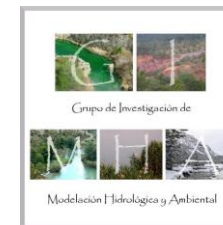




# *HOW TO USE THE DSS TOOL C.A.F.E.*

*Webminar  
October 28<sup>th</sup>, 2020*

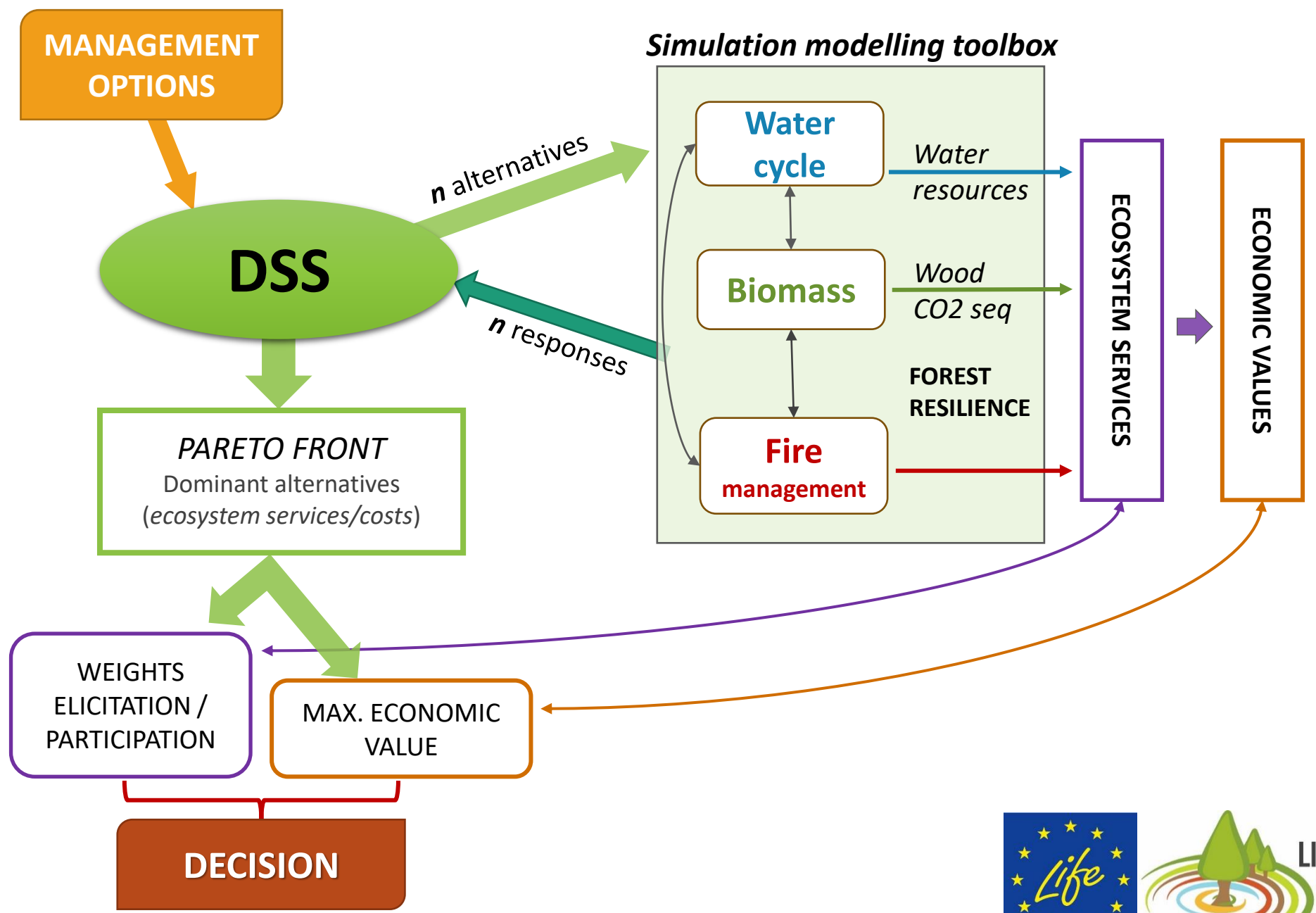
*Prepared by: Alicia García Arias  
algarar2@upv.es*

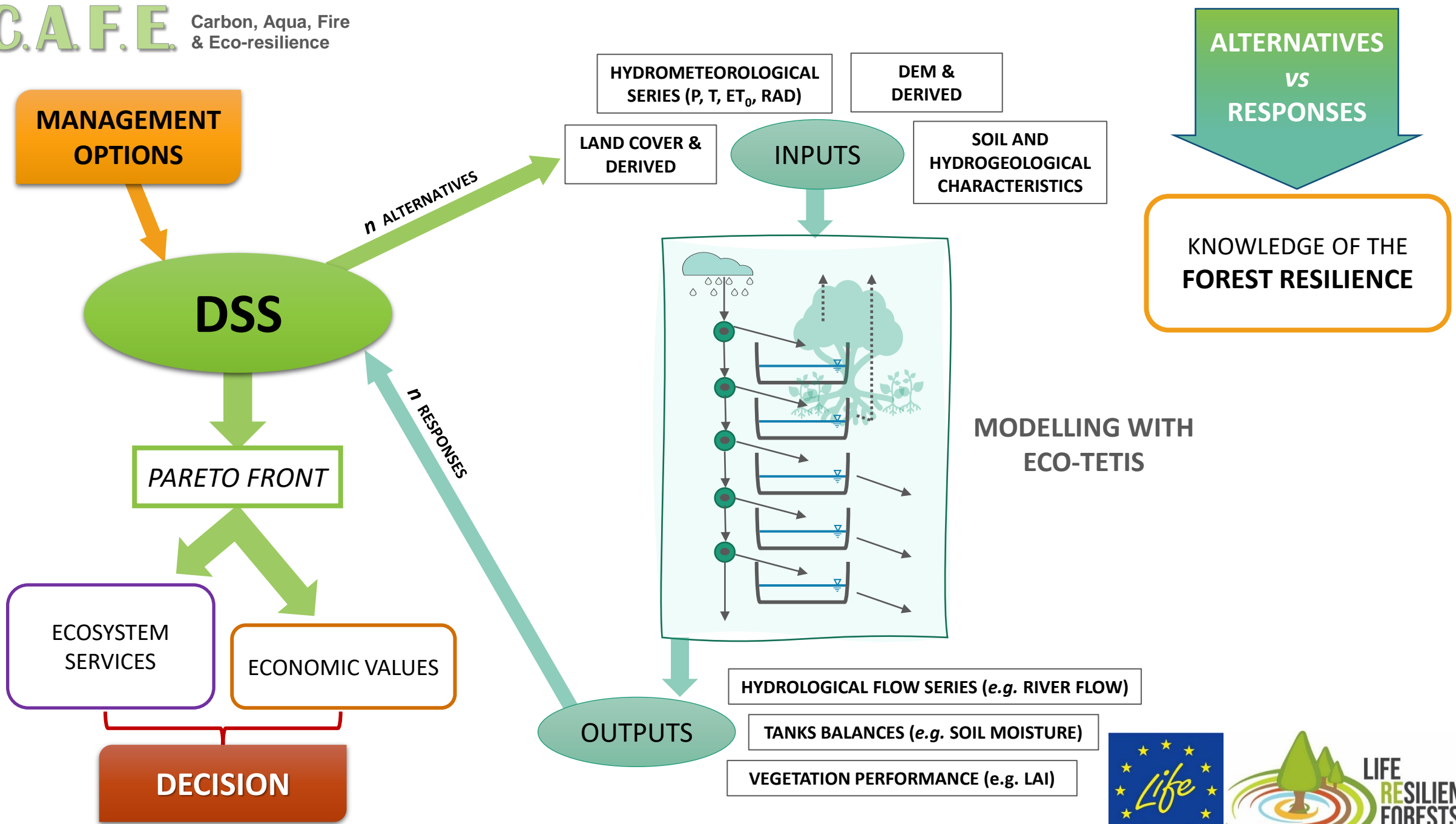


The project *LIFE RESILIENT FORESTS – Coupling water, fire and climate resilience with biomass production from forestry to adapt watersheds to climate change* is co-funded by the LIFE Programme of the European Union under contract number LIFE 17 CCA/ES/000063.

# C.A.F.E.

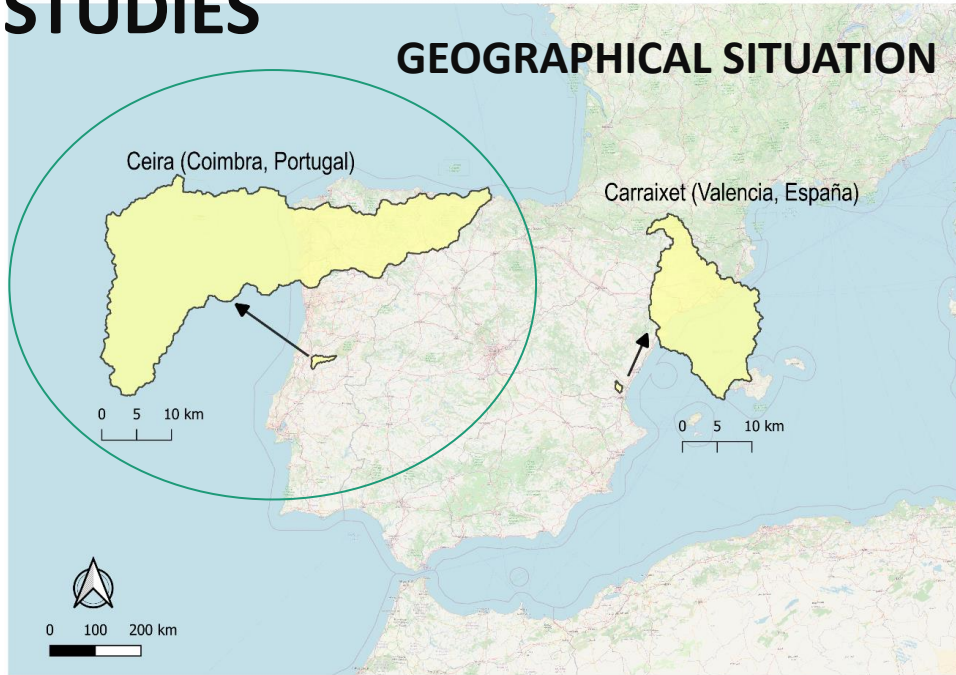
Carbon, Aqua, Fire & Eco-resilience



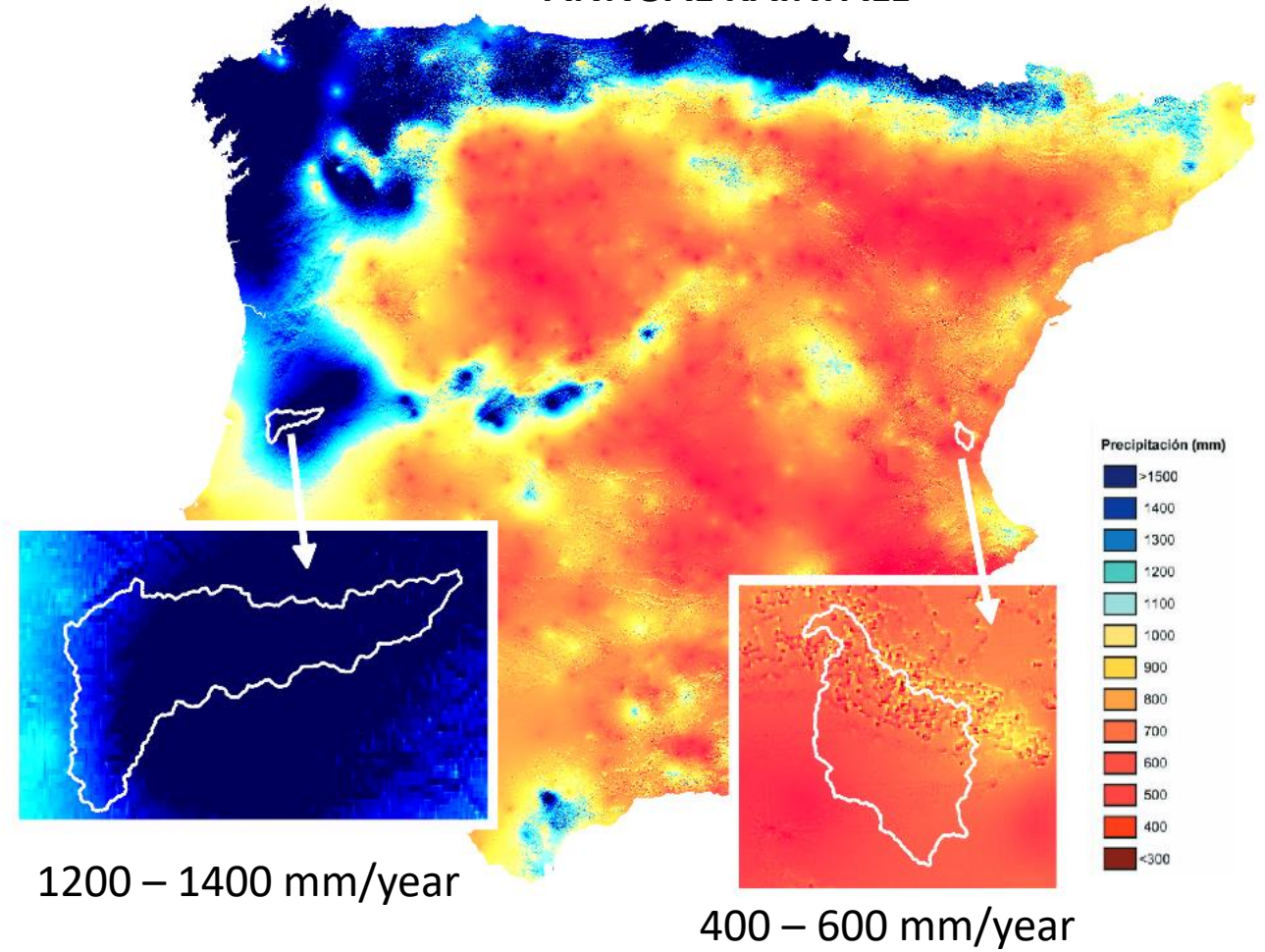


# CASE STUDIES

## GEOGRAPHICAL SITUATION



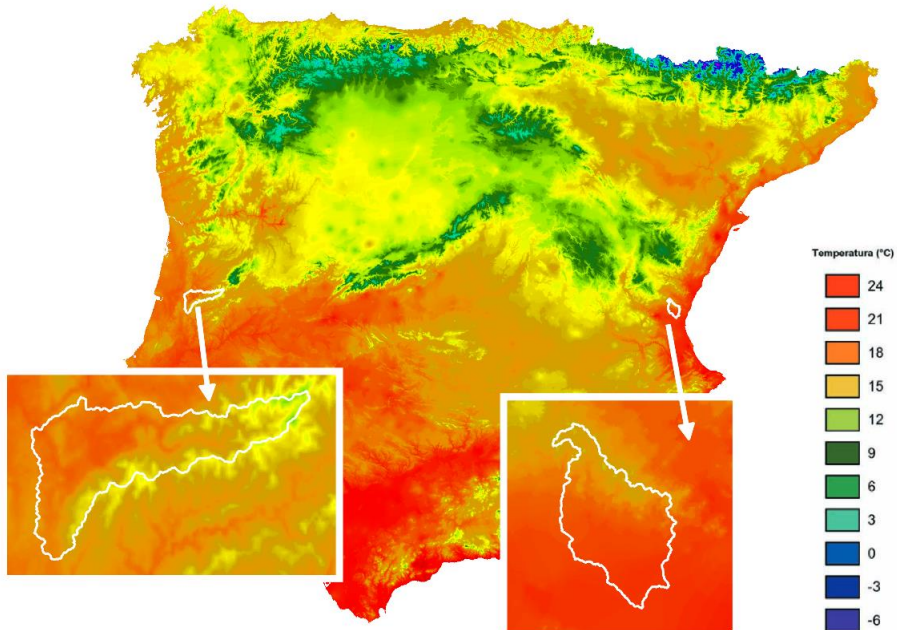
## ANNUAL RAINFALL



## MEAN TEMPERATURE

Ceira River Basin: 12 - 18 °C (t.a. ± 10 °C)

Carraixet River Basin: 15 - 18 °C (t.a. ± 8 °C)



# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION



[SRTM Data](#)

[FAQ](#)

[Disclaimer](#)

[Contact Us](#)

[CGIAR CSI](#)

## Download Manager

- Resampled SRTM data, spatial resolution approximately 250 meter on the line of the equator, for the entire globe are available: ([Click here](#))
- **Spatial resolution approximately 30 meter on the line of the equator:**

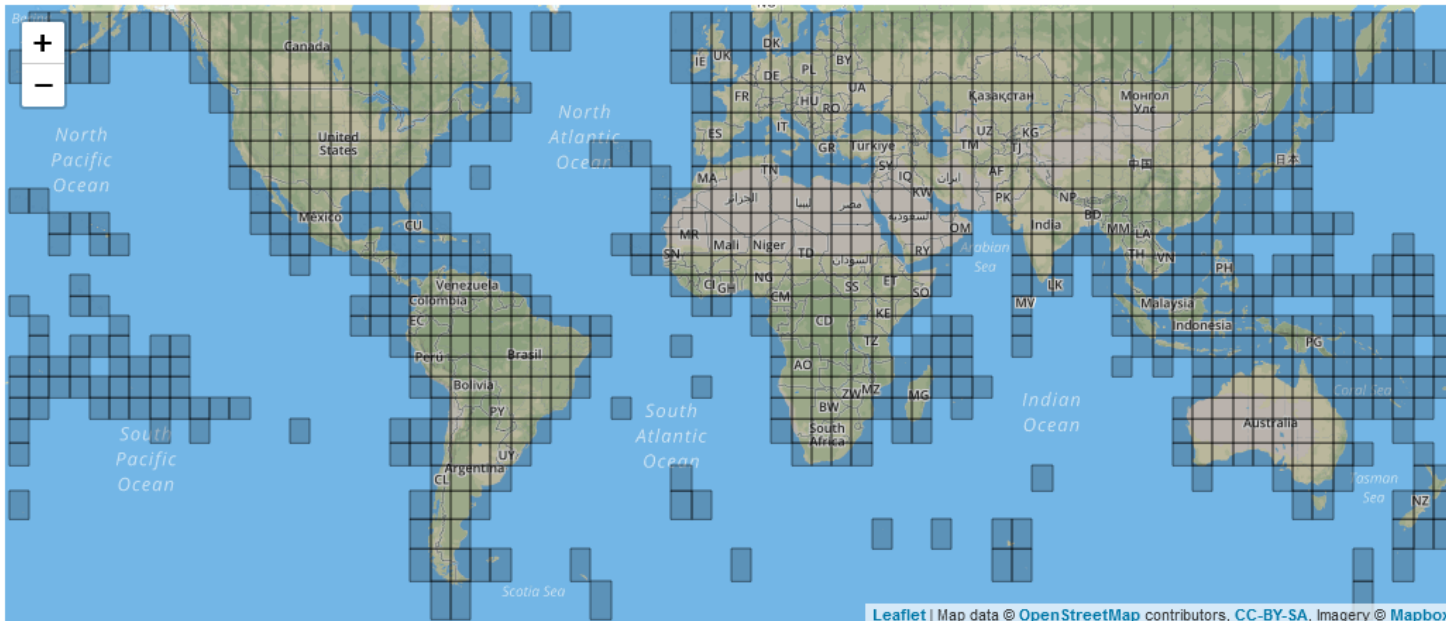
### Tile Size

- Tile 5 x 5 degree
- Tile 30 x 30 degree

### Format

- Geo TIFF
- Esri ASCII

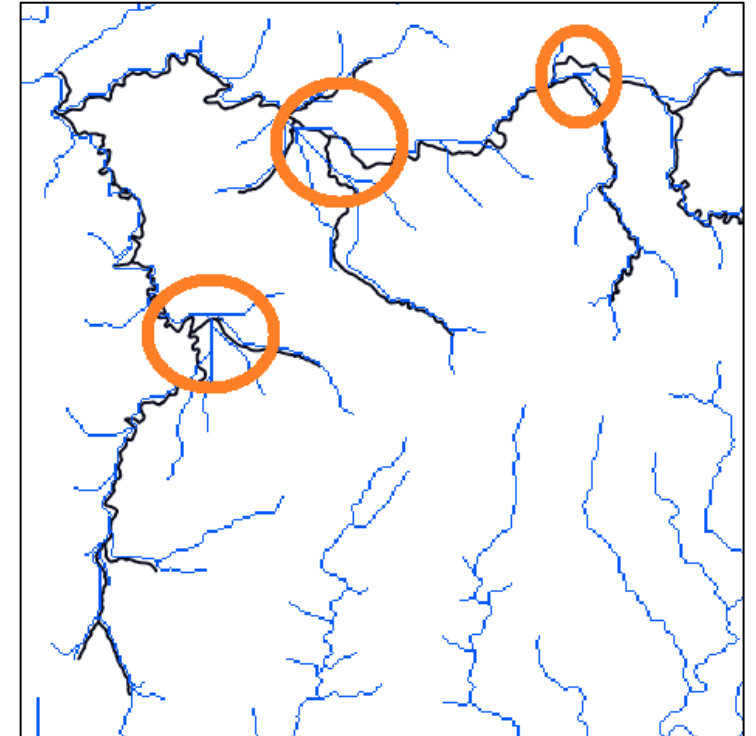
Search



Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

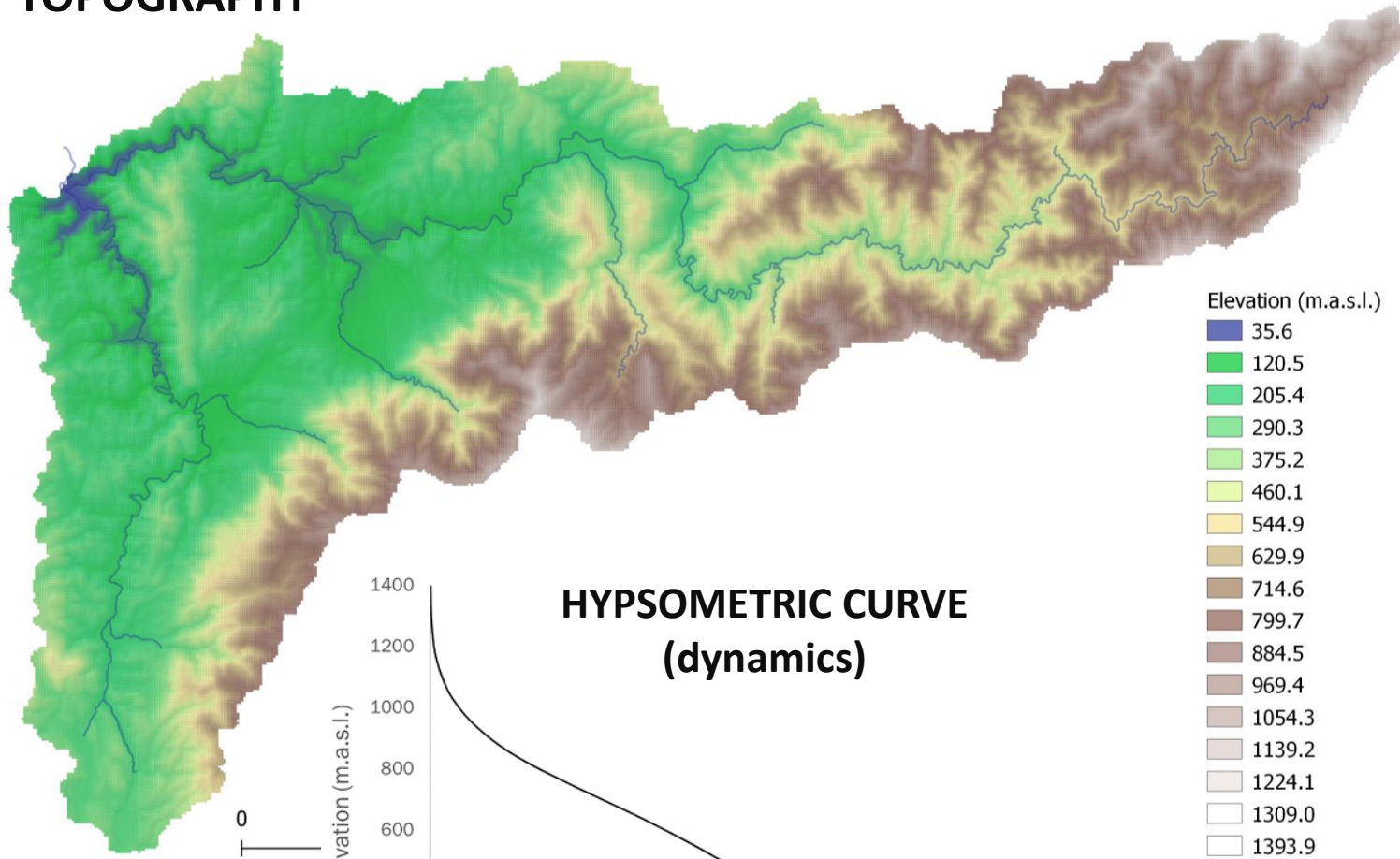
[SRTM 90m Digital Elevation Data](#)

## HYDROLOGICAL CORRECTION IS REQUIRED

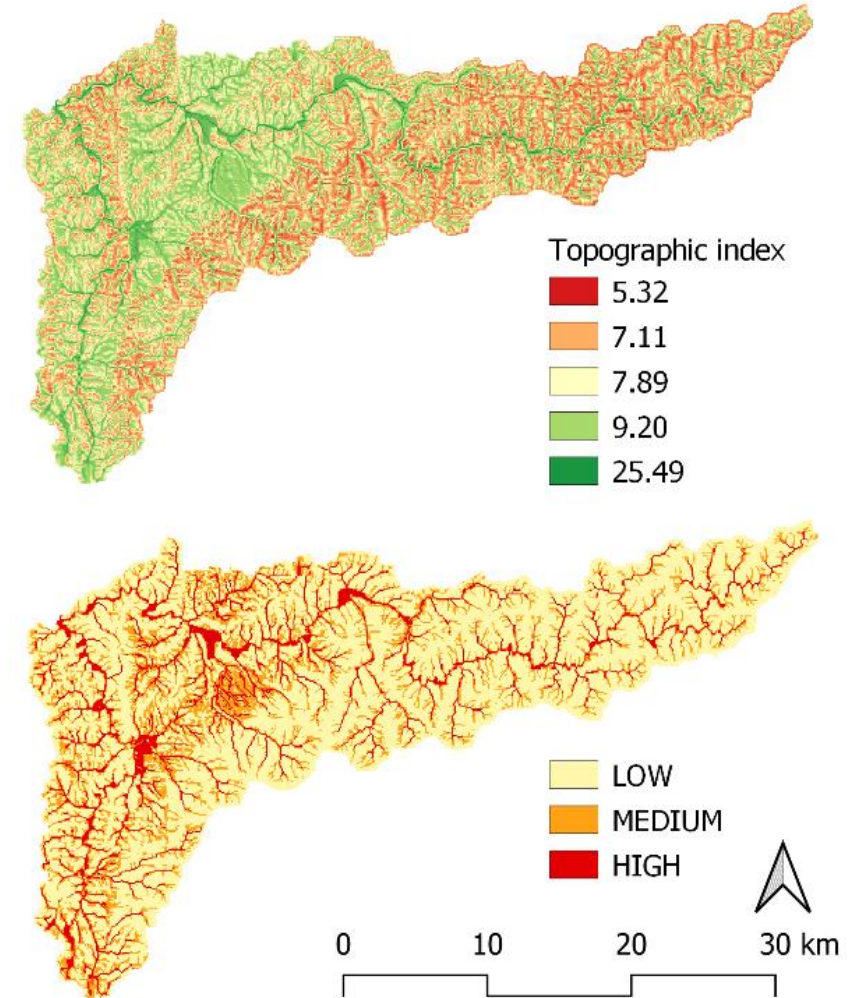


# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION

## TOPOGRAPHY

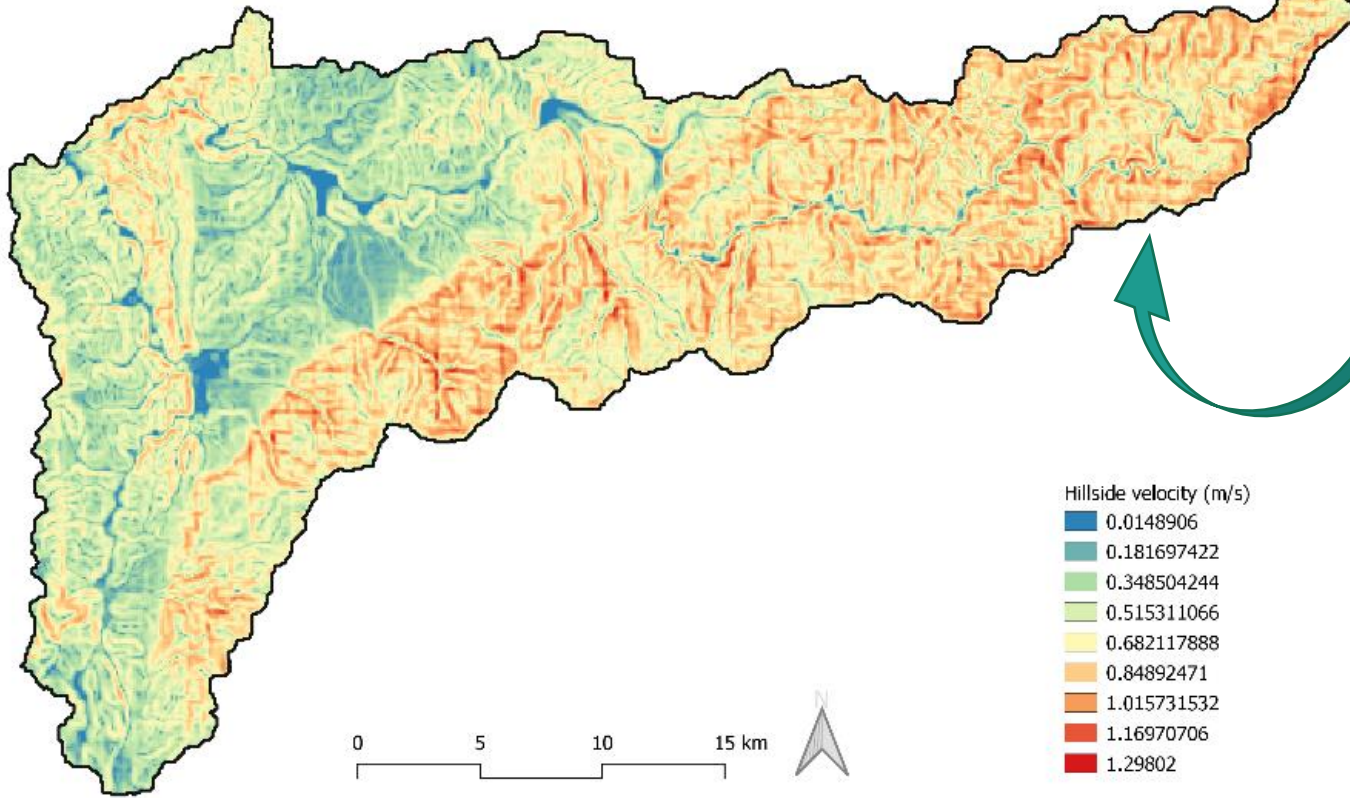


## TOPOGRAPHIC INDEX (wetness)

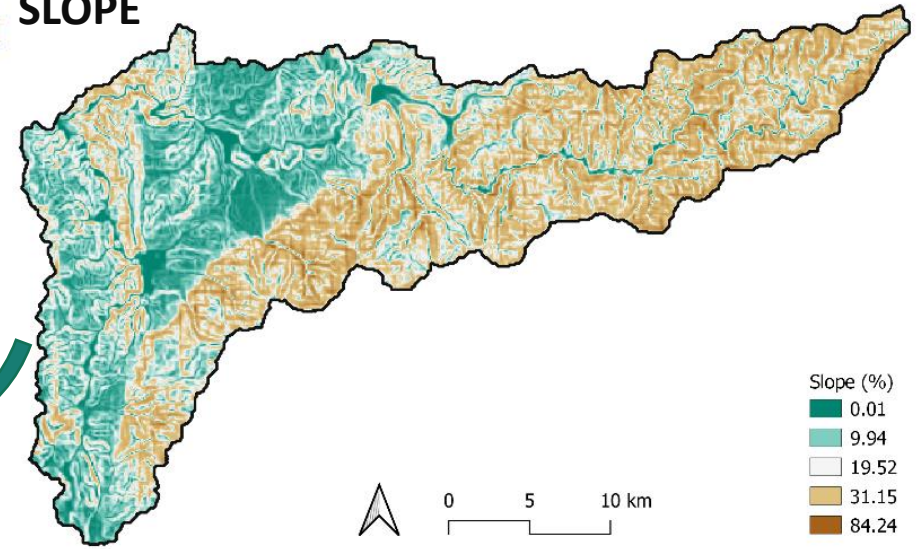


# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION

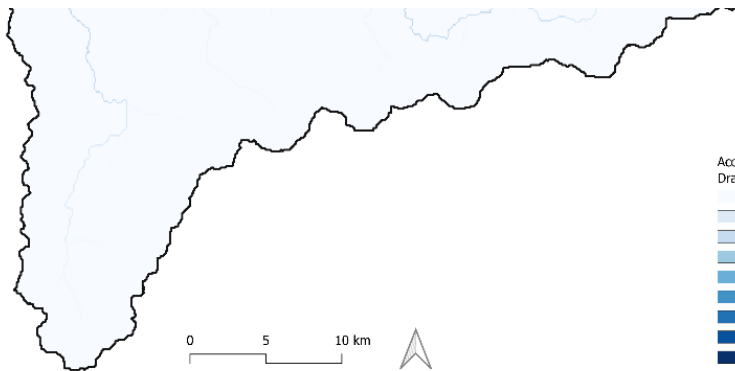
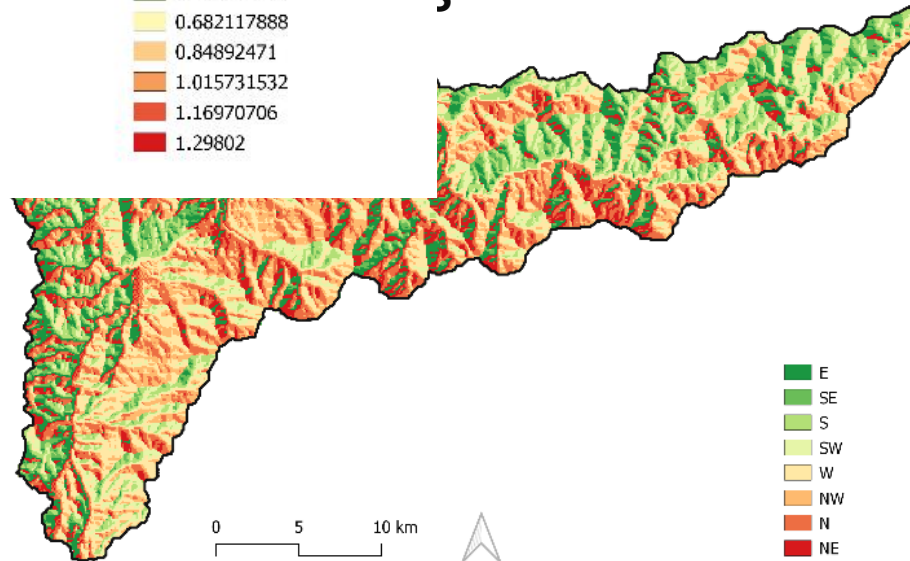
## HILLSLOPE VELOCITY



## SLOPE



## S



# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION

## LAND COVER

- 111 - Continuous urban fabric
- 112 - Discontinuous urban fabric
- 121 - Industrial or commercial units
- 124 - Airports
- 131 - Mineral extraction sites
- 141 - Green urban areas
- 142 - Sports and leisure facilities
- 211 - Non-irrigated arable land
- 212 - Permanently irrigated land
- 221 - Vineyards
- 223 - Olive groves
- 231 - Pastures
- 241 - Annual crops associated with permanent crops
- 242 - Complex cultivation patterns
- 243 - Land principally occupied by agriculture, with significant pastures or permanent crops
- 311 - Broad-leaved forest
- 312 - Coniferous forest
- 313 - Mixed forest
- 321 - Natural grasslands
- 322 - Moors and heathland
- 323 - Sclerophyllous vegetation
- 324 - Transitional woodland shrub
- 332 - Bare rocks
- 333 - Sparsely vegetated areas
- 334 - Burnt areas
- 511 - Water courses
- 512 - Water bodies



[Corine Land Cover 2018](#)

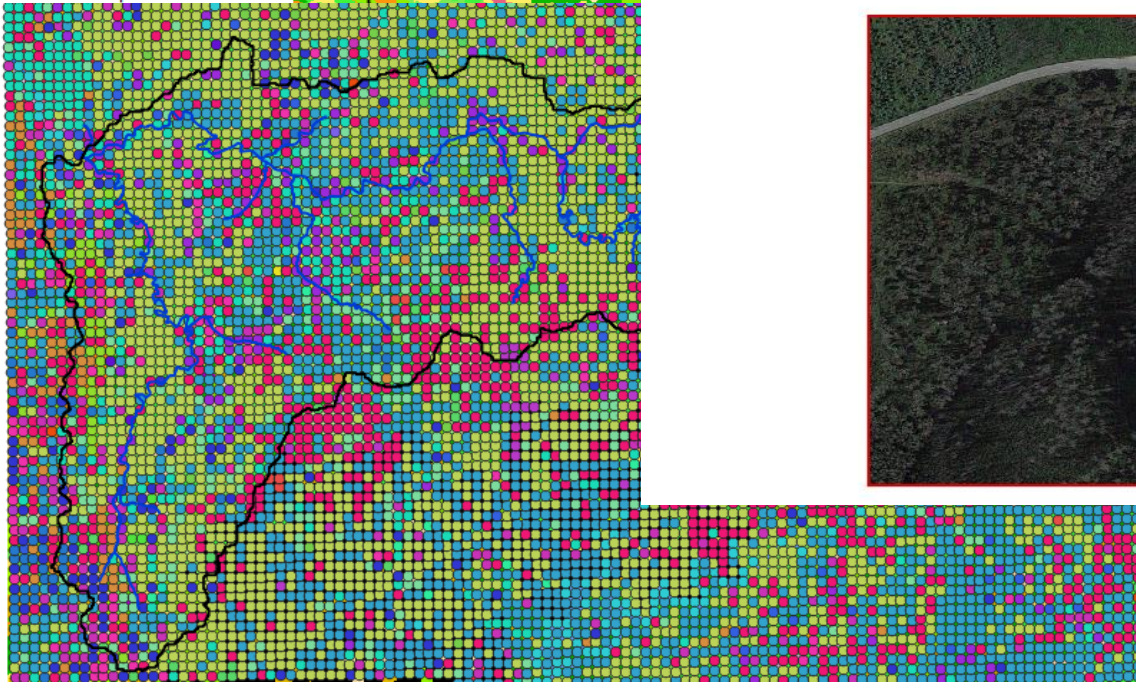
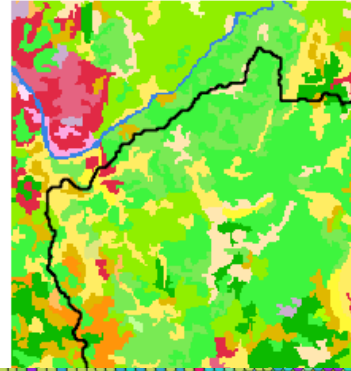




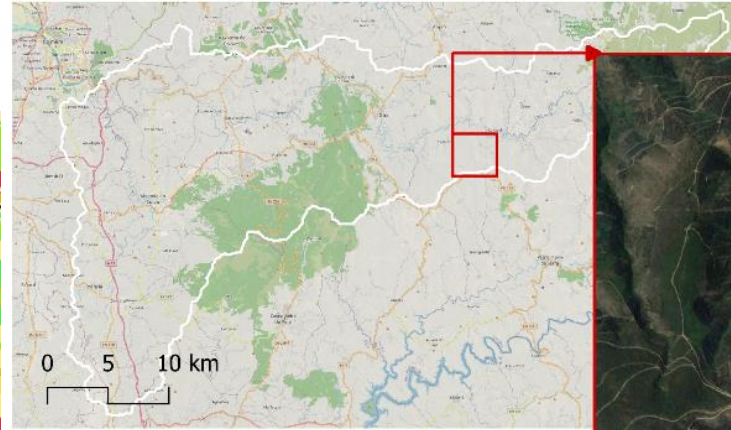
# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION

## LAND COVER

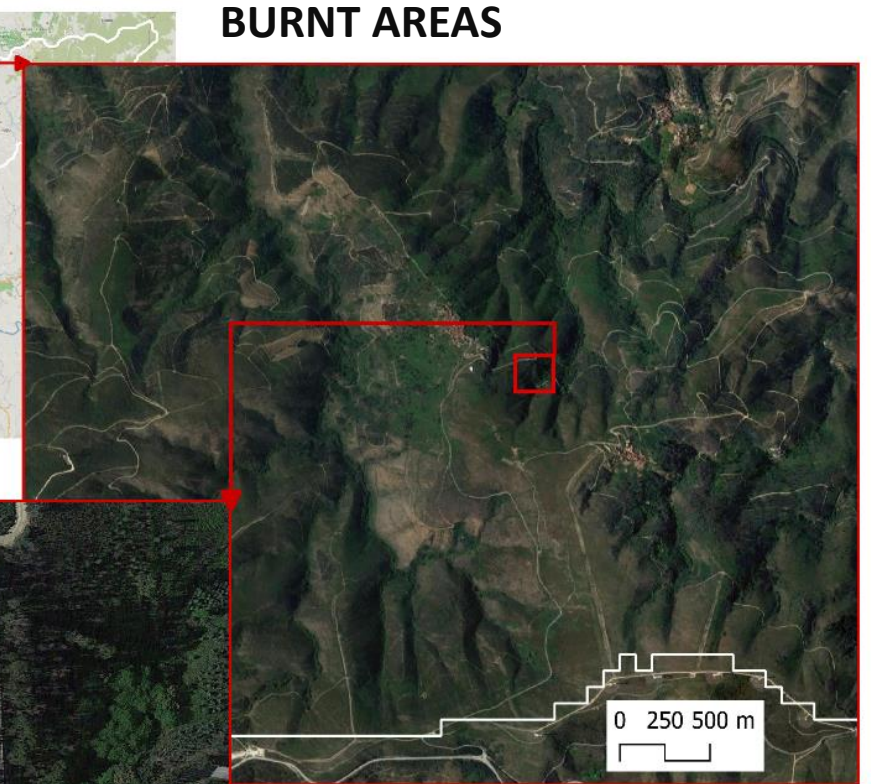
- 111 - Continuous urban fabric
- 112 - Discontinuous urban fabric
- 121 - Industrial or commercial units
- 124 - Airports
- 131 - Mineral extraction sites
- 141 - Green urban areas
- 142 - Sports and leisure facilities
- 211 - Non-irrigated arable land
- 212 - Permanently irrigated land
- 221 - Vineyards
- 223 - Olive groves
- 231 - Pastures
- 241 - Annual crops associated with permanent crops
- Acácias
- Águas interiores e zonas húmidas
- Carvalhos
- Castanheiro
- Cortes únicos
- Eucaliptos
- Improdutivos
- Mato
- Matos altos
- Matos ardidos
- Misto de permanentes
- Olival
- Outras folhosas
- Outras resinosas
- Pastagem regadio
- Pastagem sequeiro
- Pinheiro-bravo
- Pinheiro-manso
- Pomar
- Povoamentos ardidos
- Sobreiro
- Temporária de regadio
- Temporária de sequeiro
- Urbano
- Vinha



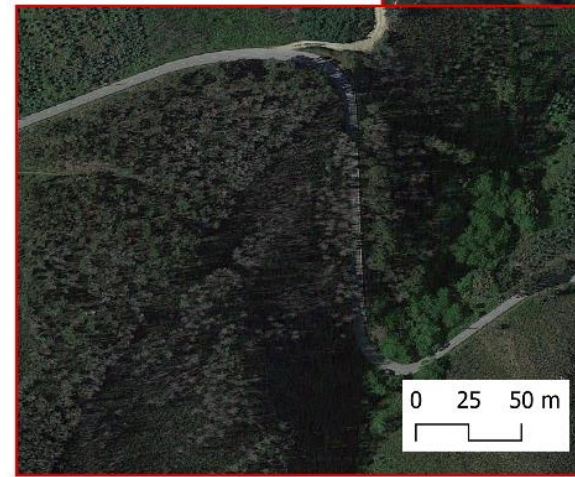
**NATIONAL FOREST INVENTORY**



0 5 10 km



0 250 500 m



0 25 50 m

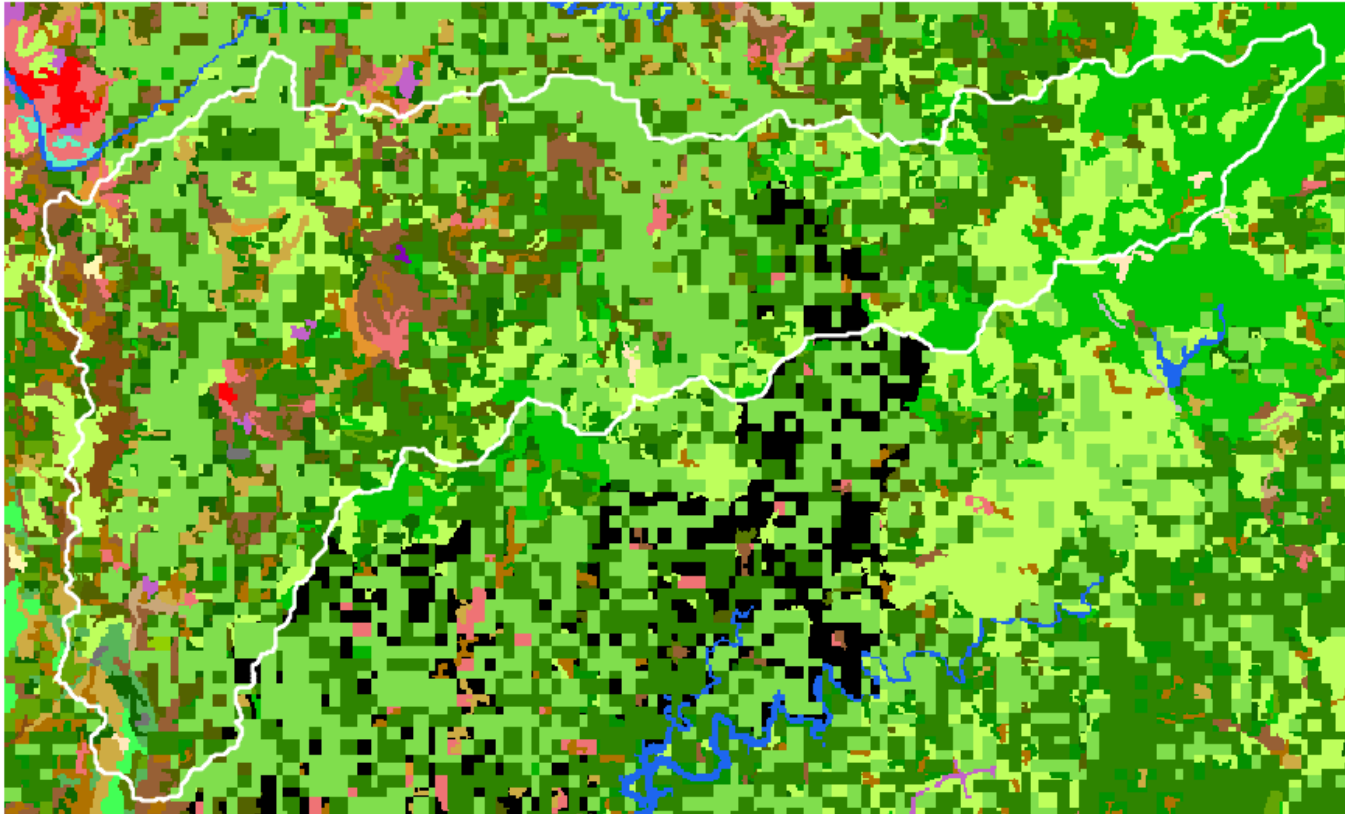
## BURNT AREAS

## SATELLITE IMAGERY

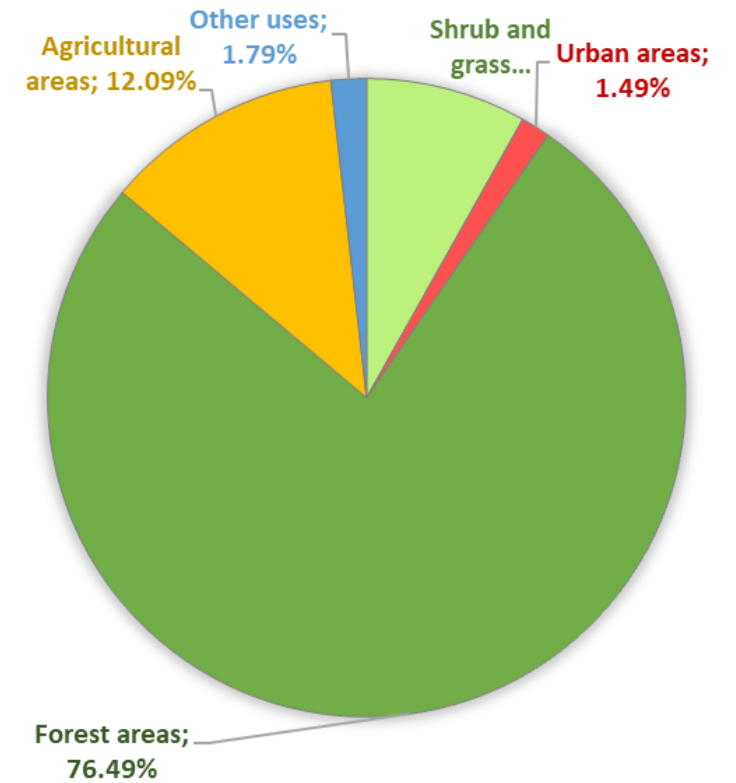


# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION

## LAND COVER



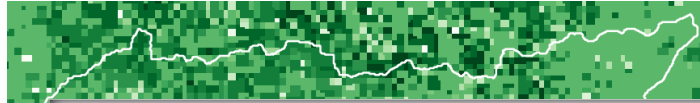
2 - Continuous urban fabric	10 - Bare rocks	18 - Quercus robur	26 - Broad-leaved forest
3 - Discontinuous urban fabric	11 - Non-irrigated arable land	19 - Acacia dealbata	27 - Coniferous forest
4 - Industrial or commercial units	12 - Permanently irrigated land	20 - Castanea sativa	28 - Mixed forest
5 - Airport	13 - Vineyards	21 - Pinus pinea	29 - Land principally occupied by agriculture with sig
6 - Mineral extraction sites	14 - Olea europea	22 - Grass	30 - Complex cultivation patterns
7 - Green urban areas	15 - Pastures	23 - Shrub	31 - Annual crops associated with permanent crops
8 - Sport and leisure facilities	16 - Eucalyptus globulus	24 - Sclerophyllous vegetation	32 - Sparsely vegetated areas
9 - Water	17 - Pinus pinaster	25 - Transitional woodland-shrub	33 - Burnt areas



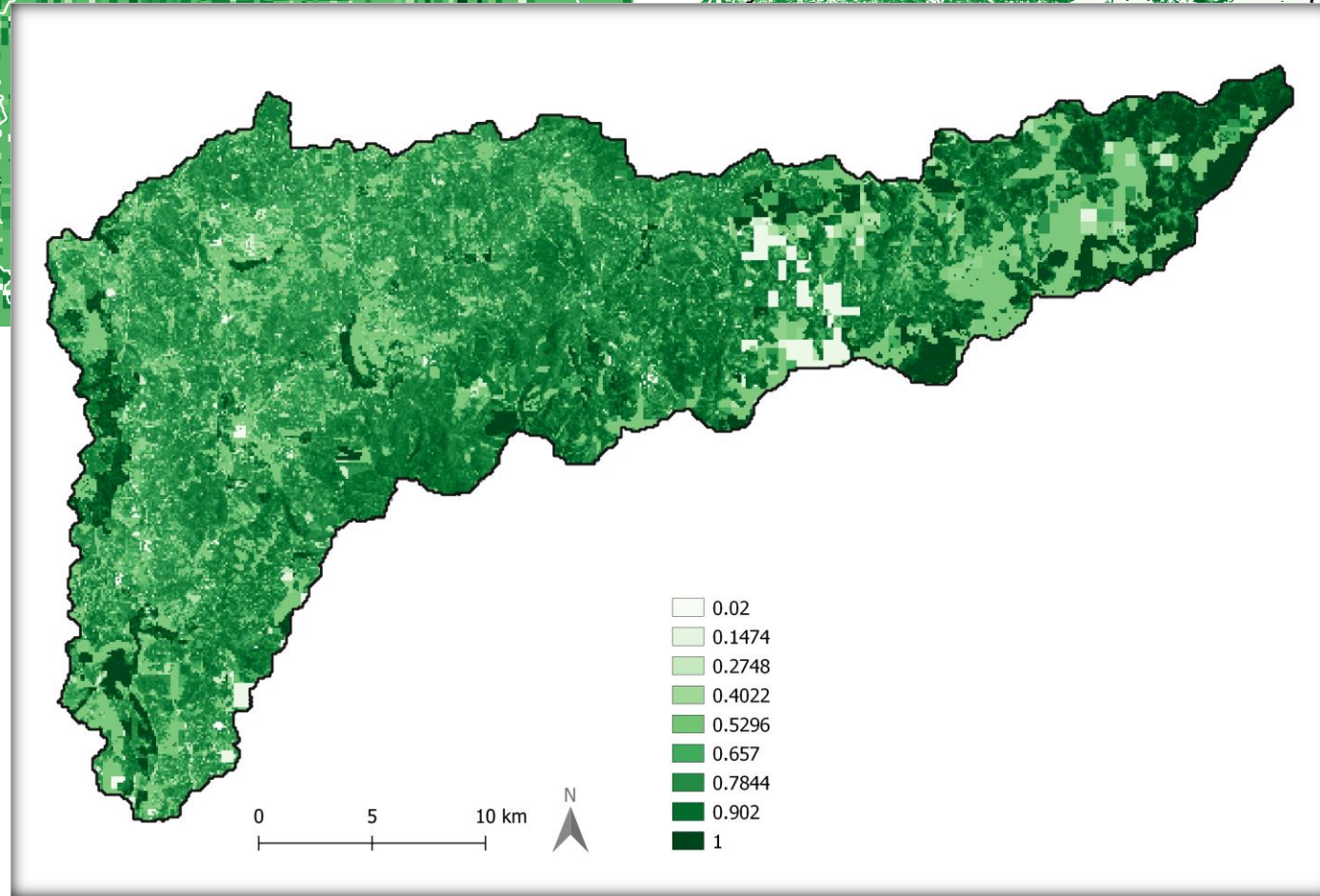
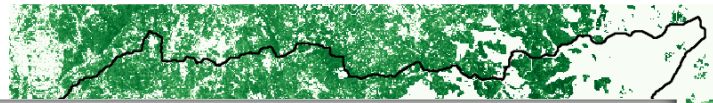
# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION

## COVERAGE FRACTION

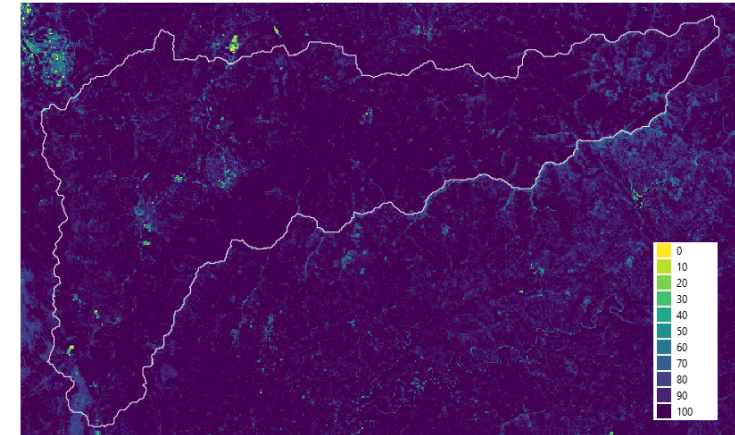
NATIONAL FOREST INVENTORY 2015



TREE COVER DENSITY 2015 (Copernicus HRL)



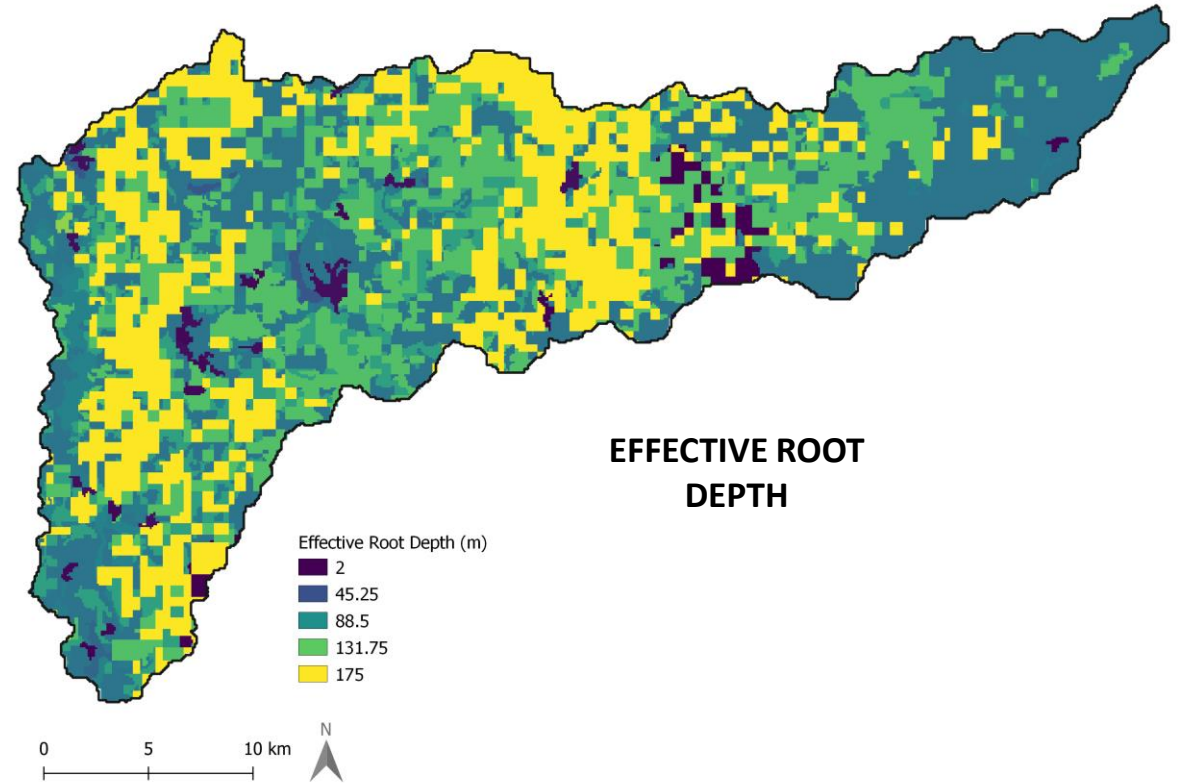
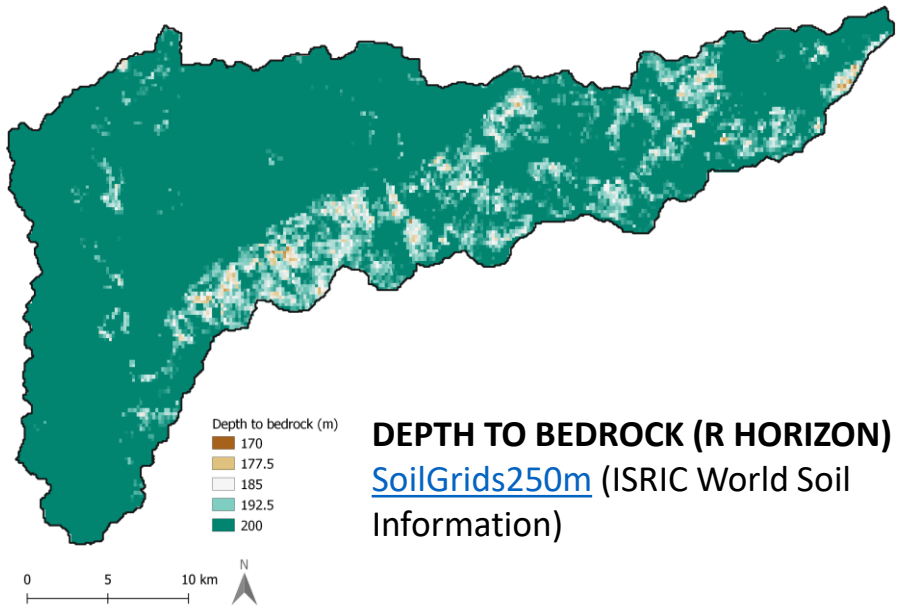
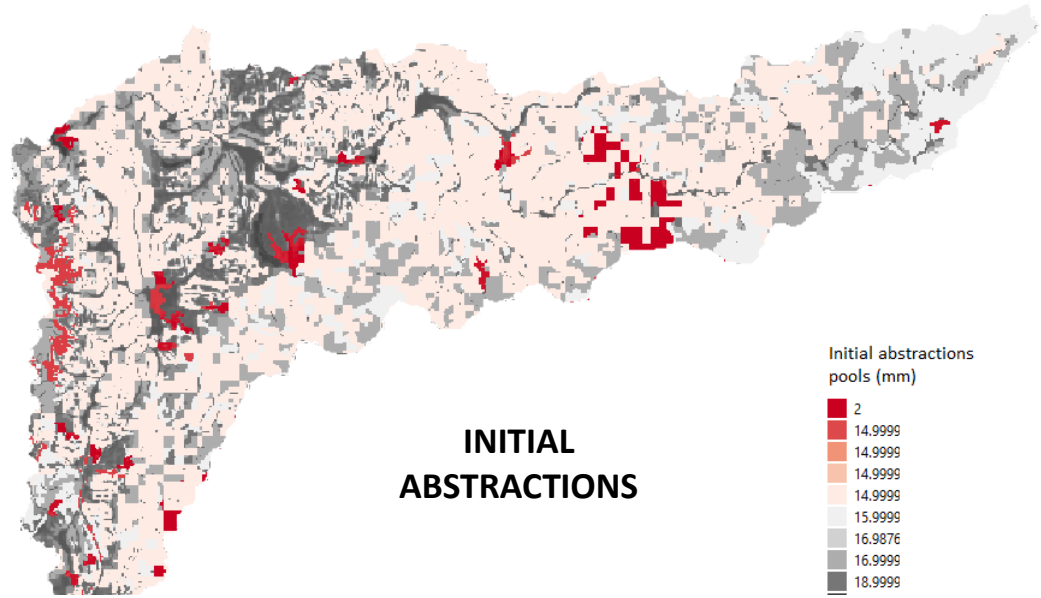
GLOBAL BARE SOIL LANDSAT 2015



SATELLITE / AERIAL IMAGERY



# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION



# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION

## SOIL HYDRAULIC PROPERTIES

EU-SoilHydroGrids ver1.0

Download 250m resolution data

- Select all
- Select none
- Select area by polygon
- Select parameters & download
- Back to main page

European Soil Database, [3D-SoilsHydroGrid](#)

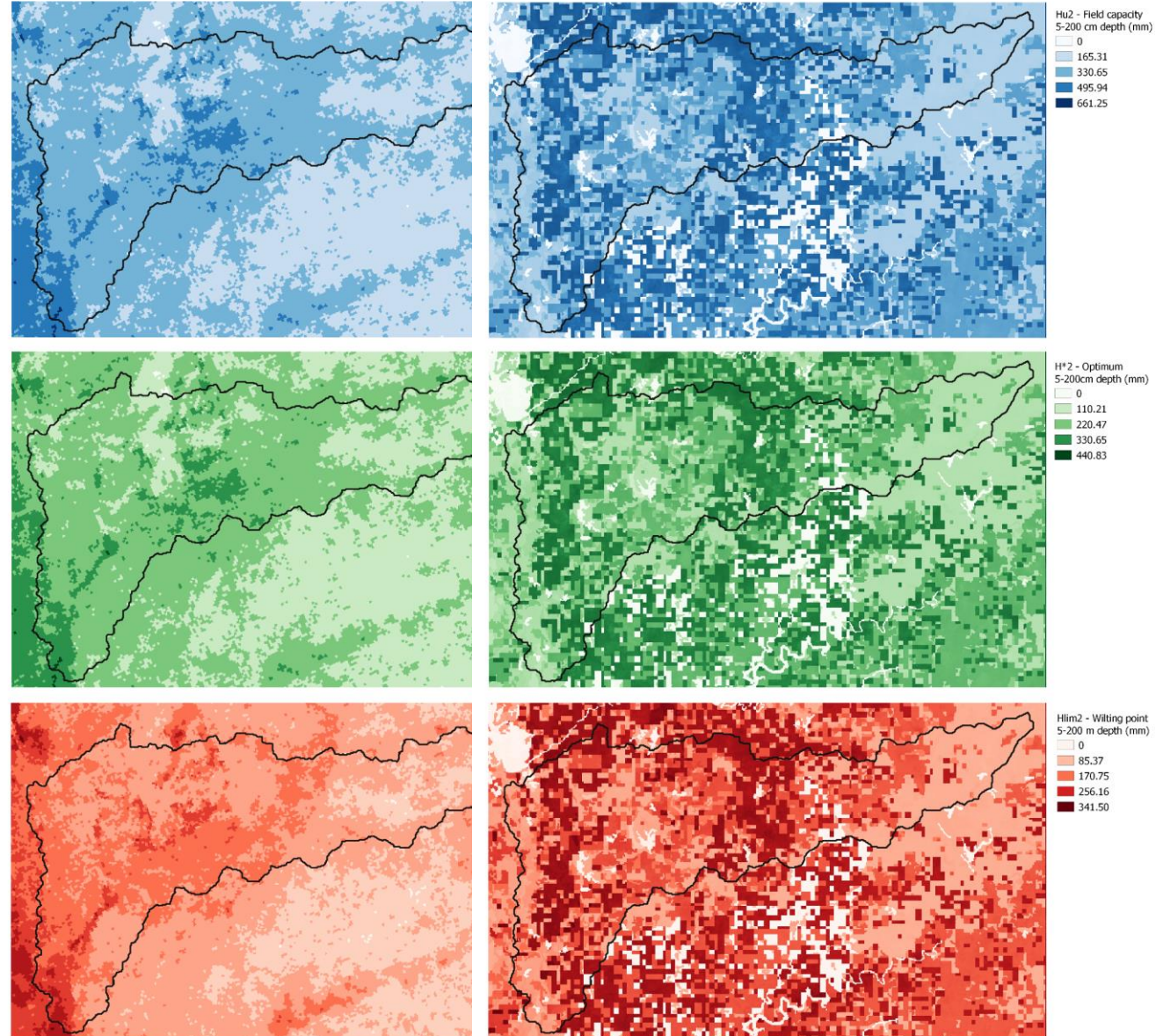
Depth

- 0 cm
- 0 cm
- 5 cm
- 15 cm
- 30 cm
- 60 cm
- 100 cm
- 200 cm

**Soil hydraulic property**

- Saturated water content (THS)
- Saturated water content (THS)
- Water content at field capacity (FC)**
- Water content at wilting point (WP)
- Saturated hydraulic conductivity (KS)
- Parameters of the moisture retention curve (MRC)
- Parameters of the unsaturated hydraulic conductivity curve (HCC)

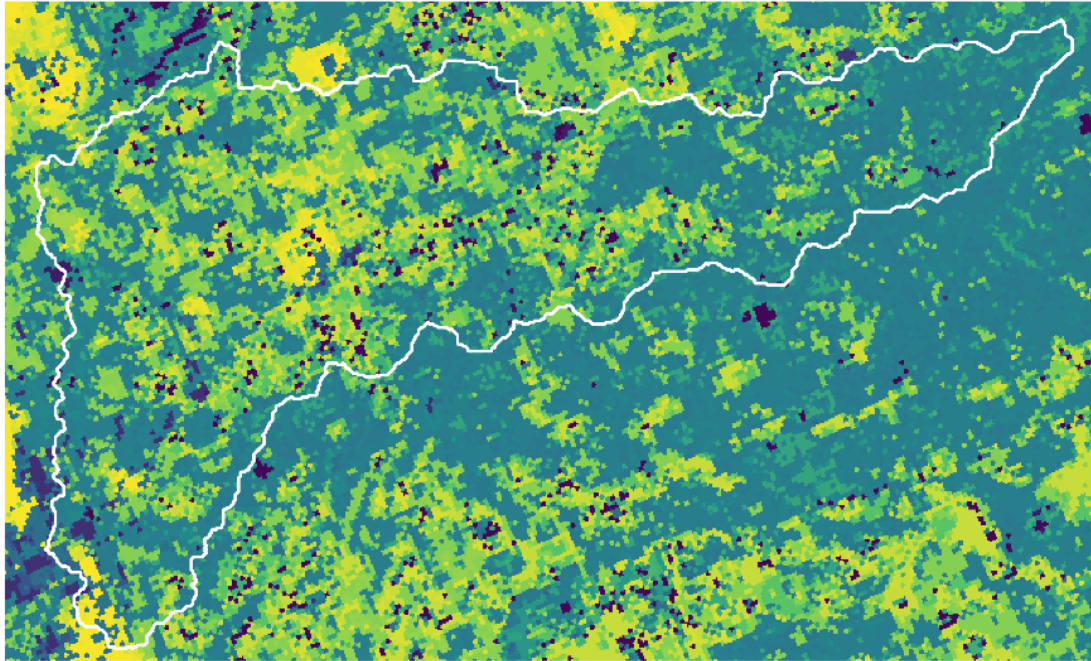
## STATIC STORAGE IN SURFACE [0-5CM] AND DEEP [5-200 CM] SOIL LAYERS



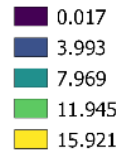
# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION

## SOIL HYDRAULIC PROPERTIES

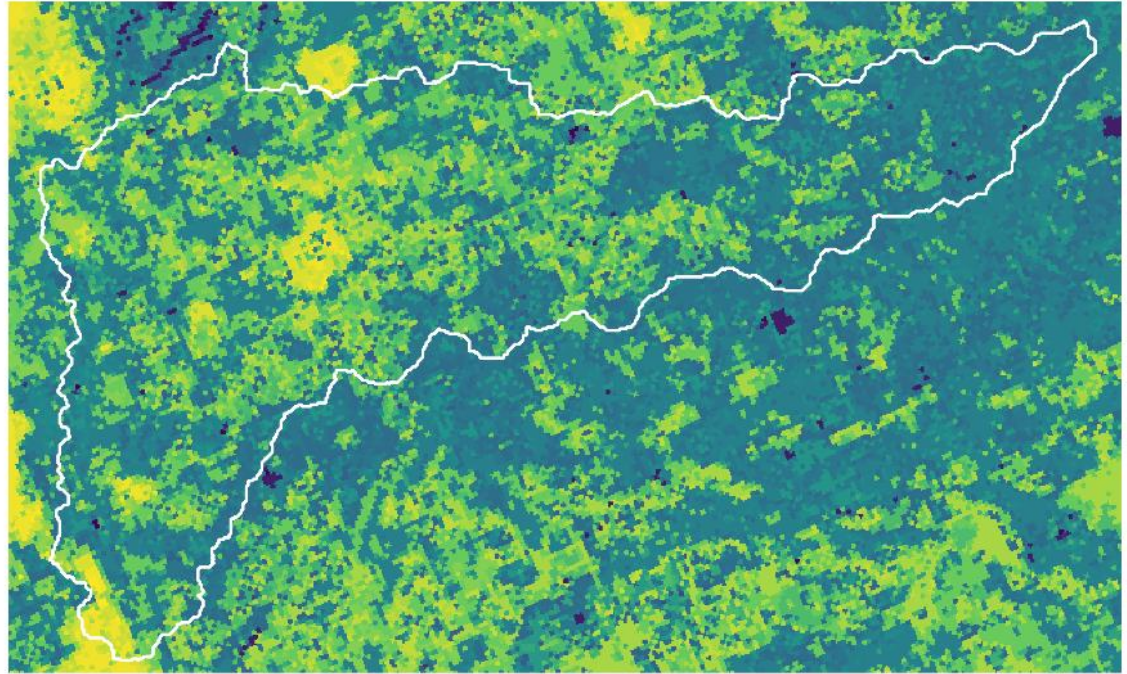
SATURATED HYDRAULIC CONDUCTIVITY ( $K_s$ )



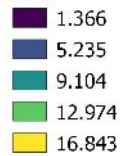
Saturated hydraulic conductivity (mm/h)



SATURATED INTERFLOW CONDUCTIVITY ( $K_{ss}$ )



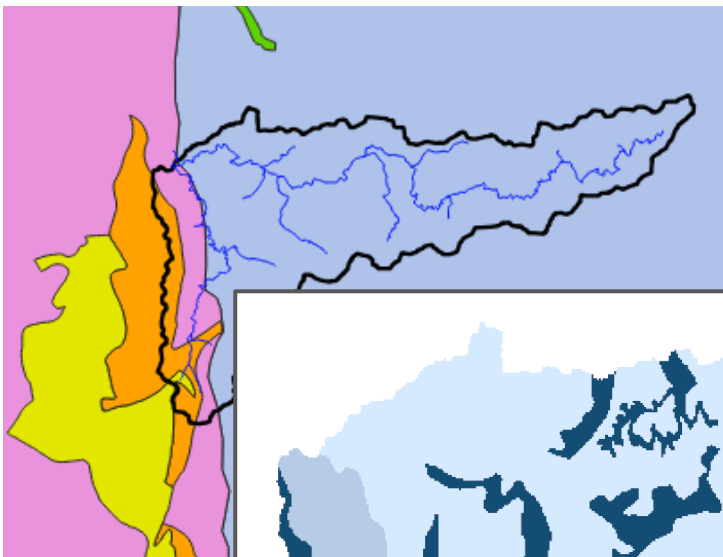
Saturated interflow conductivity (mm/h)



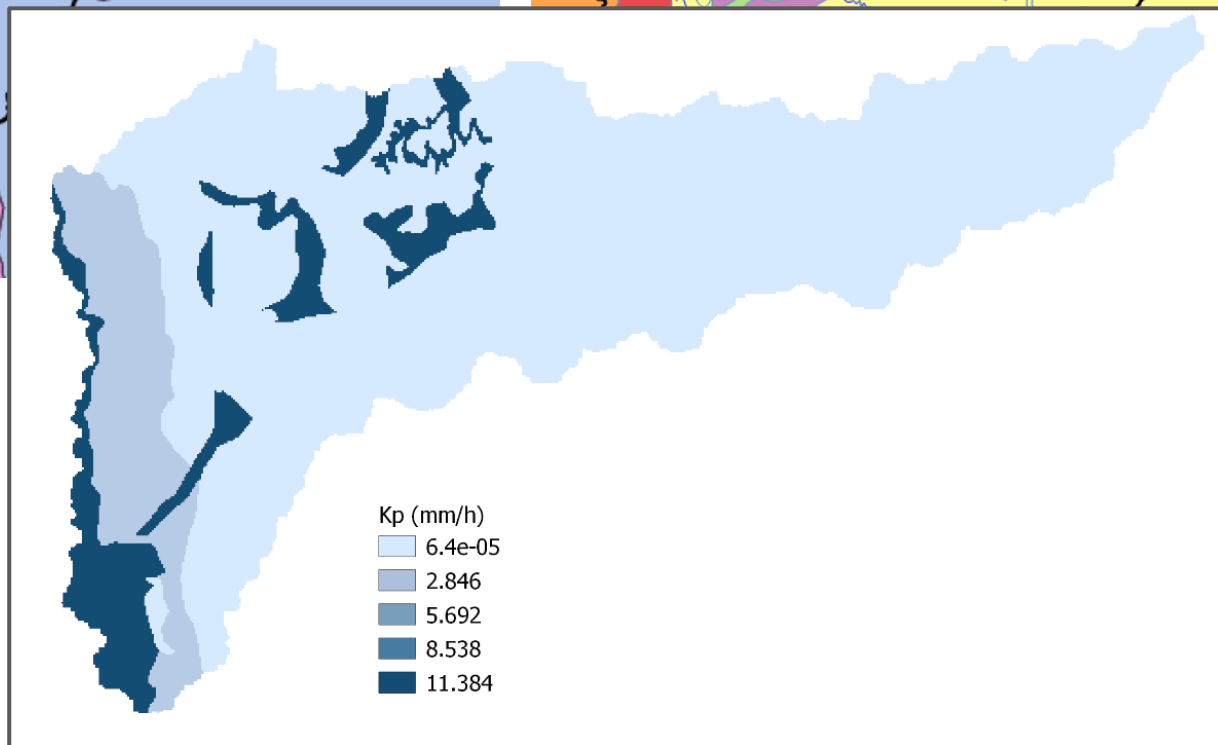
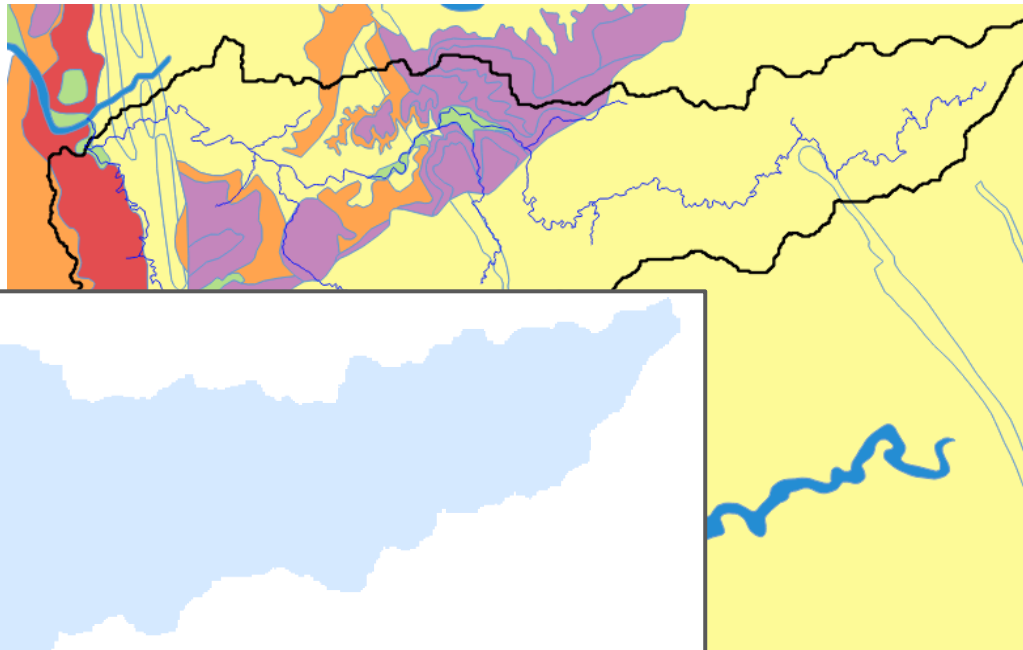
# CEIRA RIVER BASIN – ECO-HYDROLOGICAL CHARACTERIZATION

## PERMEABILITY AND PERCOLATION CAPACITY (Kp)

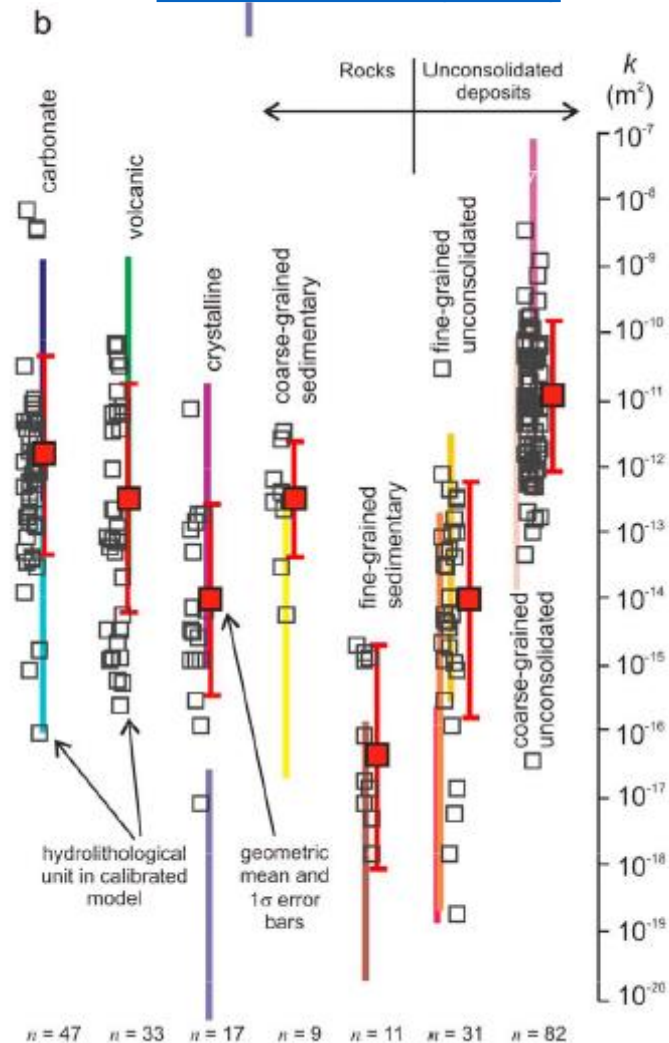
### HYDROGEOLOGICAL UNITS



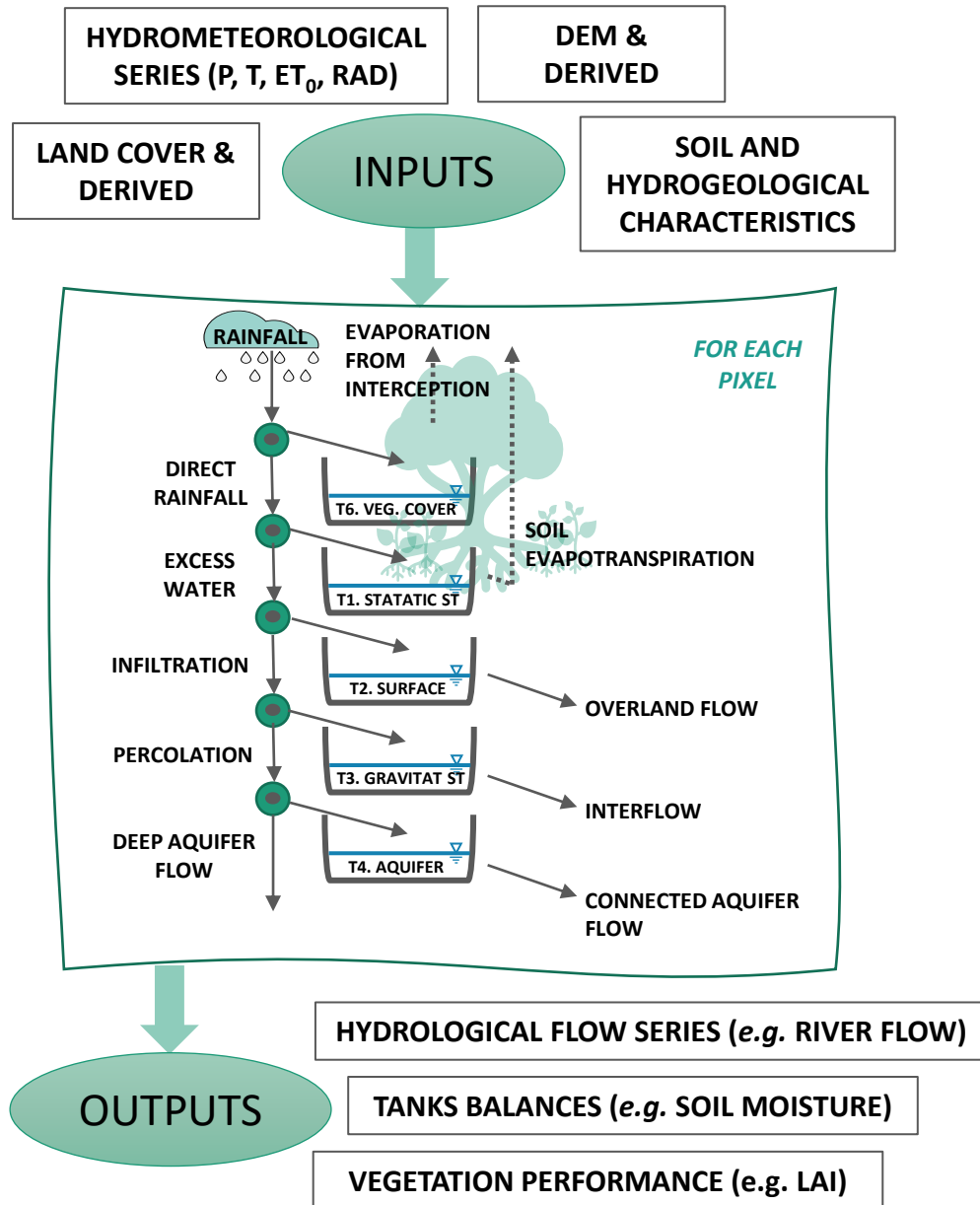
### LITHOLOGICAL MAP (GLiM – Global Lithological Map)



[Gleeson et al. \(2011\)](#)



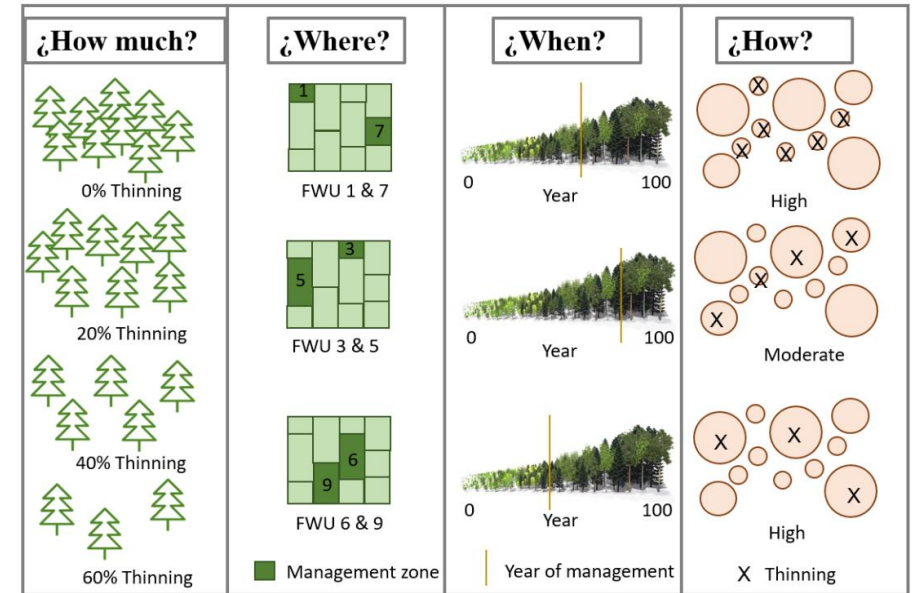
# MODELLING WITH ECO-TETIS



## REQUIREMENTS

- **RELIABLE INPUTS**
  - DIFFERENT SOURCES
  - KNOWLEDGE OF THE CASE STUDY
- **CALIBRATION**
  - HYDROLOGICAL PARAMETERS
  - VEGETATION PARAMETERS

## PROJECTIONS ANSWERING



## CLIMATE CHANGE SCENARIOS





# MODELLING WITH ECO-TETIS

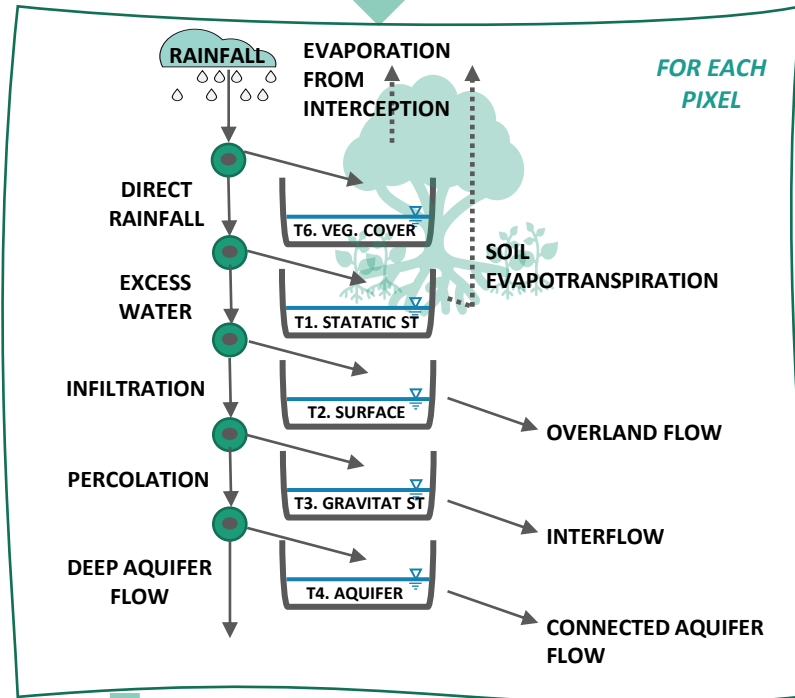
HYDROMETEOROLOGICAL SERIES (P, T, ET<sub>0</sub>, RAD)

DEM & DERIVED

LAND COVER & DERIVED

SOIL AND HYDROGEOLOGICAL CHARACTERISTICS

INPUTS

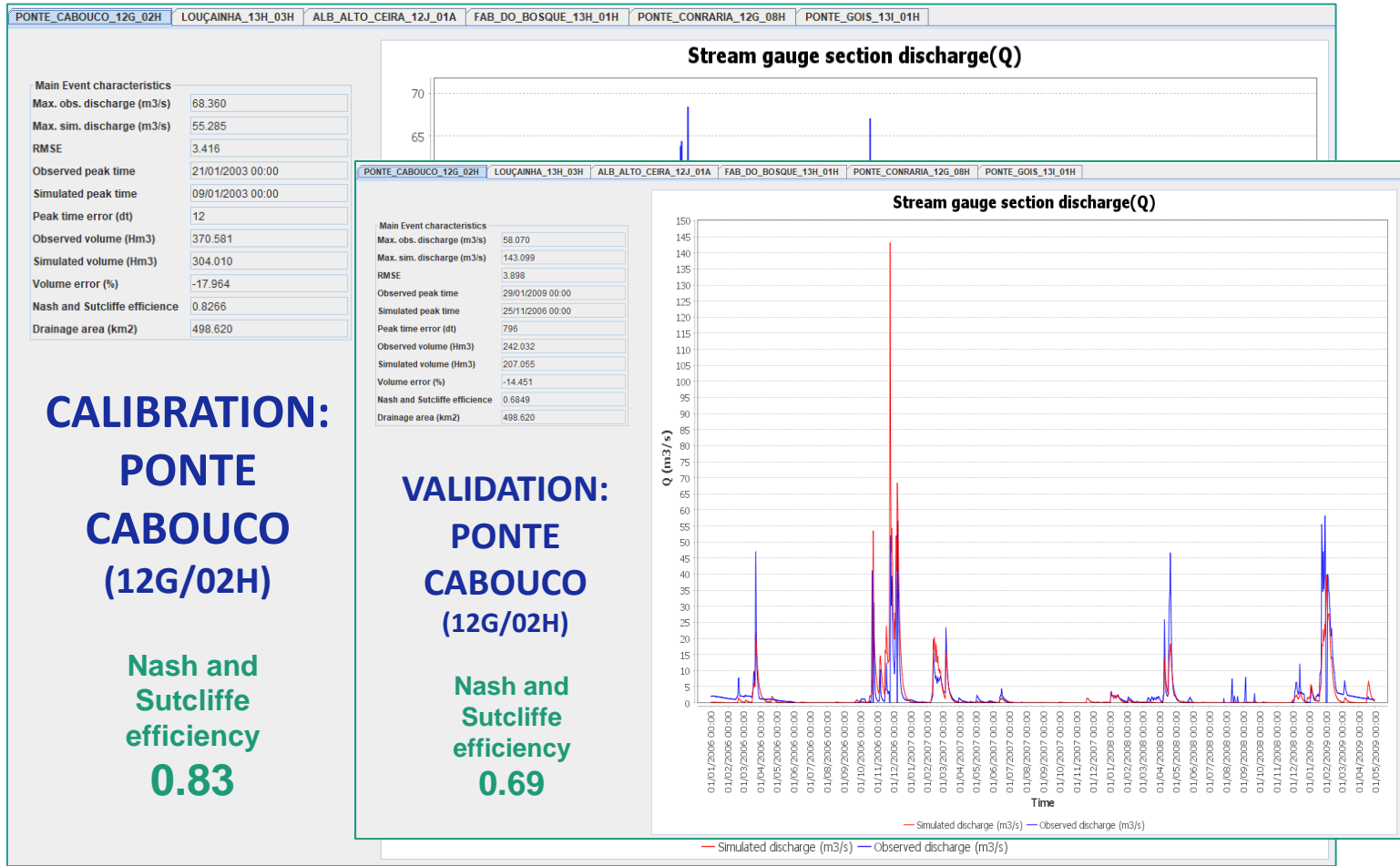


OUTPUTS

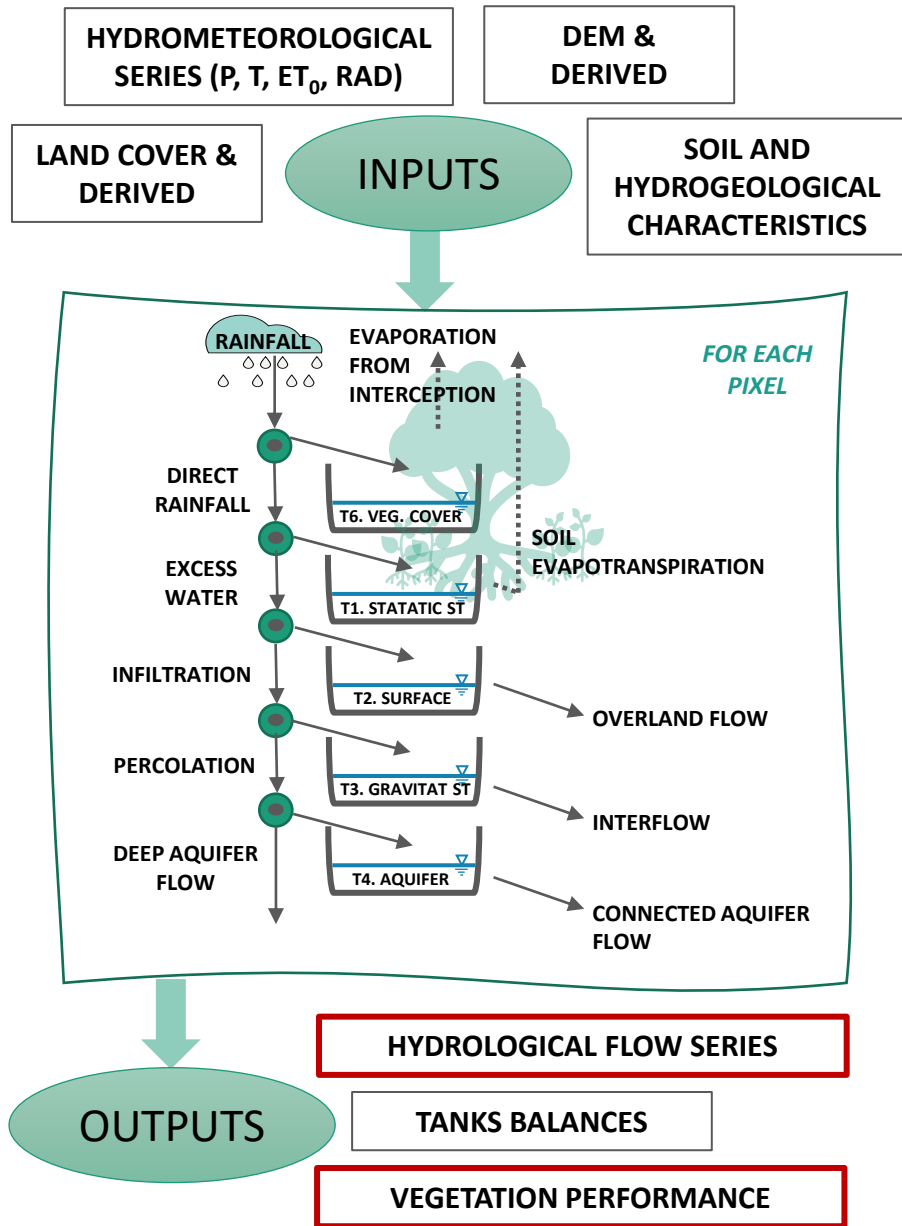
HYDROLOGICAL FLOW SERIES

TANKS BALANCES

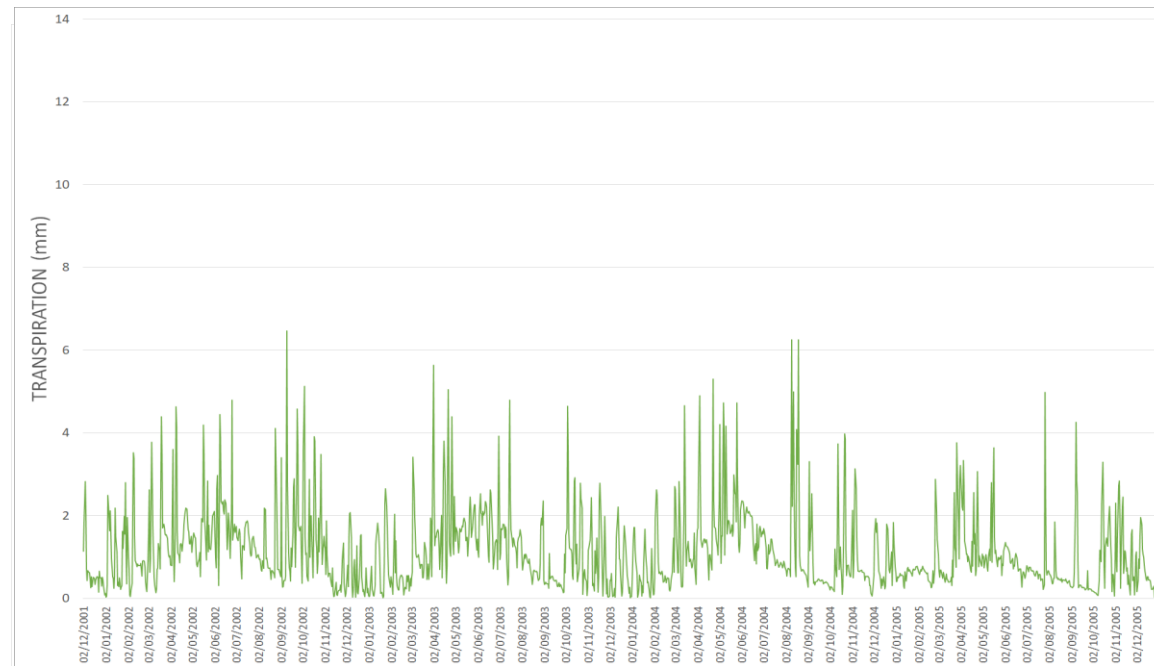
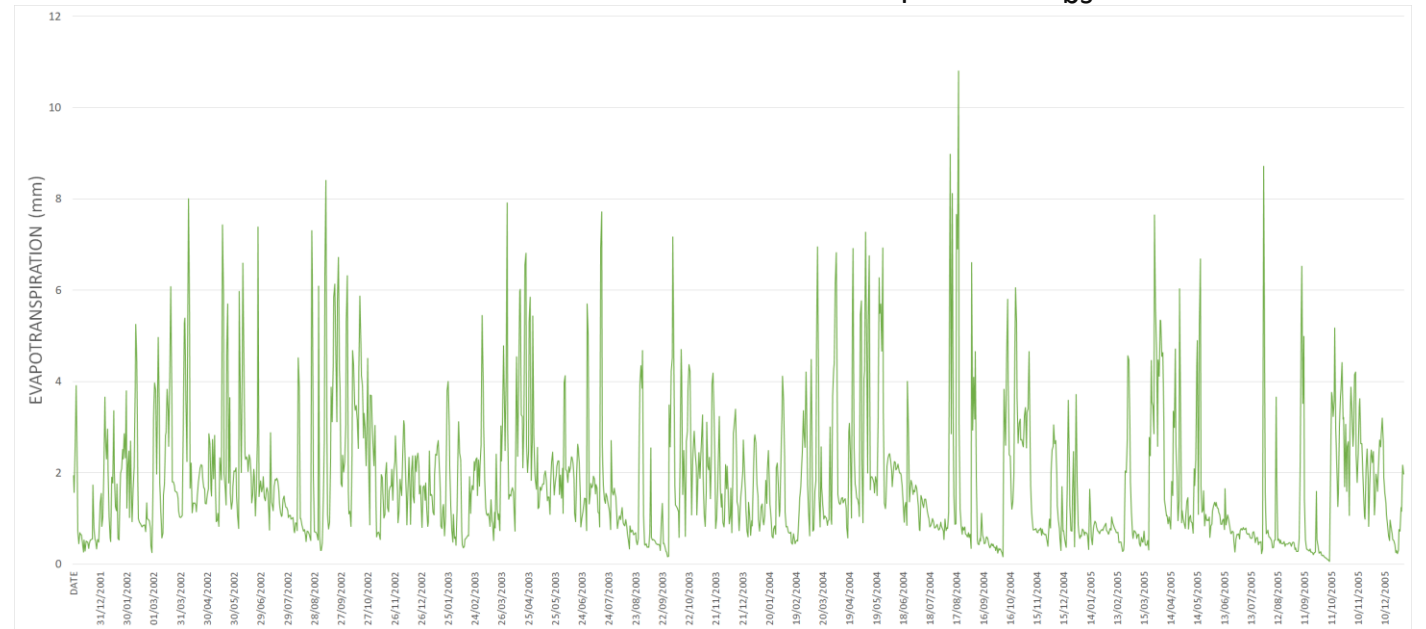
VEGETATION PERFORMANCE



# MODELLING WITH ECO-TETIS



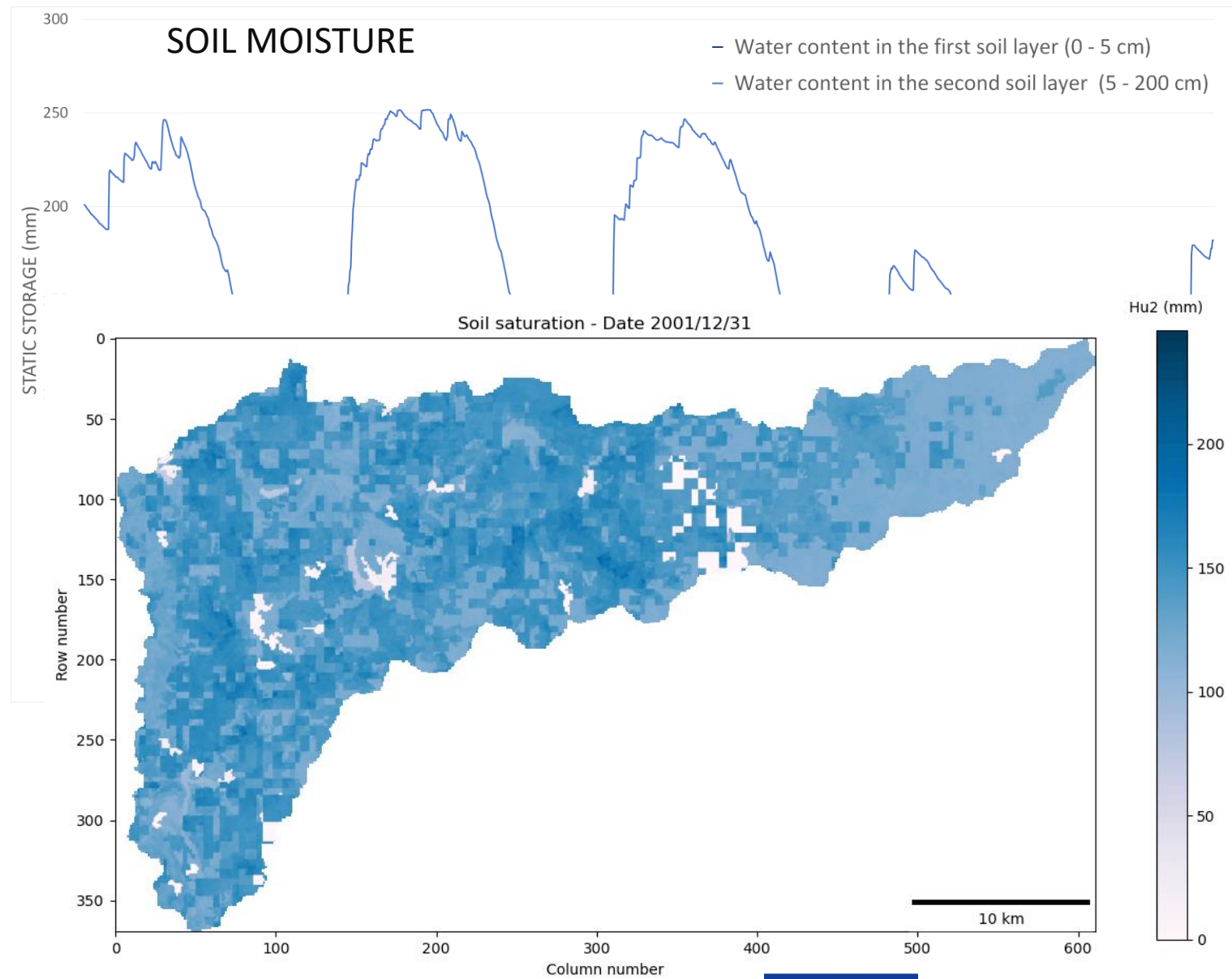
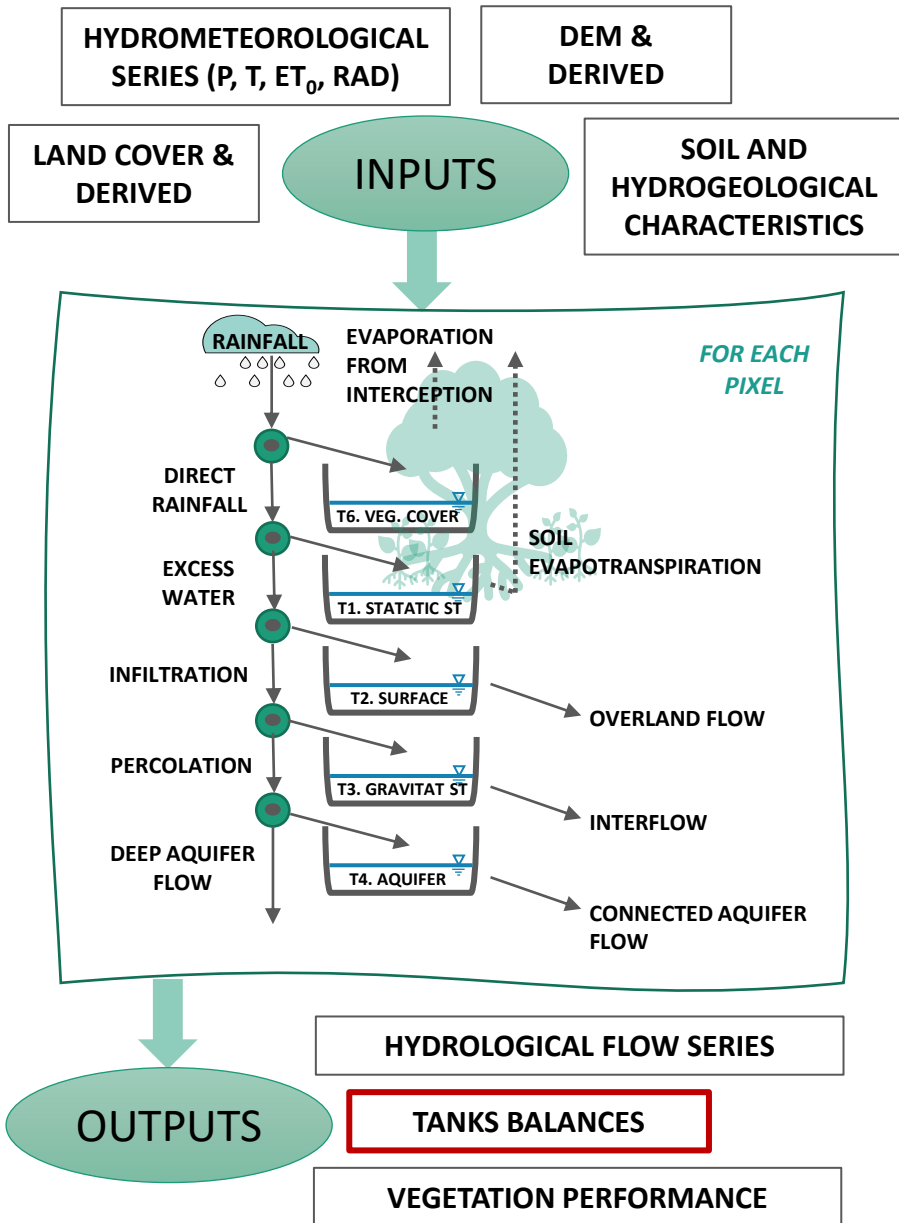
$$\text{EVAPOTRANSPIRATION} = E_i + T + E_{bs}$$



- Evaporation from the interception
- Transpiration
- Evaporation from the bare soil



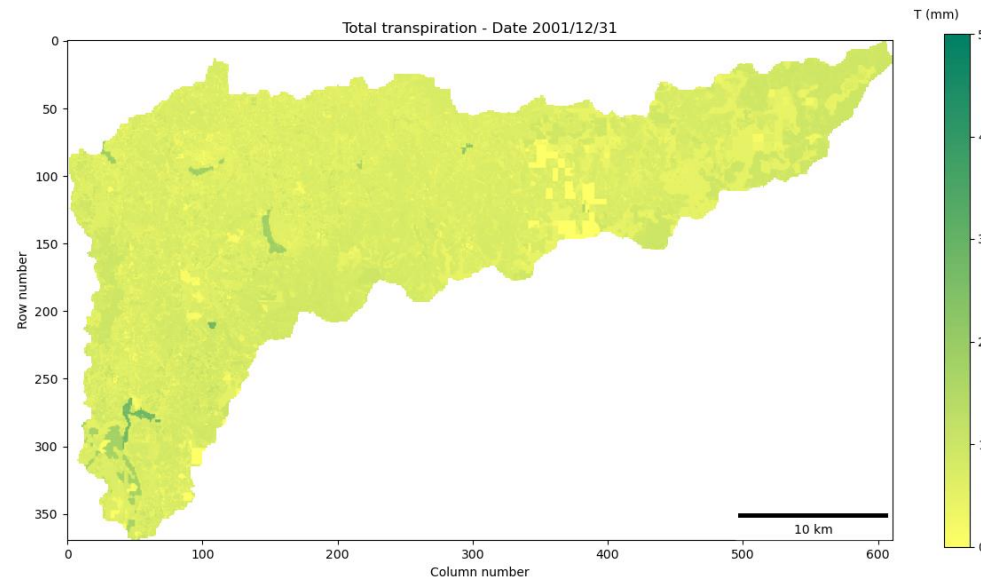
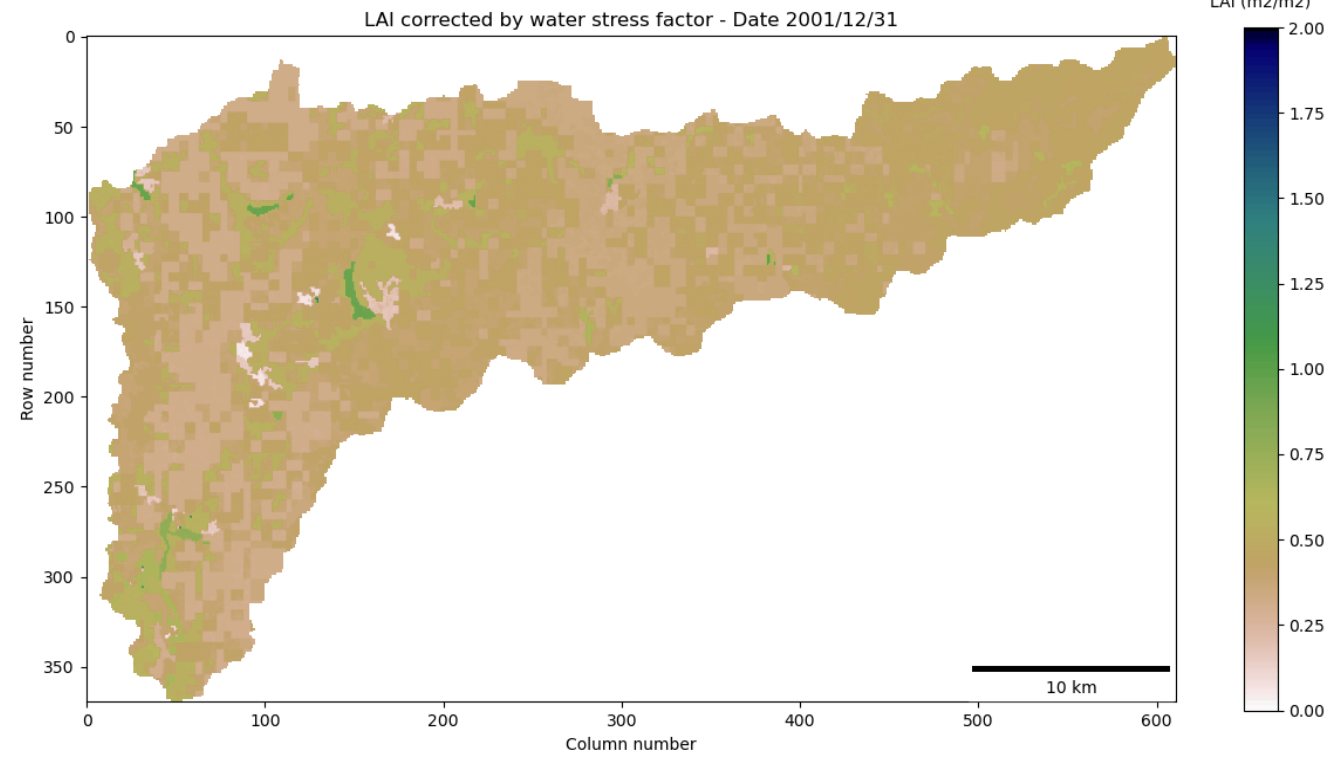
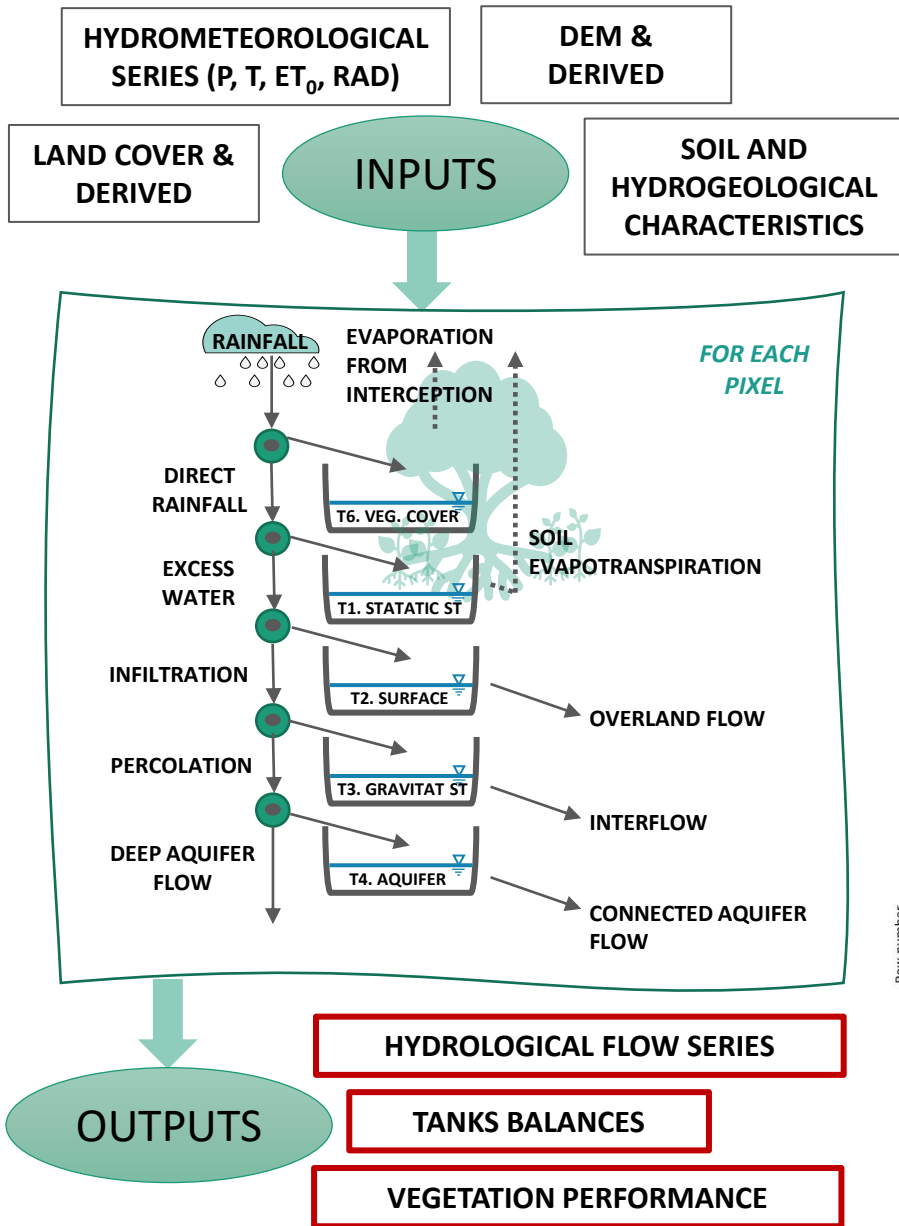
# MODELLING WITH ECO-TETIS



## STATIC STORAGE EVOLUTION



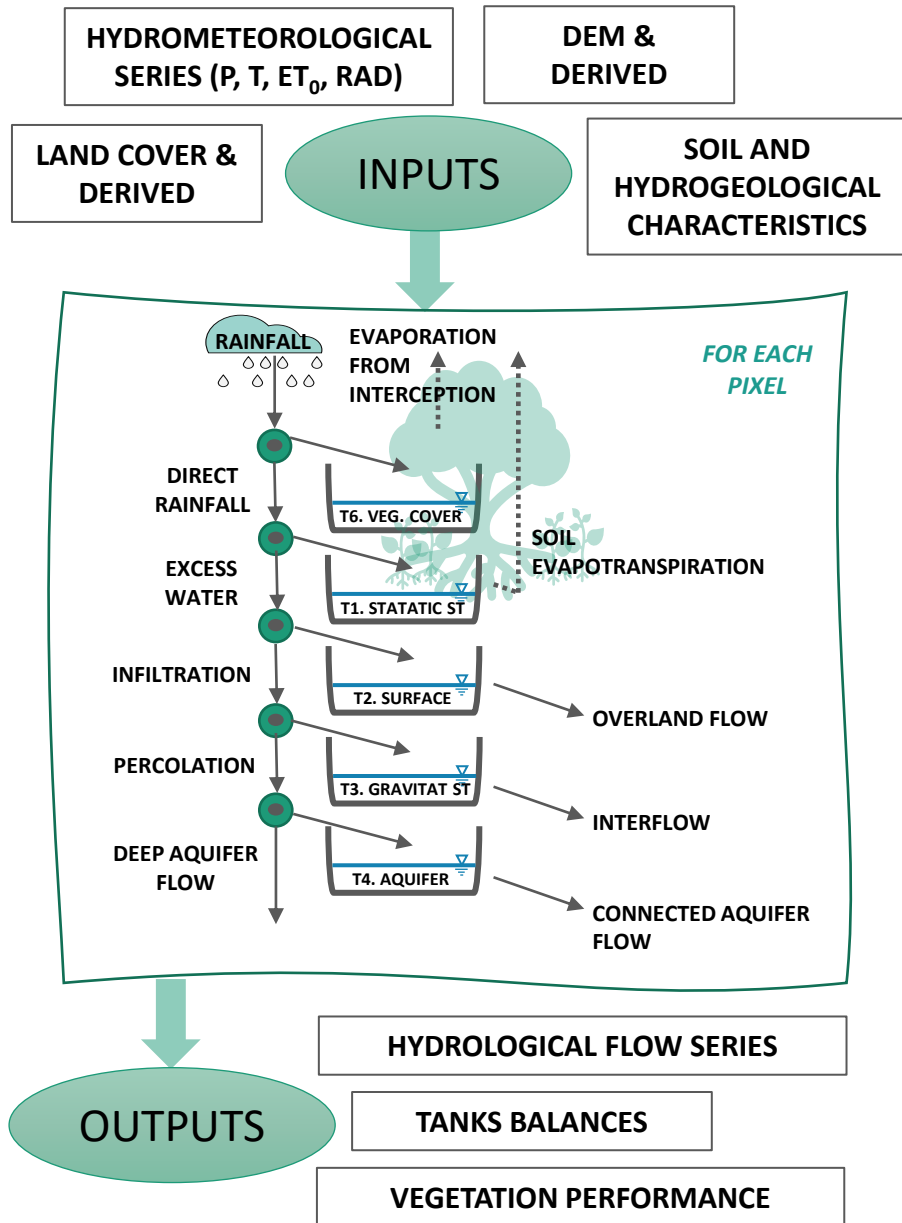
# MODELLING WITH ECO-TETIS



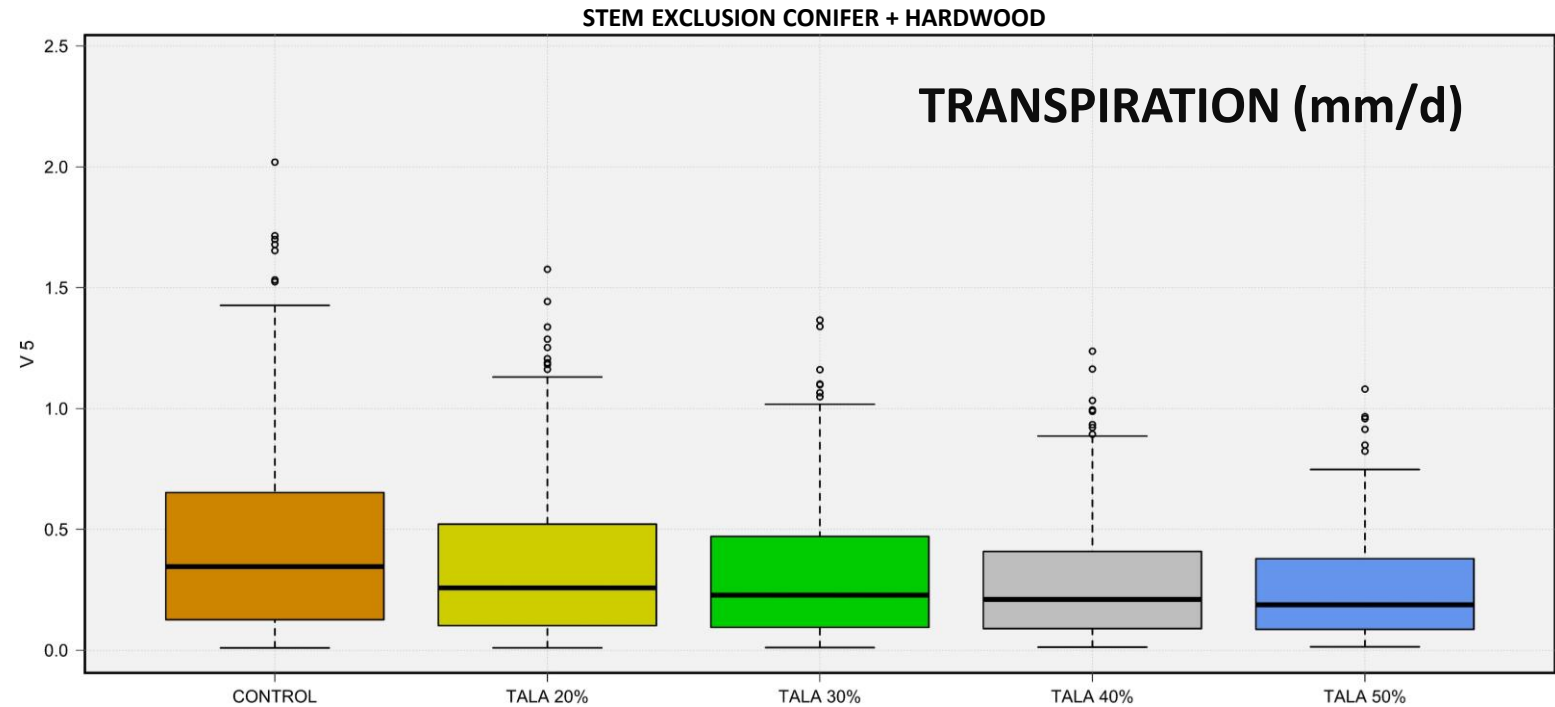
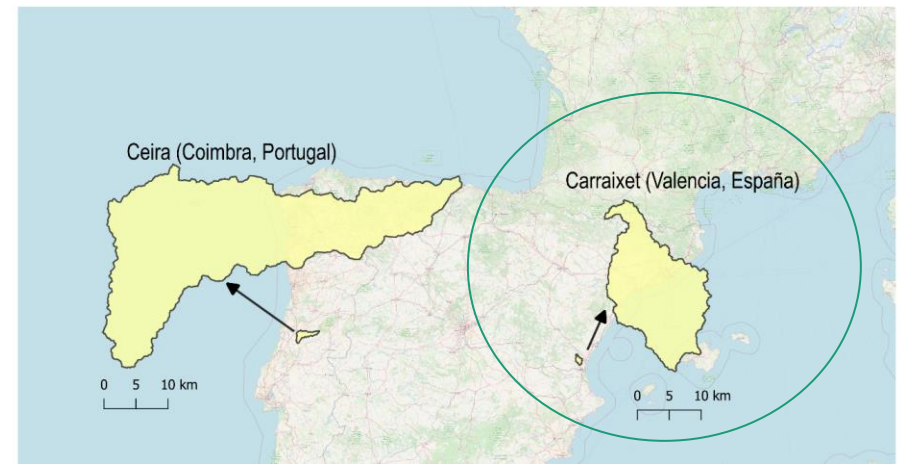
## VEGETATION PERFORMANCE EVOLUTION



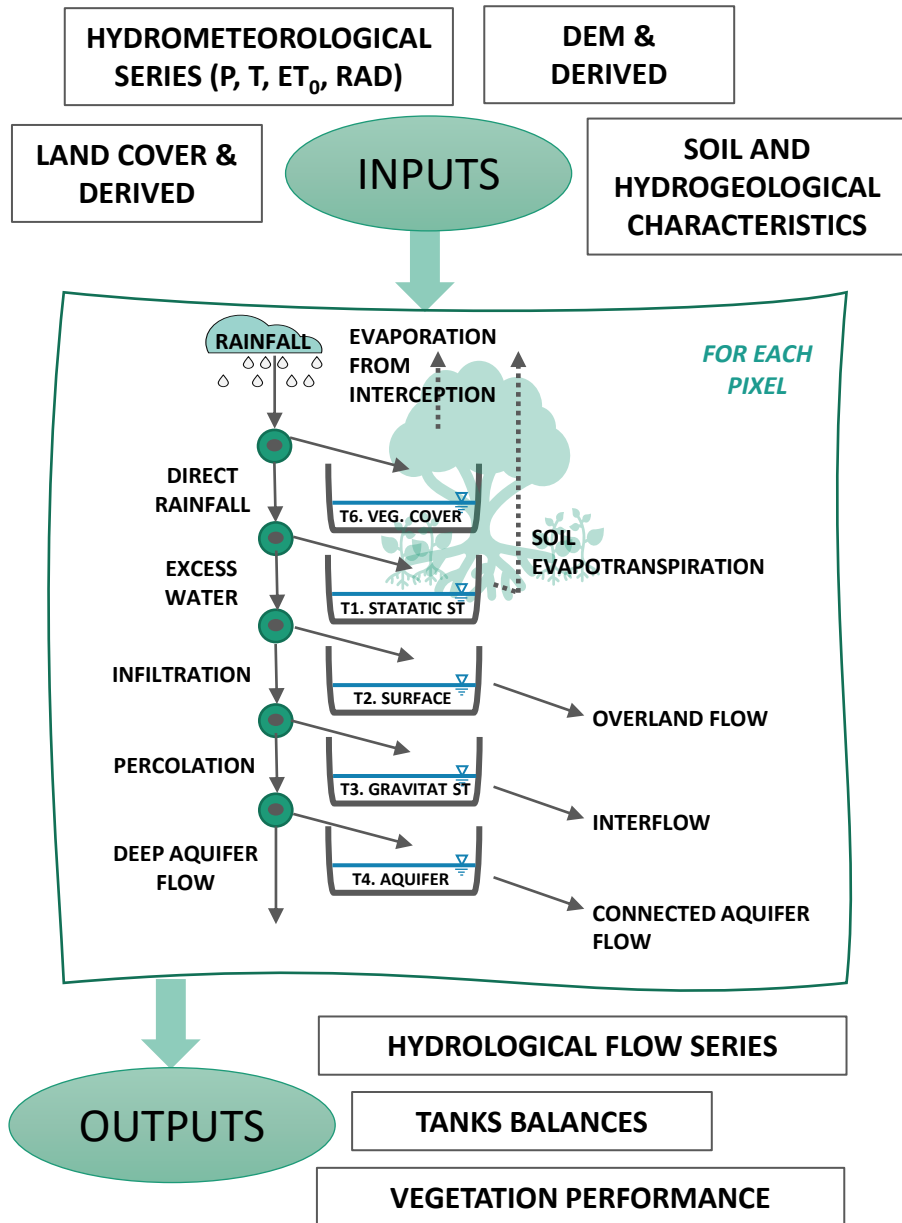
# MODELLING WITH ECO-TETIS



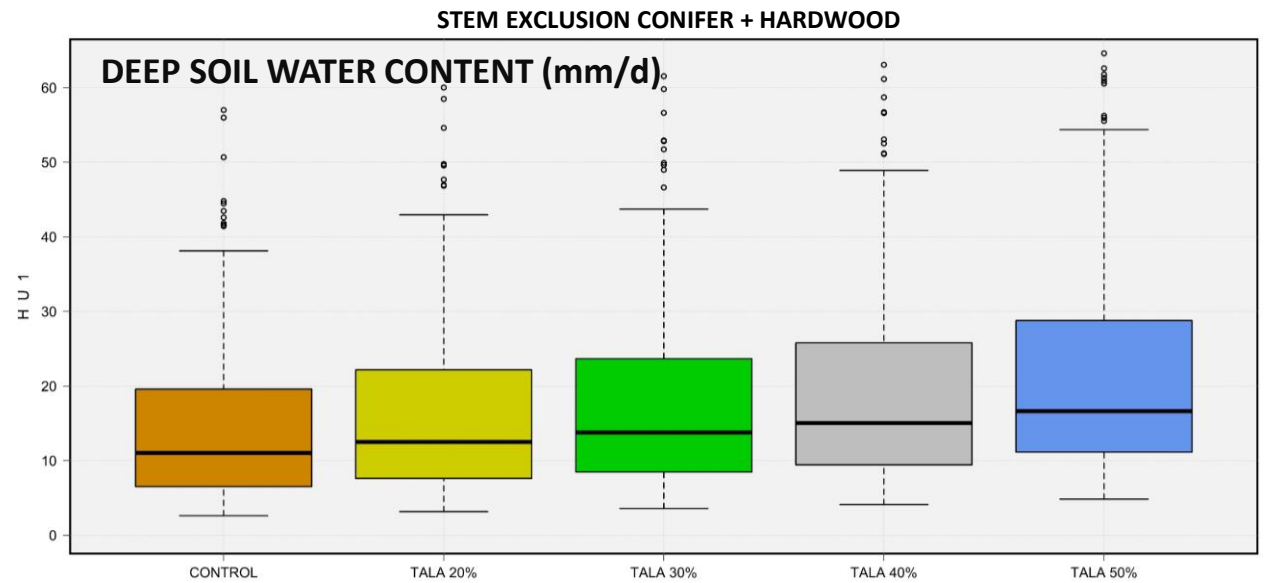
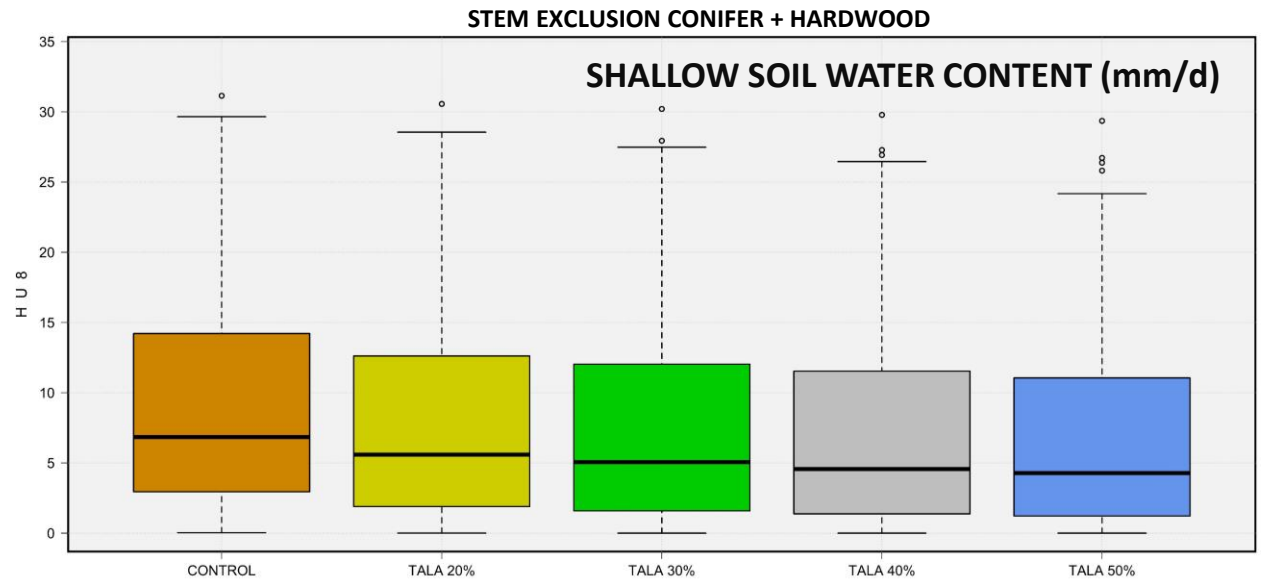
# FOREST MANAGEMENT OPTIONS ANALYSIS



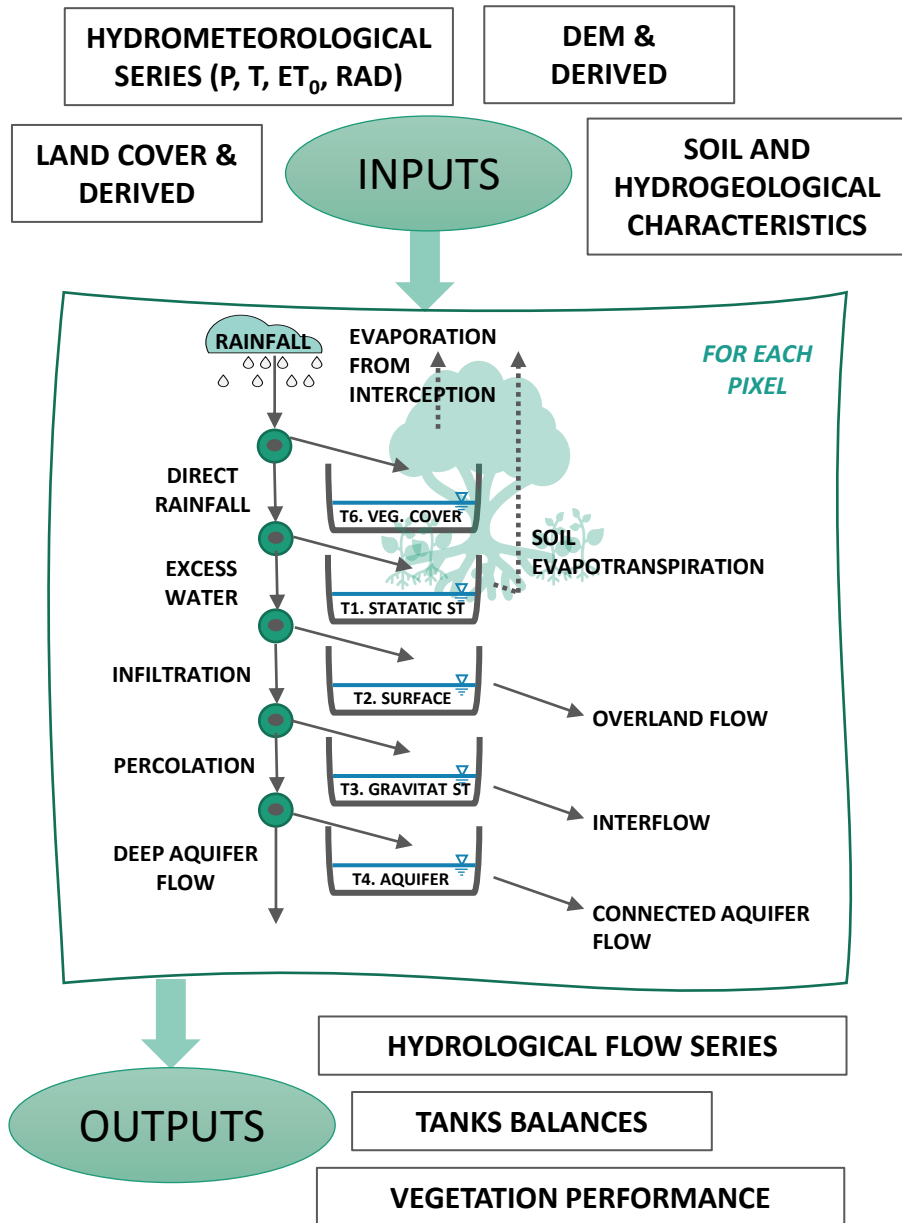
# MODELLING WITH ECO-TETIS



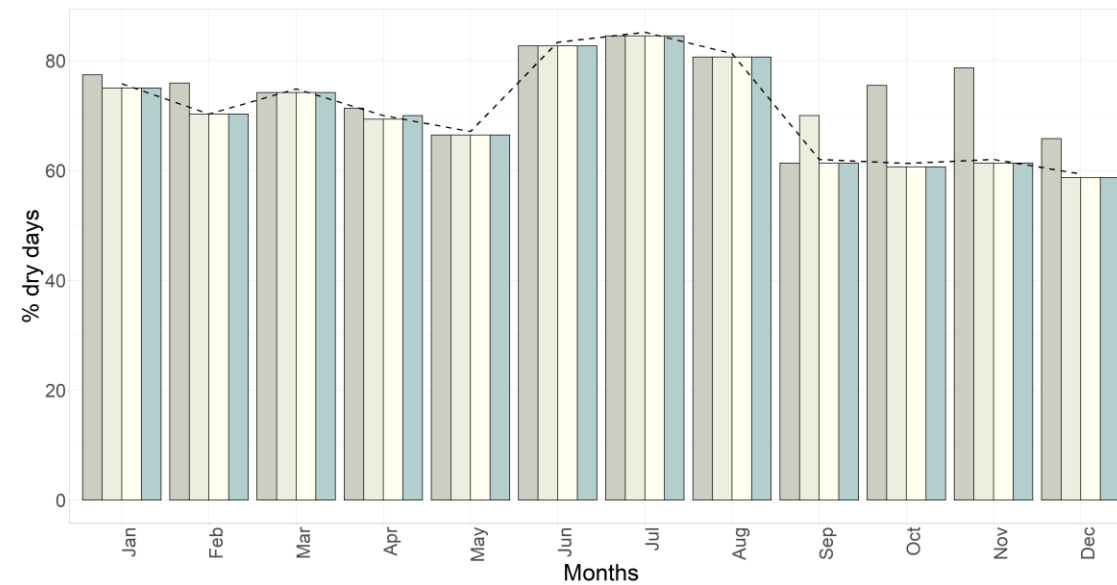
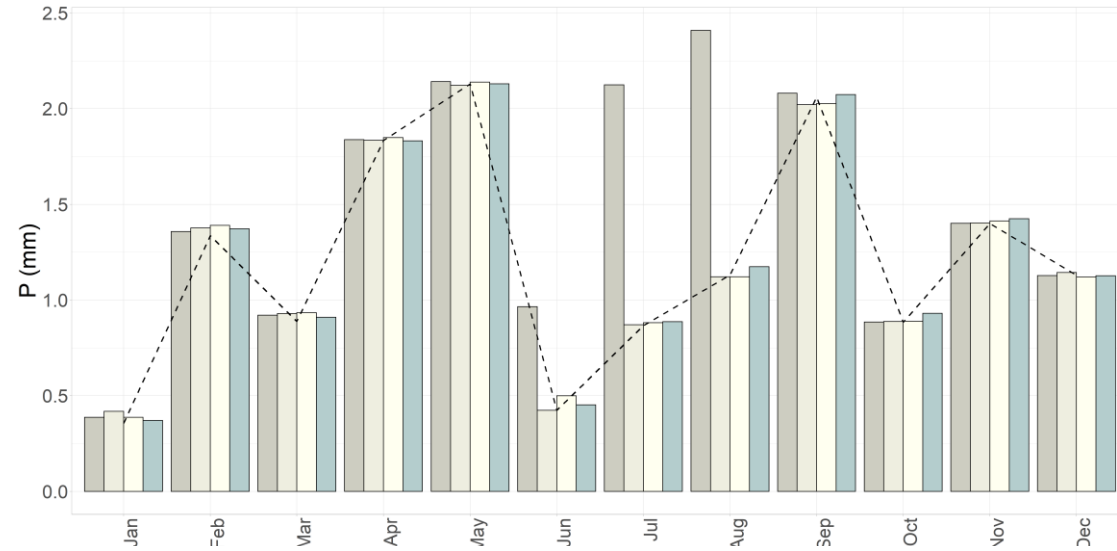
## FOREST MANAGEMENT OPTIONS ANALYSIS



# MODELLING WITH ECO-TETIS



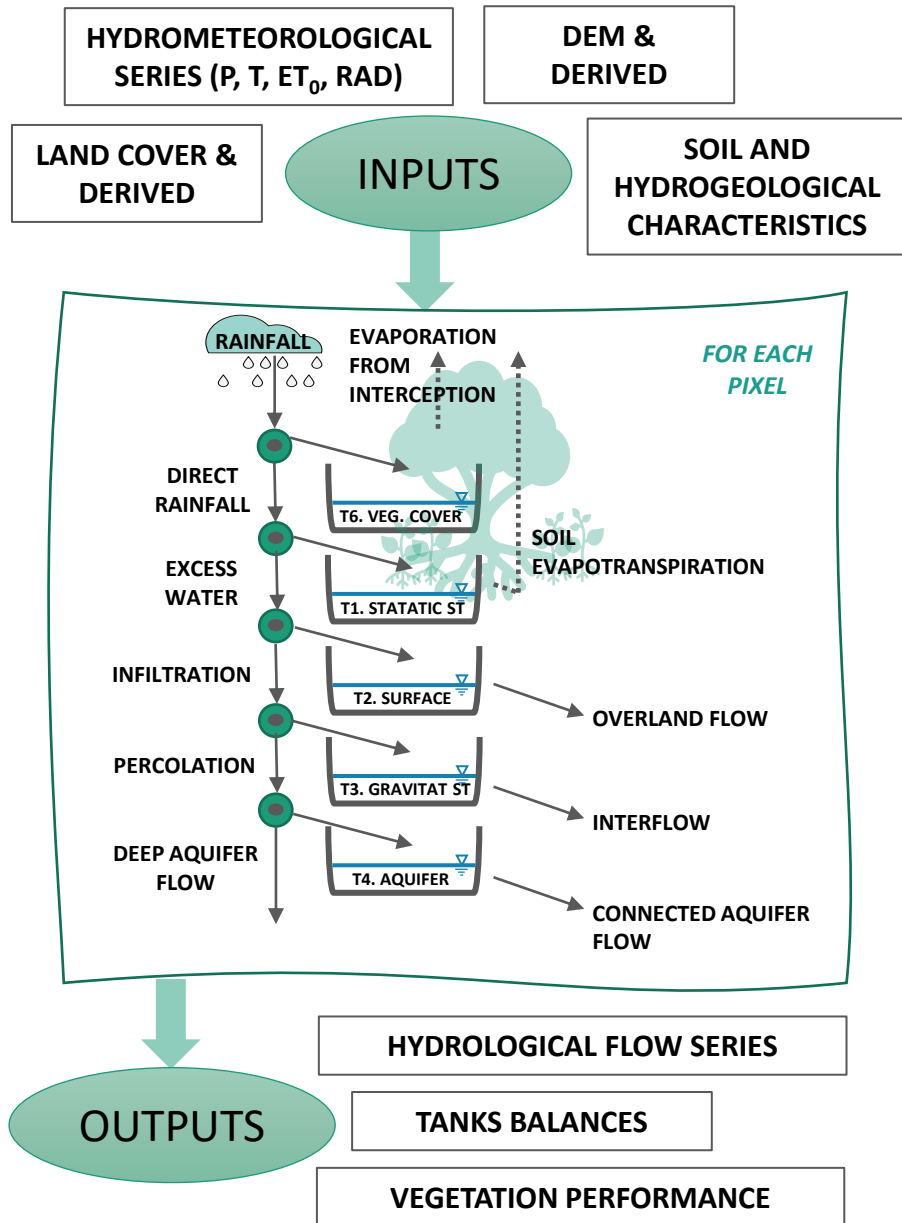
# CLIMATE CHANGE PROJECTIONS



% DRY DAYS (important in arid or semiarid environments)

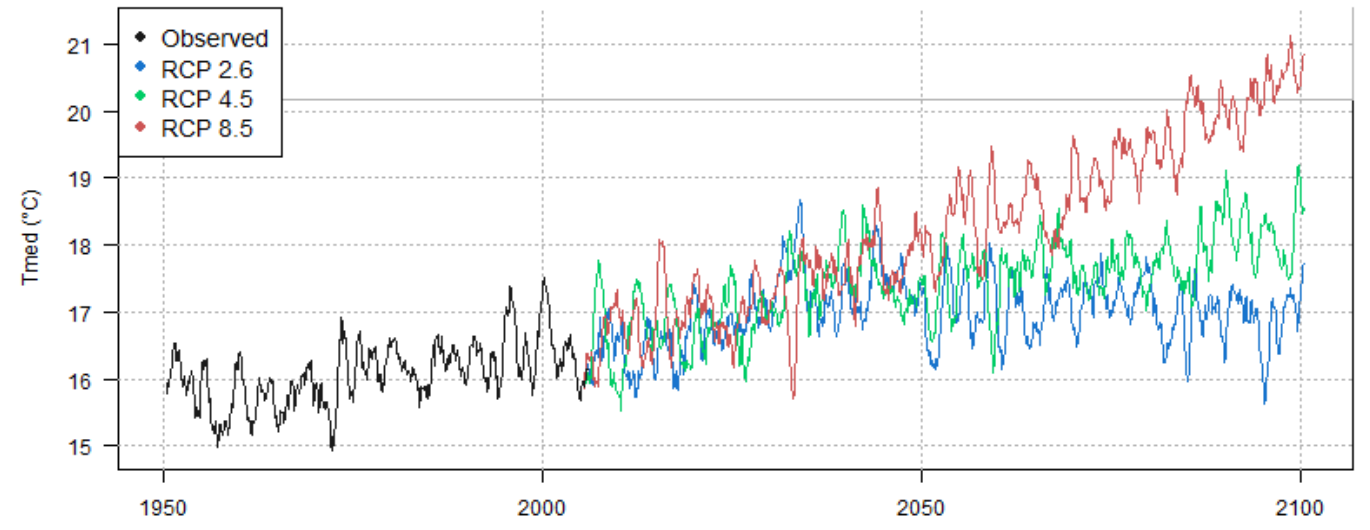


# MODELLING WITH ECO-TETIS

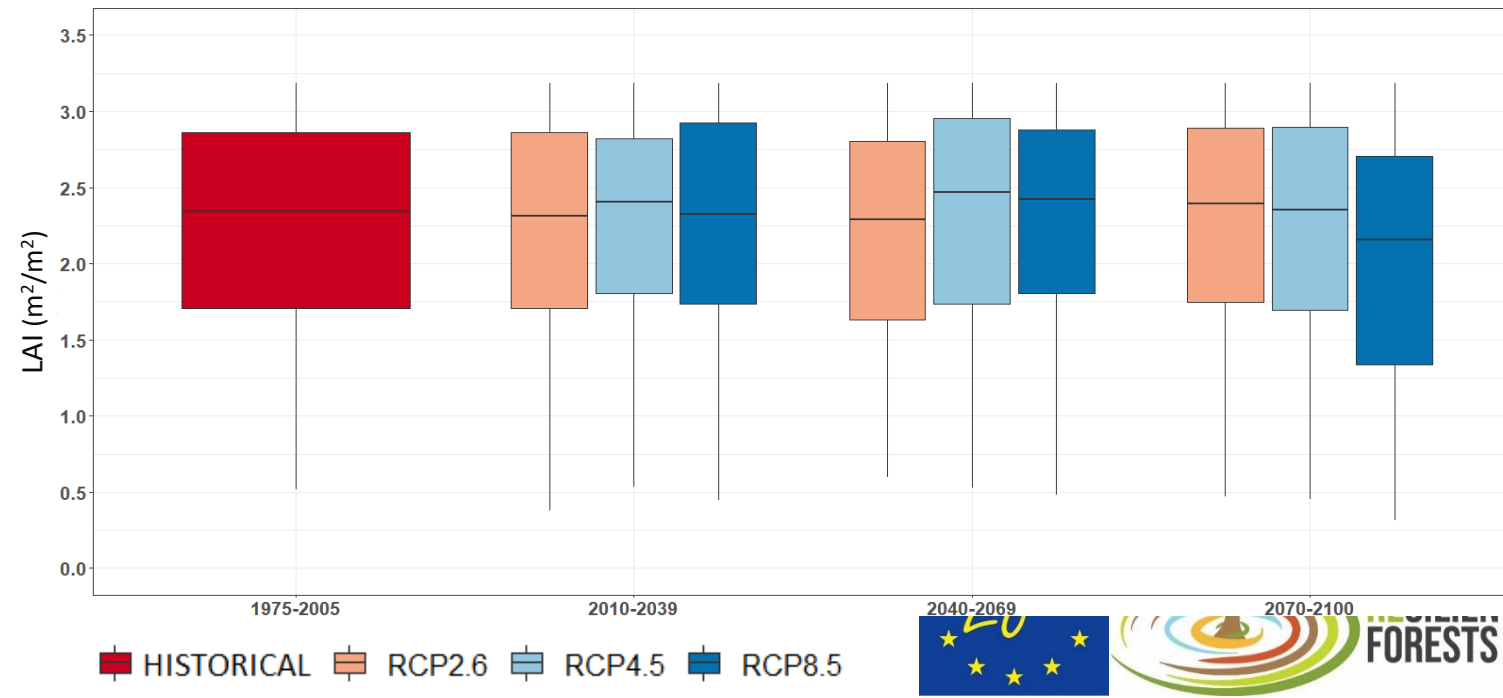


# CLIMATE CHANGE PROJECTIONS

RCM:  
MPI-CSC – REMO 2009\_v1



STEM EXCLUSION CONIFER + HARDWOOD  
FOREST MANAGEMENT SCENARIO : CONTROL

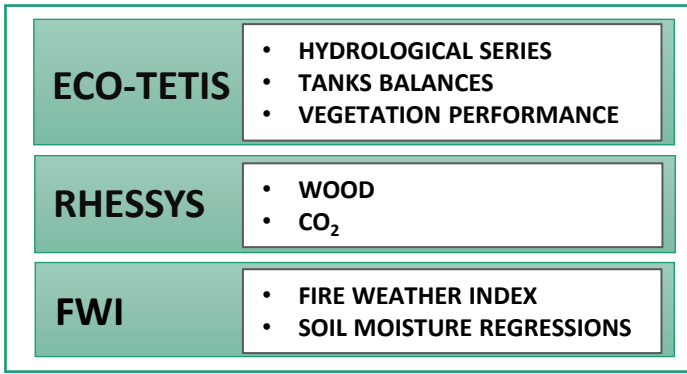




# COST-BENEFIT ANALYSIS

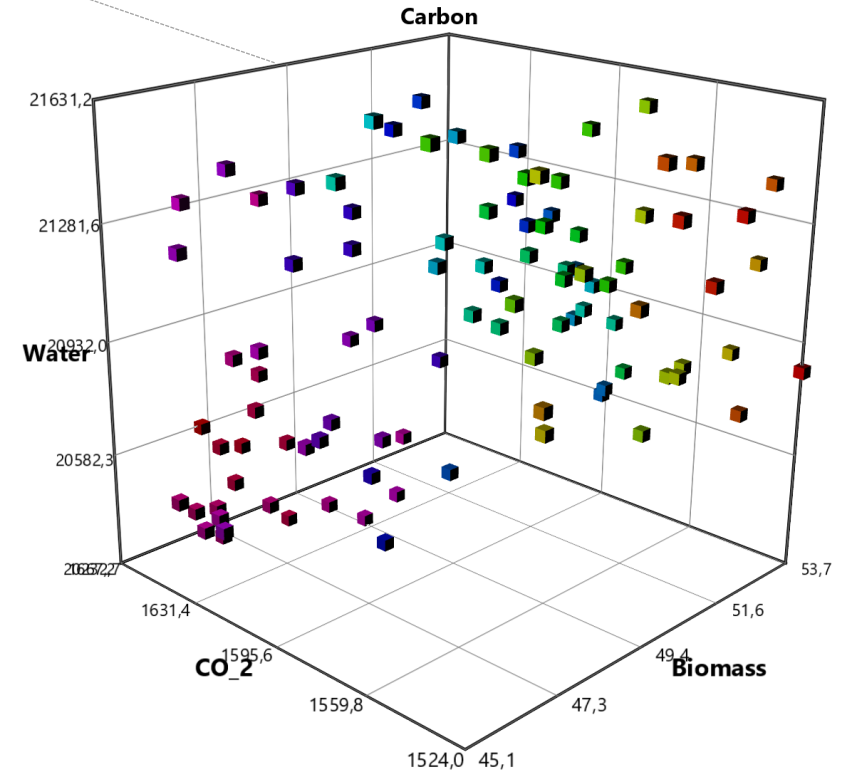
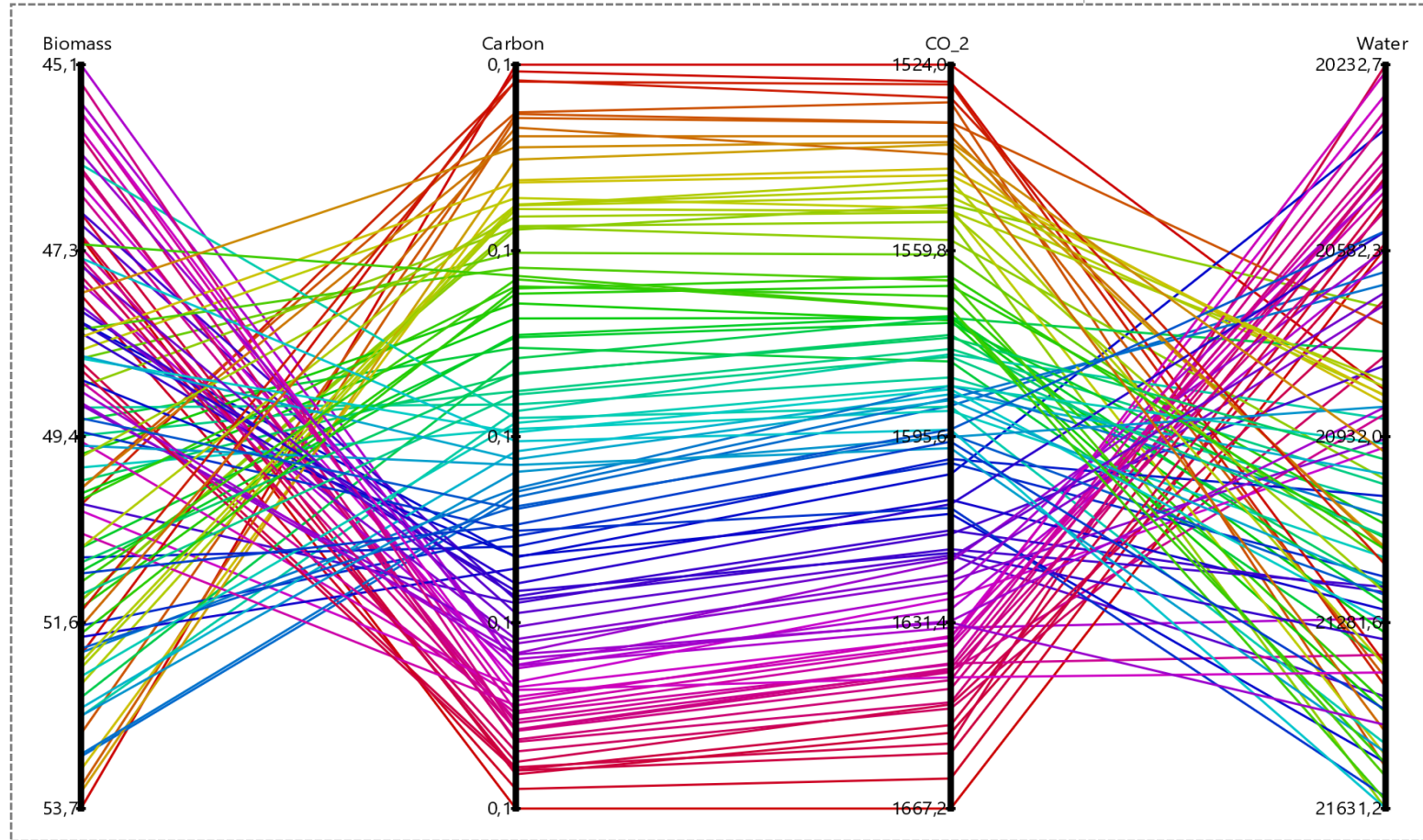
# C.A.F.E.

Carbon, Aqua, Fire & Eco-resilience



MANAGEMENT  
OPTIONS  
n alternatives

FOREST  
RESILIENCE  
n responses





***THANK YOU FOR YOUR ATTENTION***

*Webminar  
October 28<sup>th</sup>, 2020*

*Prepared by: Alicia García Arias  
algarar2@upv.es*



The project *LIFE RESILIENT FORESTS – Coupling water, fire and climate resilience with biomass production from forestry to adapt watersheds to climate change* is co-funded by the LIFE Programme of the European Union under contract number LIFE 17 CCA/ES/000063.