EGU General Assembly 2025
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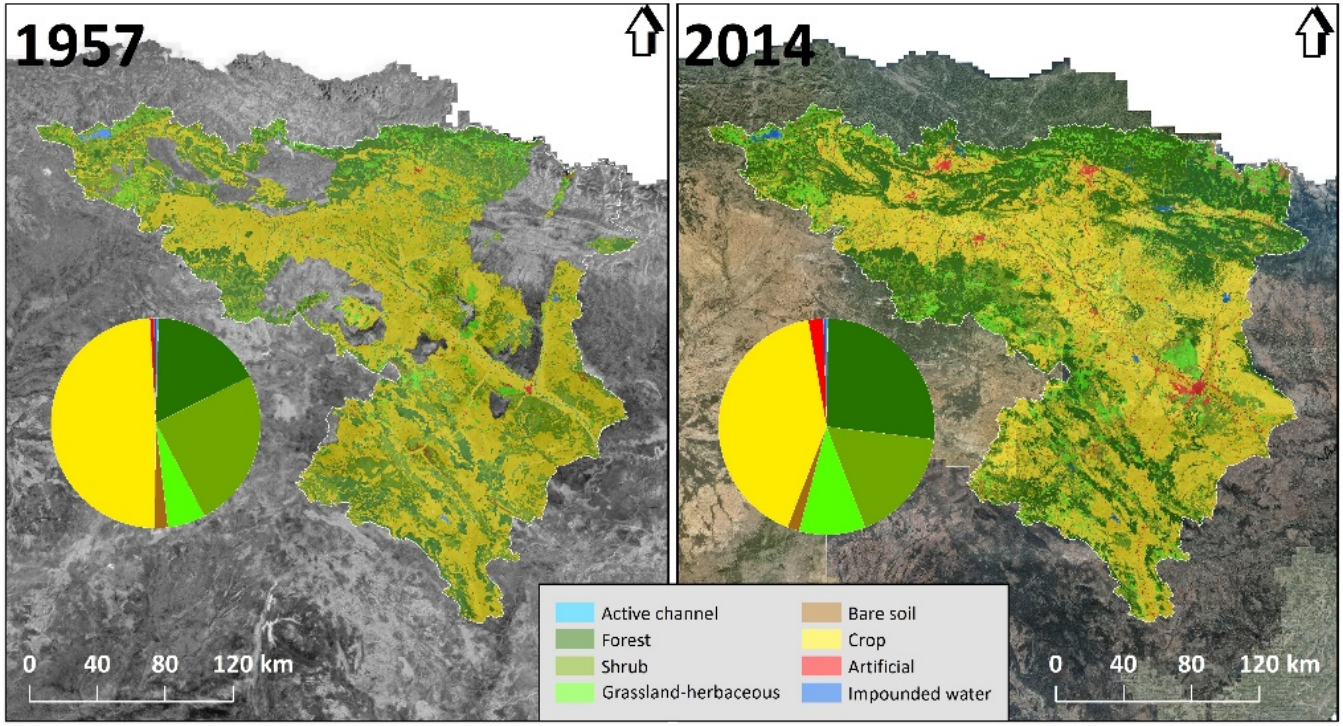
Land use and land cover change and river adjustment



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Grant PID2022-138196OB-C32 "**The Ebro Sediment Observatory (OSE): hydro-geomorphological adjustments in response to human-induced impacts. Implications for flooding risks and sediment management (EbroHydroMorph)**" funded by MICIU.

OBJECTIVES

- One of the objectives of the project "**The Ebro Sediment Observatory (OSE): hydro-geomorphological adjustments in response to human-induced impacts. Implications for flooding risks and sediment management (EbroHydroMorph)**" is the assessment of the impacts produced since the middle of the 20th century by human activity in the basin and the analysis of their implication in the hydromorphological evolution of the Ebro and its main tributaries.
- In this presentation we will analyse LU/LC changes in the basin and their consequences on the river morphology, specifically in the active channel.

STUDY AREA

- The study area is the upper and middle Ebro basin, the drainage basin of the Ebro River up to the end of its free meandering reach in La Zaida.
- In this area we find a very wide range of landscapes due to very diverse environmental conditions, from the high mountains in the Pyrenees on the north, Atlantic conditions in the upper basin, to Mediterranean in the southeast and semiarid in the Ebro Depression.

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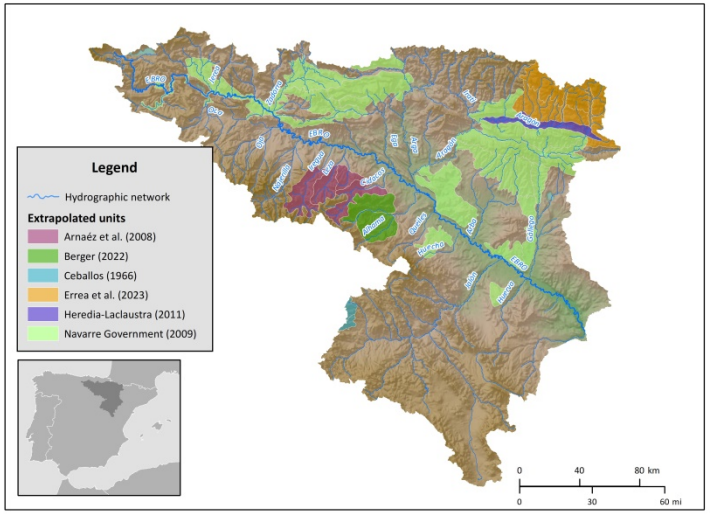
METHODOLOGY

LU/LC Categories definition for our project objectives: active channel, forest, shrubs, grassland, bare soil, crops, artificial, impounded water



- **Mid 20th century: 1957 LU/LC cartography reconstruction**
  - Collection of existing LU/LC cartography and data (13.672 km^2 - 27,7% of the study area)
  - We completed the remaining area by:
    - extrapolation of existing LU/LC distribution to similar areas based on landscape units (20.1%)
    - and the digitalization of LU/LC surfaces (26,849 km^2 and 52.2%)
  - So we have 79.9% of study area covered by cartography, and the remaining 20.1% with LU/LC distribution data at the landscape unit scale

- **Present time: 2014 LU/LC cartography** from **SIOSE,** the Information System on Land Occupation in Spain
  - The scale is similar to that of 1957 LU/LC cartography
  - The classes of SIOSE are comparable with the proposed categories
  - Reclassification

- **Digitalisation of all active channel surfaces** of both 1957 and 2014 images.

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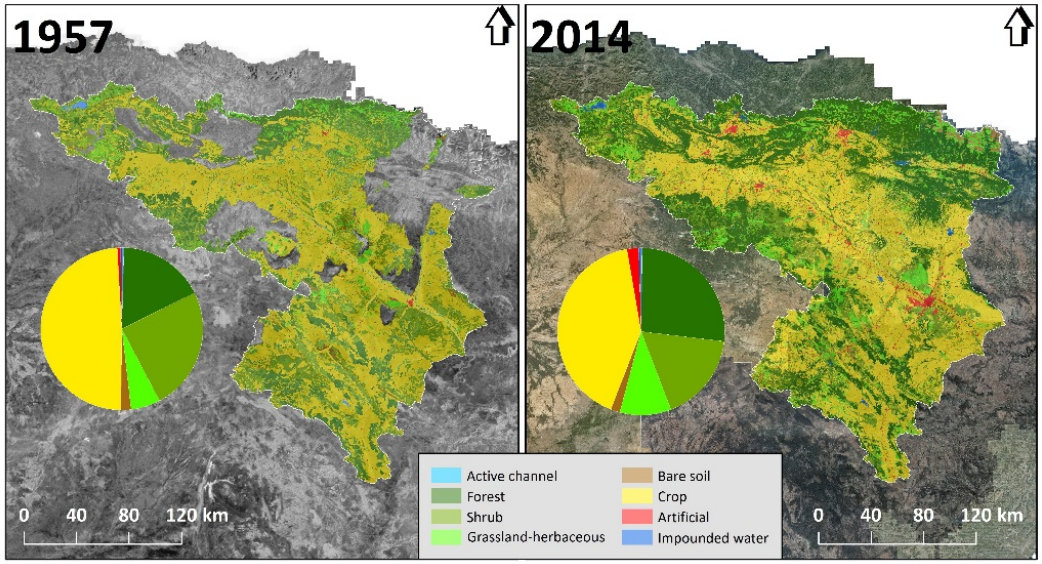
RESULTS

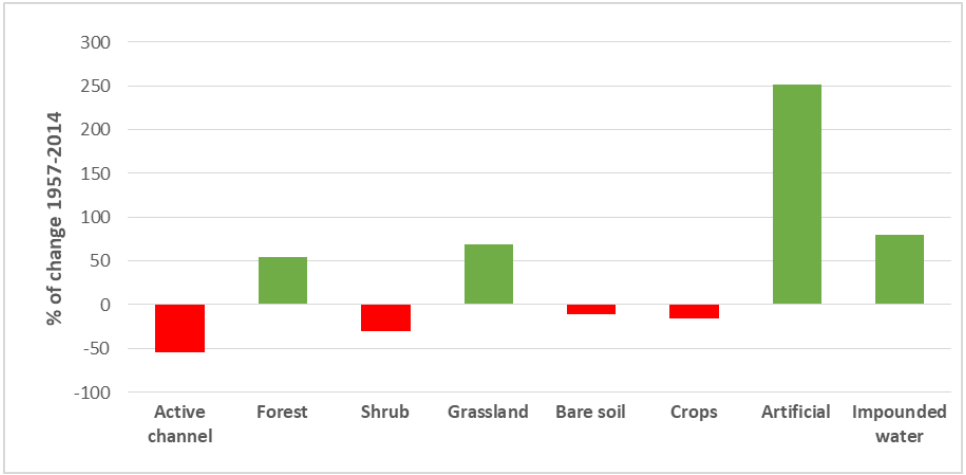
LU/LC distribution cartography in 1957 and 2014



LU/LC distribution data in 1957 and 2014

Category	1957		2014		Difference (%)
	km²	%	km²	%	
Active channel	208.22	0.42	94.13	0.19	-0.23
Forest	8535.29	17.27	13192.96	26.69	9.42
Shrub	12163.36	24.61	8546.85	17.29	-7.32
Grassland	2900.06	5.87	4911.66	9.94	4.07
Bare soil	991.23	2.01	887.37	1.8	-0.21
Crops	24187.14	48.93	20450.22	41.37	-7.56
Artificial	318.62	0.64	1120.28	2.27	1.63
Impounded water	126.06	0.26	226.52	0.46	0.2
TOTAL	49430	100	49430	100	

Percentage of change in relation to the surface of each category in 1957



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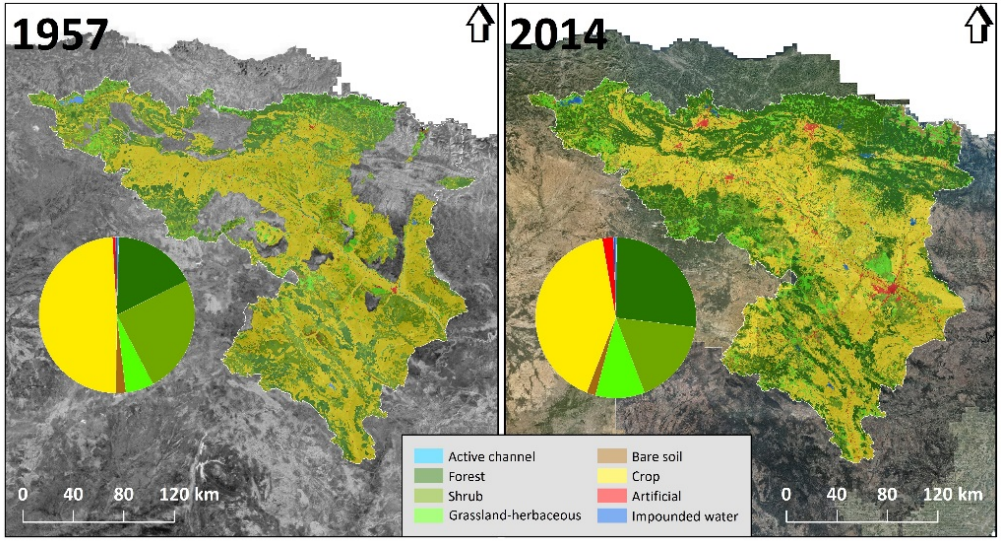
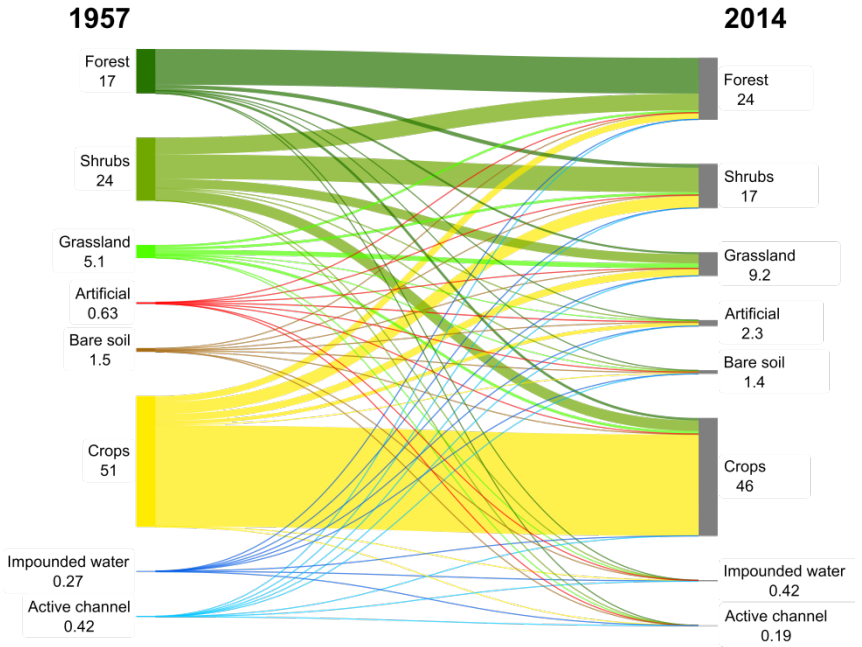


Land use /land cover transfers among categories between 1957 and 2014



- The increase in forest mainly comes from shrubs and crops.
- Shrubs also transfer to grassland and crops
- Crops also lose part of their 1957 surface in favour of forest, shrubs, grassland and artificial surfaces.

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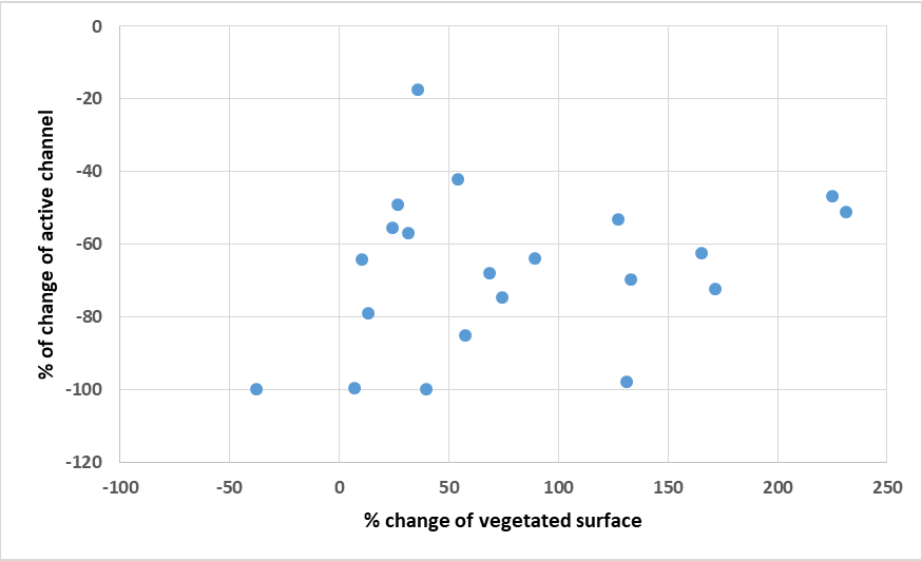
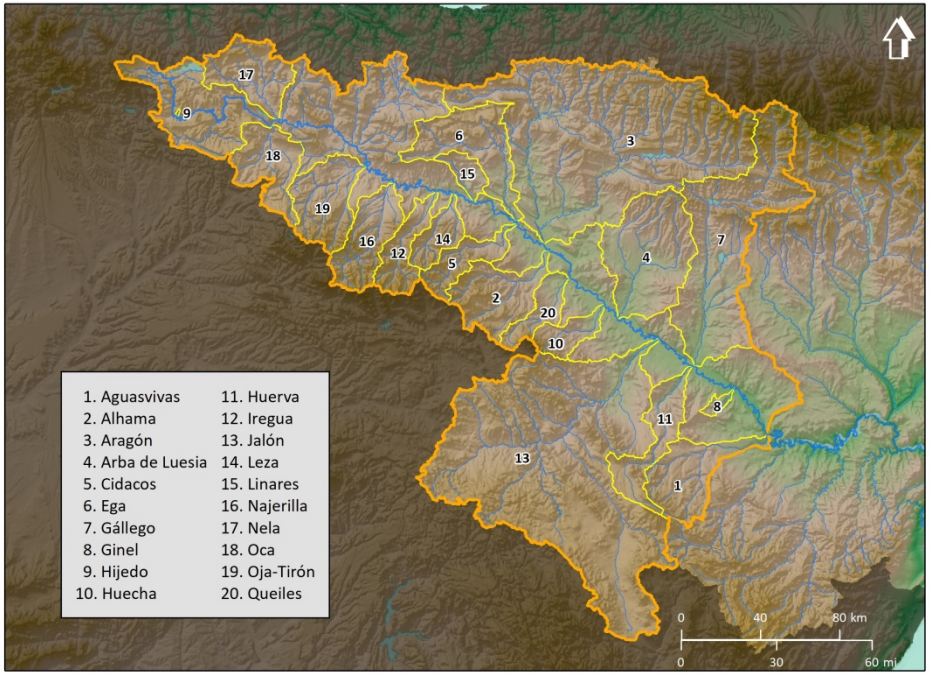
RESULTS

Percentage of change in relation to the surface in 1957 of forest *vs* active channel for 20 sub-basins and Ebro basin





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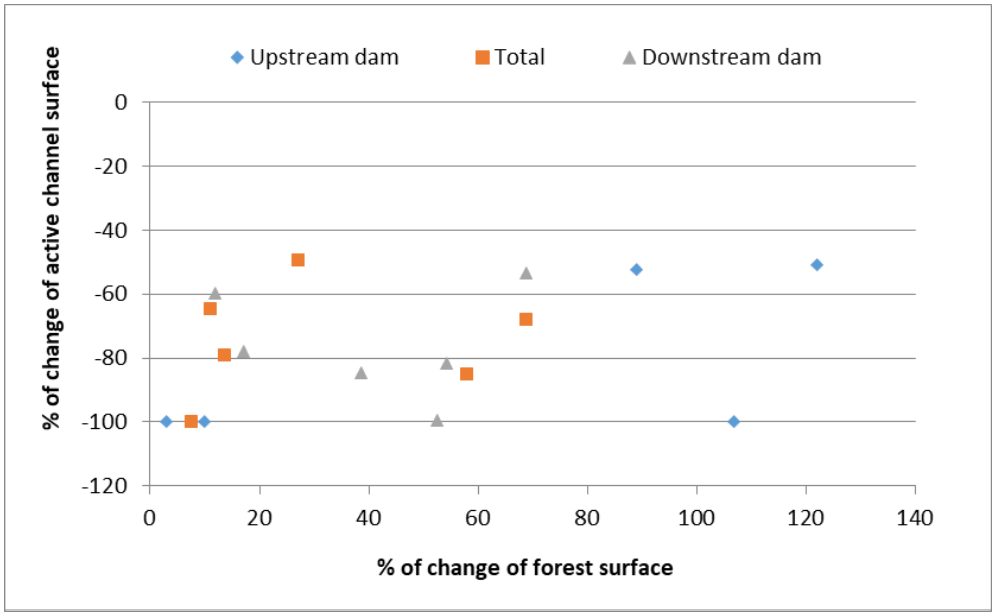
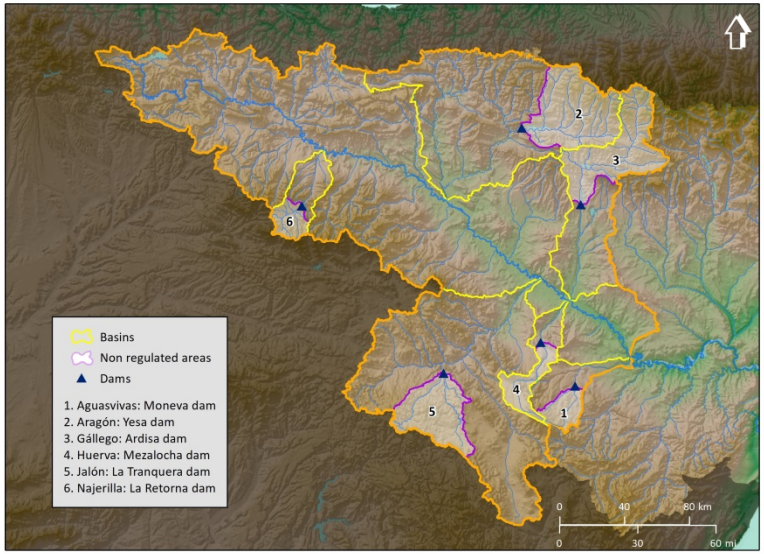
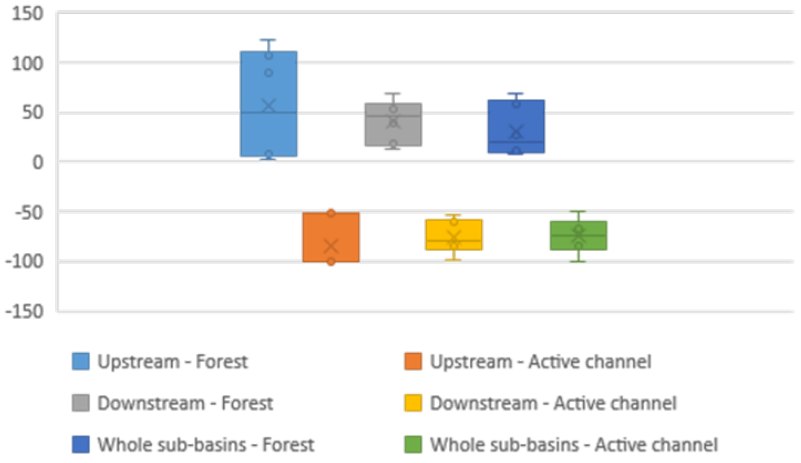
RESULTS

Percentage of change in relation to the surface in 1957 of forest *vs* active channel in 6 subasins, comparing upstream dams, downstream dams and the whole basin







% of change of each category

	Forest	Active channel
Non regulated	56.33	-83.88
Regulated	40.53	-79.12
Whole basin	30.94	-74.28

NEXT STEPS:

Next months we will continue with the analysis of other impacts

Thank you very much for your attention!

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