



**IH cantabria**  
INSTITUTO DE HIDRÁULICA AMBIENTAL  
UNIVERSIDAD DE CANTABRIA

IH cantabria

**Copernicus Tools for Monitoring Global Change  
Effects in Rivers and Riparian Zones  
(Cop.RIVER)**

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**Deliverable 6: National meetings (Spain)**

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## 1 BACKGROUND

Cop.RIVER aims to promote the use of Earth Observation (EO) in applications and services related to the ecological status of riverscapes (*i.e.*, rivers and their associated alluvial plains, floodplains and riparian forests). The action will strengthen the Copernicus user uptake by supporting regional and national authorities in the implementation of the EU Biodiversity Strategy to 2020, the Habitats and Birds Directives and the Water Framework Directive by applying GAP analysis, to complement available Copernicus information on the state and characteristics of rivers and riparian zones.

## 2 NATIONAL LEVEL MEETINGS

After identifying key agents for the co-design of relevant methodologies and products to be developed in Cop.RIVER, we held four national-level meetings with the following agents of interest:

- The General Directorate for Biodiversity, Forests and Desertification (terrestrial domain), a governing institution of the Spanish Ministry for the Ecological Transition and the Demographic Challenge (MITECO).
- The Cantabrian Hydrographic Confederation (terrestrial and aquatic domains), MITECO
- The National Parks Autonomous Agency
- The TRAGSA Group (terrestrial and aquatic domains), a company owned by the Spanish State General Administration, the Autonomous Communities and Municipalities.

These meetings allowed us to exchange key information for the development of Cop.RIVER and to identify potential limitations in the selected indicators and proposed methodologies.

### 2.1 Meeting with the General Directorate of Forests and Biodiversity

The General Directorate of Forestry and Biodiversity is one of four directorates under the General Department of Rural Development, Livestock, Fisheries, and Food. This directorate is responsible for overseeing the management of public utility forests, biodiversity monitoring (with a particular focus on protected species), fire prevention, and the regulation of energy and fishing activities.

The meeting, held on November 2023 at IHCantabria in Santander (Spain), was attended by a total of seven participants. Five attendees were from IHCantabria, while two were representatives of the General Directorate of Forestry and Biodiversity.

The meeting focused on presenting the progress made by IHCantabria in integrating forestry and remote sensing methodologies for the evaluation and monitoring of forests and other terrestrial ecosystems. The aim of this meeting was to demonstrate the utility of these approaches and discuss future developments to address specific operational needs.

#### 2.1.1 Topics discussed

The meeting addressed two primary subjects. First, the characterization of vegetation structure was demonstrated using LiDAR data and Sentinel-derived indices, in conjunction with ground-based

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training points, focused on developing a fuel model for fire prevention. Second, advancements in the assessment of forest habitat conservation status were discussed, focusing on the application of remote sensing techniques and spatial modelling to meet the reporting requirements of the Habitats Directive.

Lastly, future developments and improvements in these topics were discussed with the aim of refining these methodologies based on remote sensing data and techniques. These improvements will allow to enhance the quality and applicability of the resulting products in the near future, mainly related to the monitoring and reporting processes of forests conservation status.

For future developments in the methodology for identifying vegetation structural typologies, it was proposed to enhance the quality of in situ data. Additionally, there was a suggestion to incorporate new components into the model, such as moisture levels and the inclusion of meteorological variables.

For the calculation of forest conservation status, the need for improvement through validation with *in situ* data was highlighted. Additionally, potential enhancements to the methodology were discussed, including increased specificity of forest species composition and the integration of more detailed dendrometry data. The possibility of extending the conservation status assessment to a broader scope was also considered.

## 2.2 Meeting with the National Parks Autonomous Agency

The National Parks Autonomous Agency is an autonomous body aimed to for the conservation of the integrity of natural values and landscapes and to strengthen the link between nature and society, through actions that promote the generation of knowledge, the use and sustainable development of natural areas.

Among the functions attributed to The National Parks Autonomous Agency are:

- To elaborate the Management Plan of the National Parks Network and its revisions, including the guidelines and common criteria for the management of the national parks.
- To monitor and evaluate the fulfilment and degree of achievement of the National Parks Network objectives (functional, ecological and socioeconomic).
- To contribute to the improvement of scientific knowledge and research in National Parks.

The meeting, held in January 2024 at the National Parks Autonomous Agency Office in Madrid (Spain), was attended by a total of four participants; two were from IHCantabria and two were representatives of the National Parks Autonomous Agency Office.

### 2.2.1 Topics discussed

The Agency's needs were identified in the framework of the “Plan de Seguimiento y Evaluación de la Red de Parques Nacionales” ([https://www.miteco.gob.es/content/dam/miteco/es/parques-nacionales-oapn/planes-y-estrategias/plan-seguimiento\\_tcm30-59978.pdf](https://www.miteco.gob.es/content/dam/miteco/es/parques-nacionales-oapn/planes-y-estrategias/plan-seguimiento_tcm30-59978.pdf)). The OAPN is already using remote sensing products such as NDVI to evaluate the primary production of terrestrial

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vegetation or LIDAR for the evaluation of the phytosanitary status of forest stands, however it does not use any product specifically associated with fluvial watercourses. The possibility of using COPERNICUS products such as Riparian Zones and the more specific products developed by IHCantabria using SENTINEL for habitat mapping in the Picos de Europa NP environment was reported. The latter product attracted the attention of the technicians because of its potential for mapping riparian habitats in the entire Spanish NP network.

IHCantabria will maintain the contact with the Agency to inform it about the development in Cop.RIVER products and get its feedback.

### 2.3 Meeting with the TRAGSA Group

The TRAGSA Group is a company owned by the Spanish State General Administration with the aim of providing the services required in the environmental, rural development and resource and process management fields. TRAGSA develops and execute solutions that contribute to guaranteeing social development and economic and environmental sustainability.

The meeting, held in January 2024 at the TRAGSA Group Office in Madrid (Spain), was attended by a total of seven participants; two were from IHCantabria and five were representatives of the TRAGSA Group.

#### 2.3.1 Topics discussed

The potential use of remote sensing products for water quality developed by IHCantabria and the different COPERNICUS products for the characterization of watercourses and their riparian vegetation were analyzed. TRAGSA's team was interested in the most specific mapping products developed by IHCantabria and the different COPERNICUS products for the characterization of watercourses and their riparian vegetation. The interest due to their wide spatial coverage. Traditionally, water quality is assessed via continuous automatic systems installed in selected fluvial reaches (*e.g.*, Automated Water Quality Information System in Spain) or by collecting *in situ* samples. Similarly, riparian vegetation is mainly characterized by fieldwork. Although some water variables and multiple vegetation variables have to be assessed in the field (*e.g.*, water quality in narrow river reaches or species composition in riparian zones), many other can be more easily measured and monitored in time using remote sensing data and products (*e.g.*, forest cover and connectivity). Moreover, the continuous spatio-temporal nature of remote sensing data would allow TRAGSA to ease their tasks and improve its capabilities to evaluate ecosystem attributes and conservation status in rivers and riparian zones.

### 2.4 Meeting with the Hydrographic Confederation of the Cantabro

The Hydrographic Confederation of the Cantabro is an autonomous body responsible for the management of the catchment areas of the rivers that flow into the Cantabrian Sea. Among the functions attributed to them are the following:

- The inspection and surveillance of the public water domain and its protection zones.

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- The control of the state and quality of our rivers and groundwater.
- Hydrological planning, which is the main tool for the management of water resources and for achieving the good condition of our rivers and groundwater, following the guidelines of the Water Framework Directive.
- The performance of actions related to flood risk assessment and management, including: flood risk diagnosis work, predictive work in flood and flood situations and work to assist in decision making in coordination with other competent authorities in the adoption of prevention and protection measures.

The meeting, held in April 2024 at the Hydrographic Confederation of the Cantabro Office in Santander (Spain), was attended by a total of 10 participants. Five attendees were from IHCantabria, while five were the director and other representatives of the Hydrographic Confederation of the Cantabro.

In this meeting, the objectives and approach of Cop.RIVER were presented. IHCantabria shared the advances made so far in the project and discussed with the Confederation their role as relevant stakeholders involved in the identification of needs and opportunities in the use of remote sensing tools and Copernicus data and products for the developments of the selected indicators and its applications in the monitoring and reporting processes.

### 2.4.1 Topics discussed

During this meeting, IHCantabria shared the advances made in Cop.RIVER so far: i) the list of variables to characterize riverscape elements (terrestrial and aquatic domains), ii) the identification of remote sensing indicators from a literature review, and iii) the identification of the corresponding methodologies and the suitability analysis of the CLMS products to calculate the remote sensing indicators considered. In addition, IHCantabria presented multiple approaches and products developed to monitor changes in river and floodplain biotic (*i.e.*, vegetation) and hydromorphological attributes and dynamics.

The Cantabrian Hydrographic Confederation was interested in the assessment of terrestrial vegetation associated with the river environment, including the identification of natural habitats and the monitoring of revegetation actions in the context of amelioration or restoration strategies. This institution was particularly interested in several modelling tools developed by IHCantabria that use remote sensing data and products (including Copernicus) to characterize biotic and abiotic elements associated to rivers and the riparian zones.

The first tool aims to improve our capacity to identify the riparian vegetation formations in the region of Cantabria by means of spectrophenology. This technique uses information derived from remote sensors (Sentinel-2) to analyze seasonal patterns in the vegetation (growing seasons, productivity, etc.), facilitating their identification and the monitoring of their ecological and conservation state and dynamics. These techniques also allow to generate a continuous vegetation cartography in space and

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time. Likewise, a methodology has been developed to map channel and bank structures (water, sediment bars, vegetation), quantifying interannual changes in hydromorphology and riparian vegetation and relating these processes to hydrological metrics. Based on this methodology, a mapping of mature and incipient vegetation zones has also been produced, allowing the monitoring of ecological succession in these dynamic river systems.

As the main conclusions of the meeting, the participants highlighted the urgent need to increase the amount and quality of ground data (in temporal and spatial resolution) to validate and improve the accuracy and the outputs of the proposed tools and products.

### **3 ACKNOWLEDGMENTS**

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