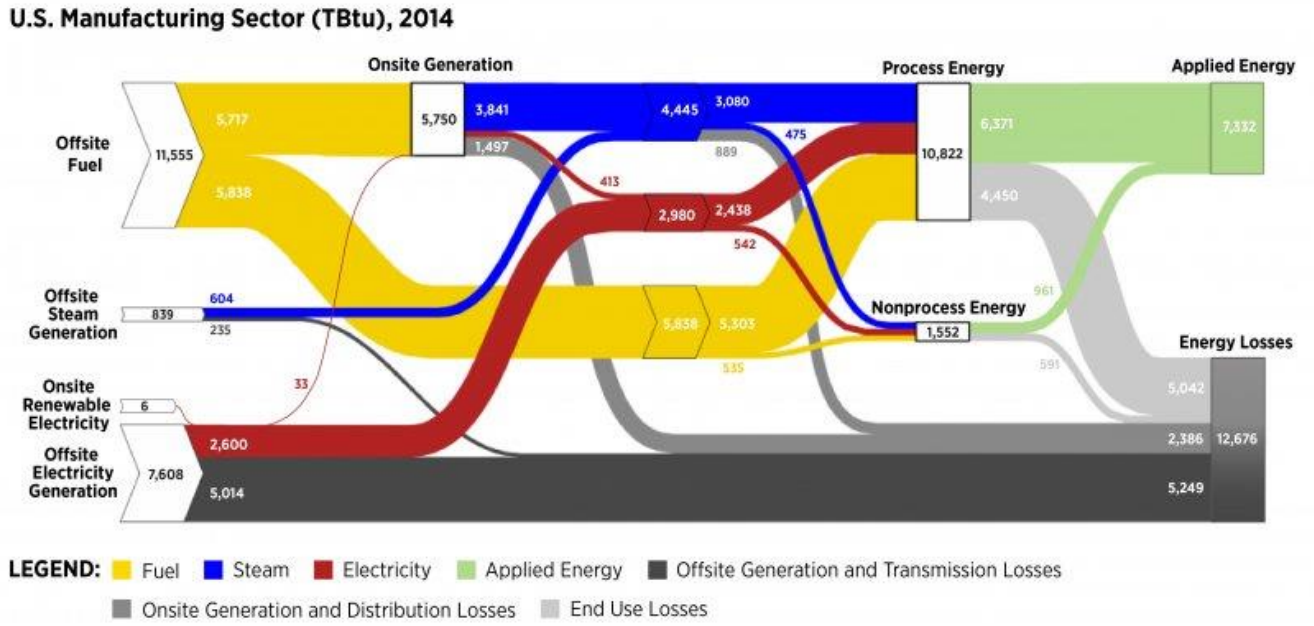
Approach

Energy footprints map the flow of energy supply, demand, and losses. The energy footprint illustrates:

- What energy is purchased from utilities (electricity, fossil fuels), generated onsite, and transported to the local electric utility grid?
- Where and how energy is used within a typical plant, from central boilers to electric motors?
- Where energy is lost due to inefficiencies, both inside and outside the plant boundary?



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Climate projections and Risk Assessments

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Data

- **Spatial Resolution:** 0.11° (~12 Km)
- **Models:** Ensemble of 5 different Global and Regional Climate Models
- **Timescale:** 1986-2005 (Reference period) and three 20-year future periods within 2031-2090
- **Climate variables:** Mean temperature, Total precipitation, Potential evapotranspiration
- **Scenarios:** Two Representative Concentration Pathways - RCP4.5 (intermediate) **&** RCP8.5 (high-emissions)
- **Files format:** NetCDF
- **Output:** D3.9 Report «Fit-for-Nexus climate projections» with maps & diagrams (submitted Dec 2021)

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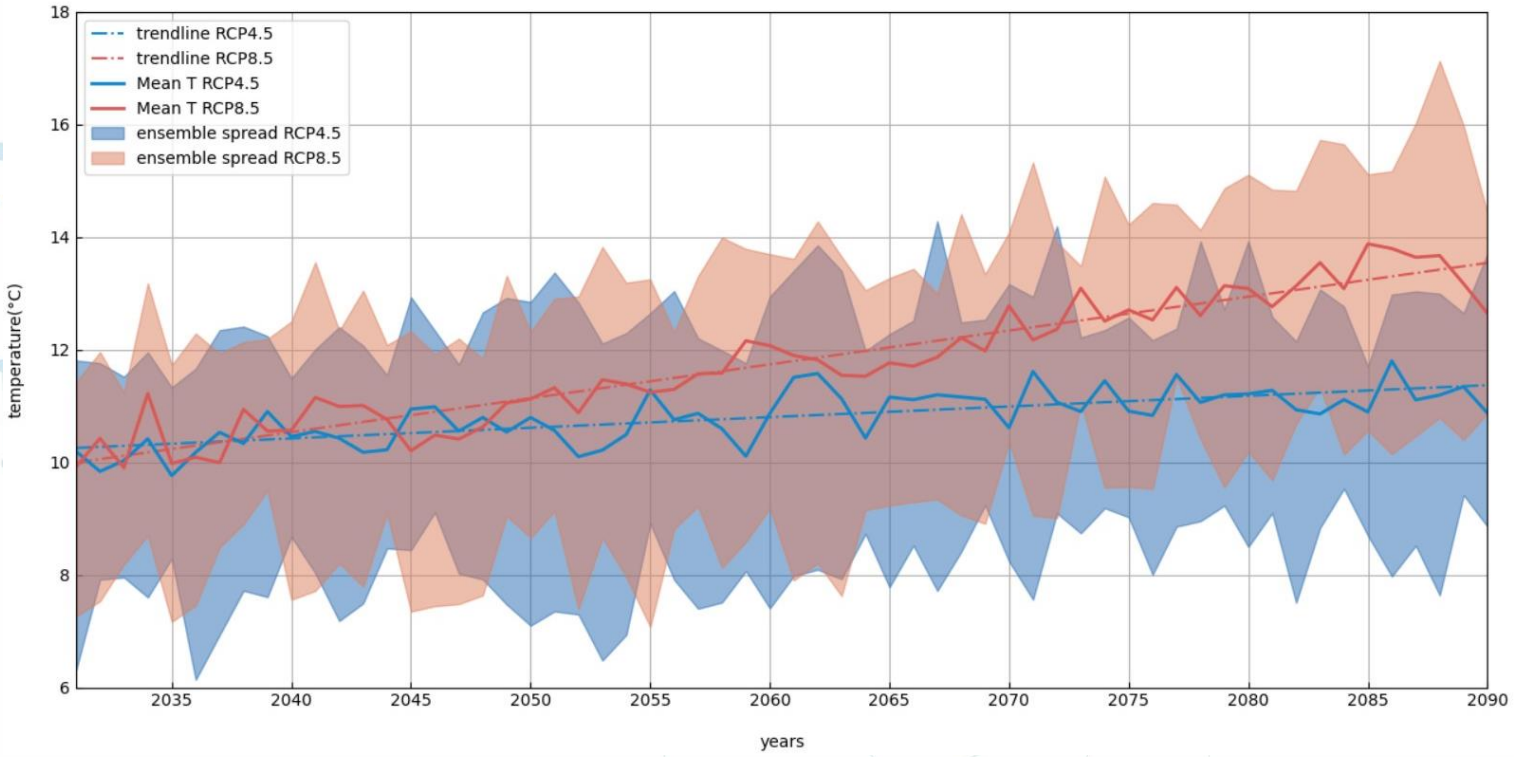
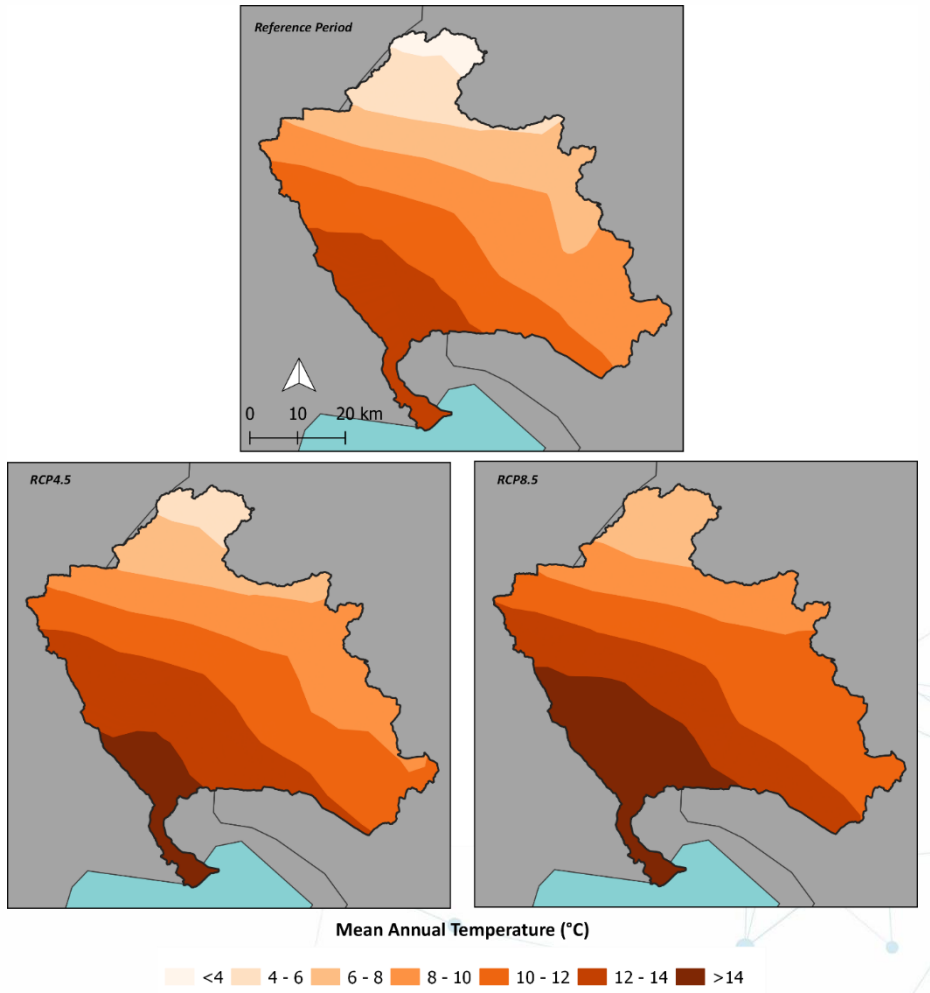
Outputs: Mean temperature





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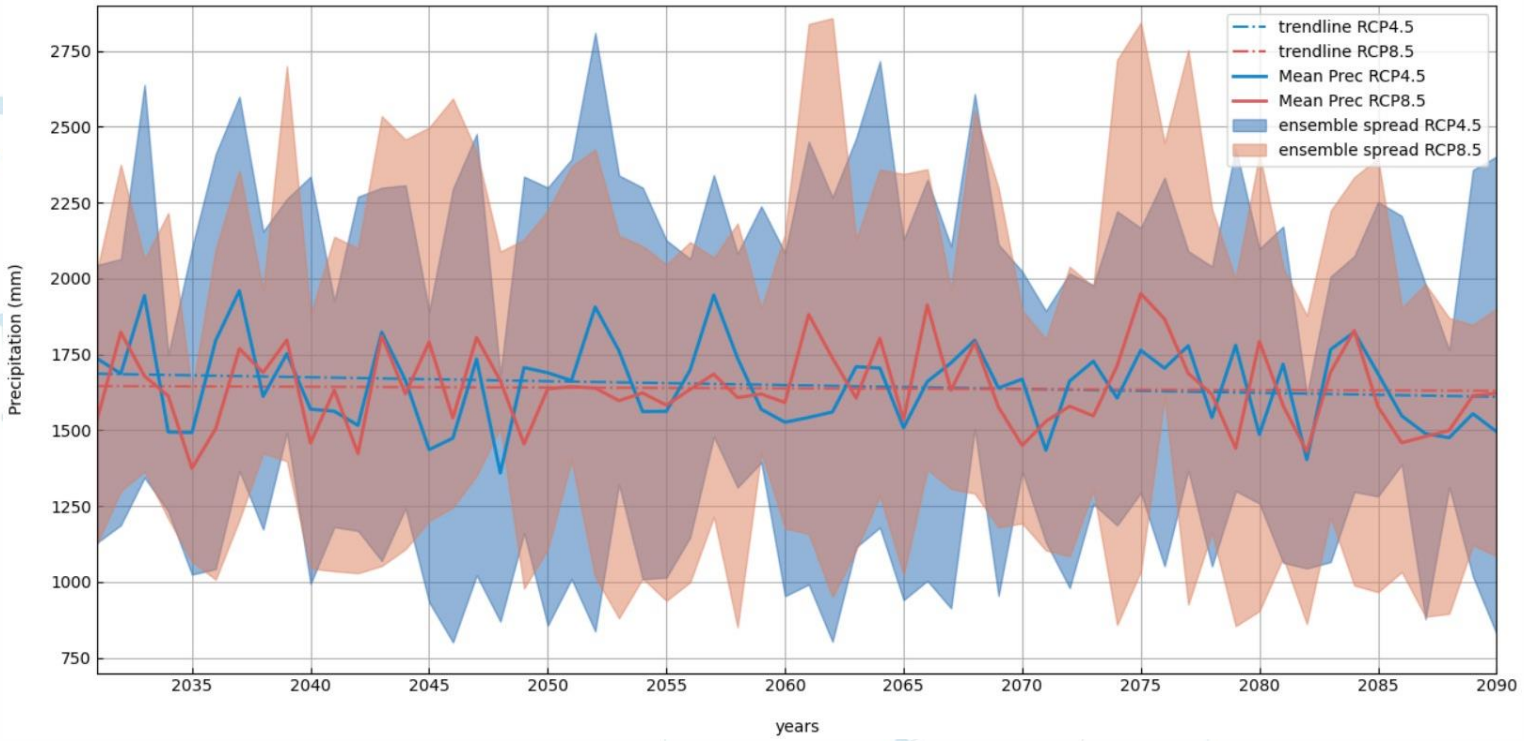
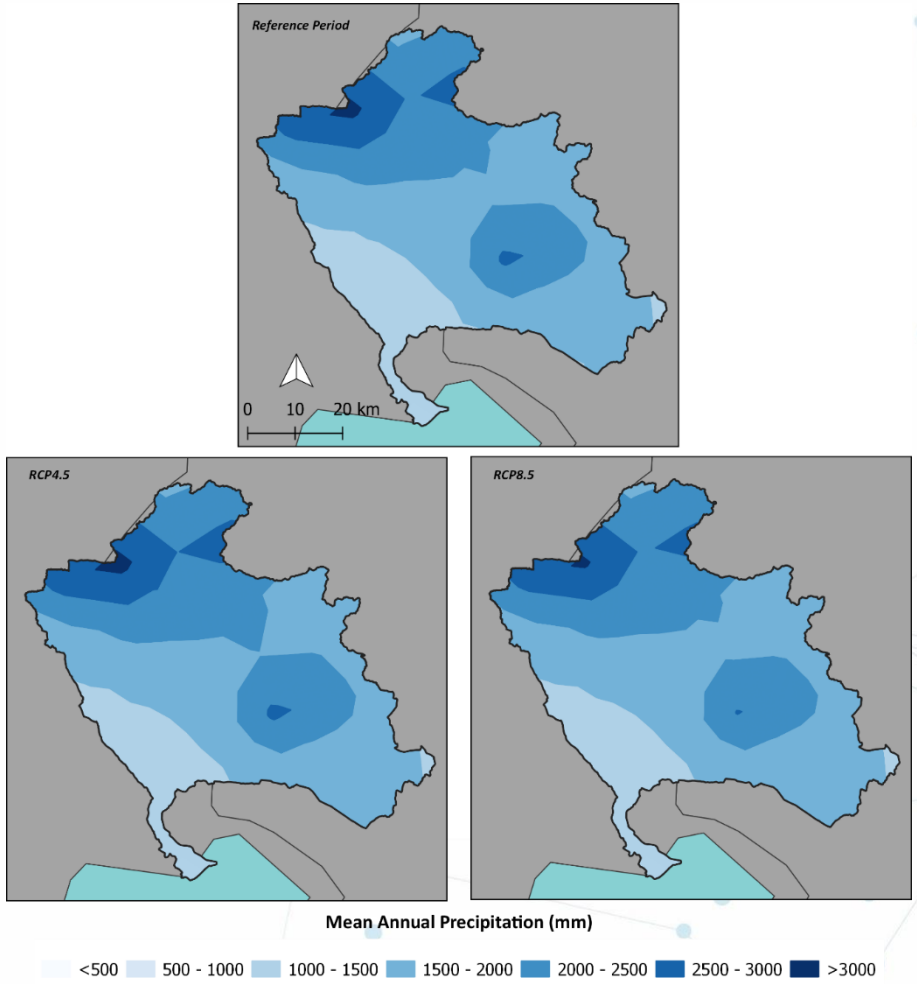
Outputs: Total precipitation





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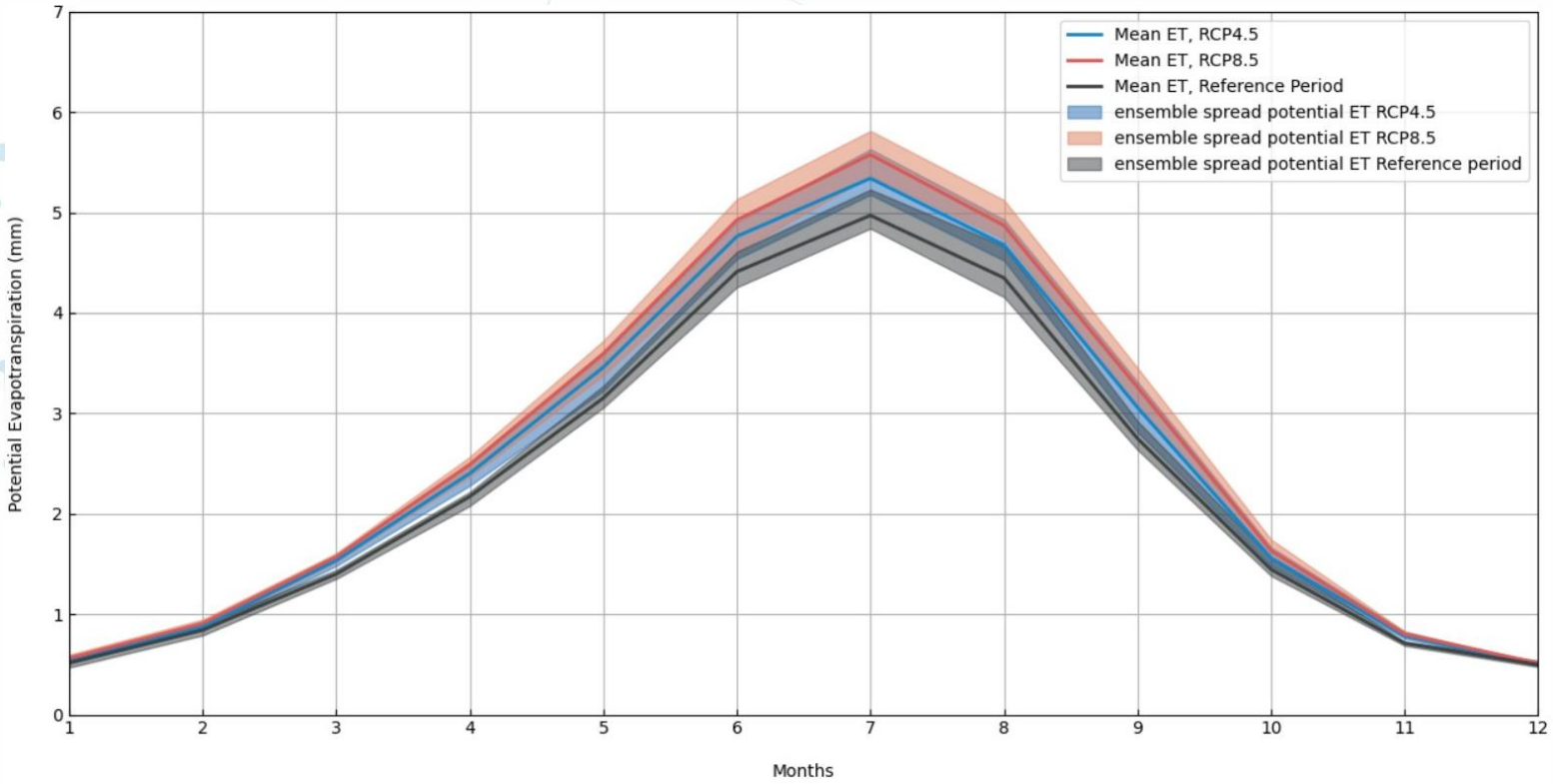
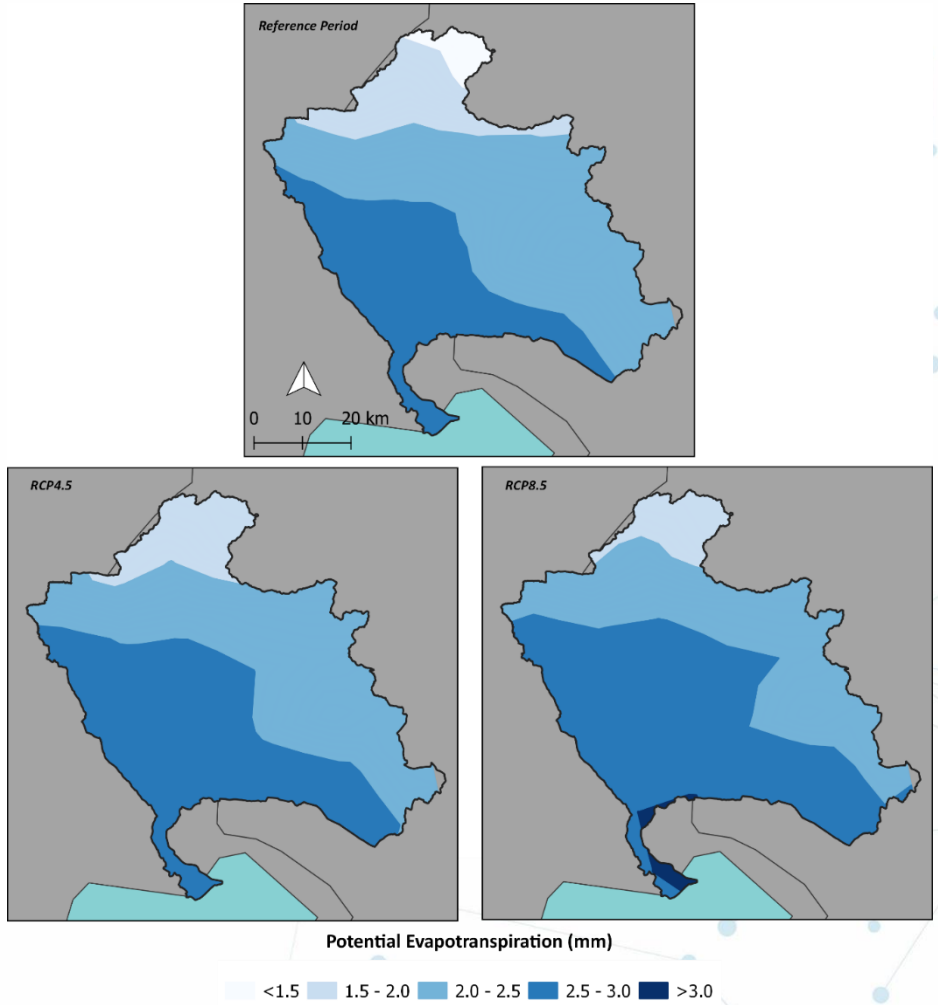
Outputs: Potential evapotranspiration





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Methodology

- **Calculation of the climate risk indicators** based on climate projections for different critical thresholds and assessment of the expected trends.
- **Assessment of impacts** to the Nexus sectors, taking into account area exposure and sensitivity of the examined elements.
- **Determination of overall risk** by jointly considering the potential impacts and institutional readiness for adaptation, along with the larger economic and social context that could influence the level of risk.

Participatory activities

- **Selection of** climate risk indicators as well as of their respective **critical thresholds where relevant** (*e.g. optimum temperature range for the growth of high importance crops for the pilot area*)
- **Weighting** individual risk indicators (*e.g. hazard, exposure, sensitivity*)
- **Evaluation of institutional readiness** for adaptation for the pilot areas

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Thank you!

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www.rexusproject.eu

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