



SCIENCE
AND FOREST
TECHNOLOGY
IN CATALONIA





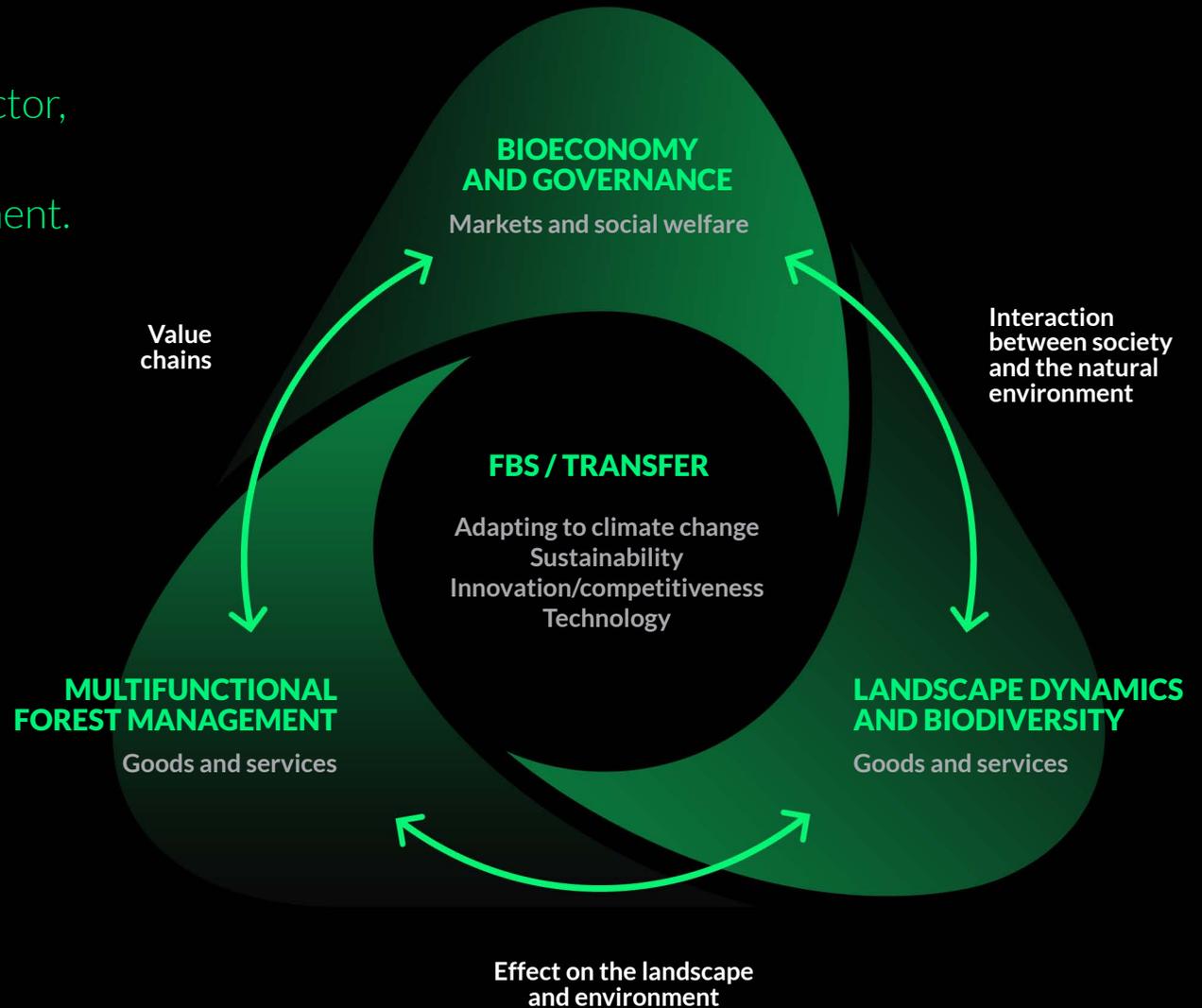
We contribute to the modernisation and competitiveness of the forest sector, rural development and sustainable management of the natural environment.

To achieve this target, we base our work around three different programmes: multifunctional forest management; landscape dynamics and biodiversity; and bioeconomy and governance.

The research carried out in these programmes is based on key concepts, such as: achieving a balance between different environmental functions, adapting to climate change, and the competitiveness of the forest sector throughout its value chain. Part of the activity undertaken in the programmes is transferred via the spin-off company FBS.

CTFC's main research and transfer lines:

- 1 / Forests, water and forest management
- 2 / Natural environment dynamics and biodiversity
- 3 / Forest fires
- 4 / Forest diseases and other disturbances
- 5 / Forest products and bioeconomy





The **Forest Science and Technology Centre of Catalonia (CTFC)**, located in **Solsona (Lleida)**, was first set up by the Solsona County Council and the University of Lleida in 1996. The Provincial Council of Lleida, the Catalan Foundation for Research and Innovation, the Regional Government of Catalonia, the Autonomous University of Barcelona, the Provincial Council of Barcelona, and the Solsona City Hall were subsequently incorporated.

The CTFC is a public consortium associated to the Administration Office of the Regional Government of Catalonia, collaborating with it through the relevant department for forestry matters. It also forms part of the Research Centres of Catalonia (CERCA) group and is accredited as a TECNIO agent by the Regional Government of Catalonia (since CTFC is developer of public technology).

The CTFC has been an Office for Research Results Transfer (OTRI) since 2009 and was a founding member, in 1999, of the GEIE-Forespir (French-Spanish-Andorran economic interest group) which was established to facilitate recovery of forests in the Pyrenees.

CTFC's mission is to contribute to the modernisation and competitiveness of the forest sector, rural development and sustainable management of the natural environment through excellence in research and the transfer of knowledge and technology to the wider public, aiming to become a centre of reference throughout Spain and further afield.



Forest Bioengineering Solutions SA (FBS) was founded in May 2014 as a 'spin-off' company of the CTFC, starting its commercial activity in January 2015.

The aim of FBS is to use the knowledge of the parent company (CTFC) and transfer it to the market in the form of new high-quality products and services, relying on the experience of the CTFC's technical-scientific teams, employing an operational dynamic that is closer to the day-to-day activities of the CTFC.

Its activity is structured along four main lines:

- Laboratory, inspection and diagnostic services
- Advanced technological services of the wood sector
- Development of new products / services / methodologies aimed at the market
- Assessment and consultancy services related to the technical-scientific activity of the CTFC.



The **Catalan Institute of Wood (INCAFUST)** is the CTFC unit that undertakes activities related to the use, transformation and other aspects related to the wood industry.

INCAFUST aims to promote the development and recognition of wood as an efficient material, make it more competitive and promote innovation and increased productivity of the wood sector.

Its aim is to assist the sector's companies, entities and institutions through research, the provision of technological services and the transfer of technology and knowledge. Part of these activities are undertaken through FBS.



01

Multifunctional forest management

Our consideration of multifunctional forest management is based on knowledge and the development of tools that ensure the **ecological, social and economic values** of the forest ecosystems, guaranteeing the sustainable provision of goods and services.

We analyse and evaluate the **modelling of forest dynamics** to promote a **silviculture aimed at adapting to environmental and social changes**, based on knowledge of how forests function. Research and innovation at various scales of **multifunctional forest planning** and the development of agroforestry planning and management support tools are key. We also develop research on the ecology of fire, the **capacity of forest systems to adapt and respond to natural disturbances**, and the prevention of **large forest fires**.



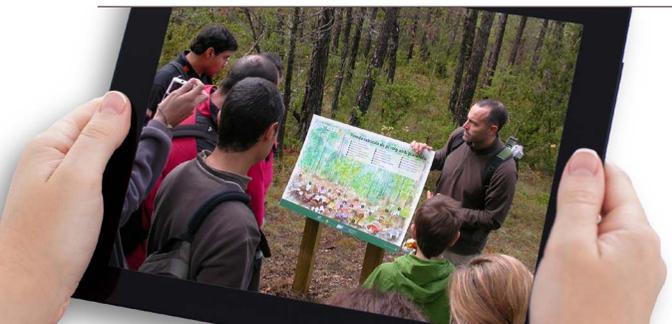
Multifunctional forest management / CTFC

R+D lines and Transfer

- Forest dynamics and global change
- Adaptive silviculture and forest management models
- Multifunctional forest planning and modelling
- Forests and water cycles
- Large fire prevention, fire ecology and forest restoration
- Forest diseases and invasive pathogens
- Forest soils, organic fertilisers and carbon sinks
- Forest management and carbon sequestration
- Forest plantations, agroforestry and silvopastoral systems

Working areas

- / Impacts of climate change and improved resistance of forest systems to various disturbances.
- / Effects of soil use changes in the dynamics and operation of forests
- / Silviculture models and recommendations for forest management and planning, adapted to the current context (natural disturbances, multifunctionality and provision of ecosystemic services)
- / Modelling forest dynamics and operation under different climate conditions and forest management
- / Prevention of large forest fires and integration of fire in forest management and post-fire restoration
- / Development of tools for analysis of the spatial variation and temporal dynamics of the composition and structure of the forest and undergrowth
- / Detection of forest pathogens via innovative techniques
- / Sustainable management of agrosilvopastoral systems and their integration on livestock farms
- / Forest plantations and agroforestry systems of high productive and environmental value
- / Chemistry of organic soil material, humic amendments and fertilisers
- / Land carbon cycle and recovery of carbon stocks in agroforestry systems



Notable PROJECTS

Management strategies for adaption to climate change of mixed sub-humid Mediterranean forests (**MIXForChange**) (**LIFE**)

Innovation in forest restoration techniques (**SUSTAFFOR**) (**SME-FP7**)

Response strategies of woody Mediterranean systems to natural or anthropic disturbances (**EST_RES**) (**AEI**)

Climate change and adaptation of Pyrenean forests (**CANOPEE**) (**Interreg POCTEFA**)

Innovation and improved competitiveness in the production and use of the stone pine tree (*Pinus pinea*) (**Quality_PINEA**) (**Interreg POCTEFA**)

Carbon stock in Spanish soils: response to climate change and changing soil use (**CARBOSOL**) (**AEI**)

Modelling of water use and the resistance of plants to drought at different time scales (**DRESS**) (**AEI**)



02

Landscape dynamics and biodiversity

This programme studies the **landscape** created by the relationship between **ecosystems** and **society**. Analysis of different drivers on natural ecosystems and the goods and services that they provide is crucial for ensuring the persistence of the ecosystems and the future provision of the associated goods and services.

Our work is based on the **ecology of landscapes** and **biodiversity**, an **analysis of fires and other disturbances, mosaic landscapes** (agroforestry systems or transitions between urban-suburban-rural areas) and the **development of innovative forest planning** and decision-making tools.

Innovative forest planning on the forest/landscape/region level and the development of decision-making support tools are key for analysing landscape dynamics and biodiversity, as well as for evaluating and selecting the management policies to implement in a given territory.



Landscape dynamics and biodiversity / CTFC

R+D lines and Transfer

- Diagnosis of natural environment dynamics
- Risk and impact analysis of global change
- Model ecosystem services and the ways in which they interact
- Fluvial dynamics: interactions between water and sediment at different spatial and temporal scales
- Development of management measures and landscape/regional adaptation
- Conservation planning
- Methods and tools for multi-objective forest planning at a landscape/region level
- Decision-making support tools in a context of global change

Working areas

- / Study the biology, ecology and conservation of species
- / Planning and management tools for biodiversity conservation
- / Ecosystem management models using multi-scale approaches, optimisation methods and decision-making support systems
- / Landscape ecology
- / Bioindicators used for evaluating ecosystem conservation levels
- / Integration of biodiversity conservation measures, use of natural resources and social perception
- / Restoration of forest and fluvial habitats
- / Use of drones for biodiversity purposes and forest applications
- / Tools for simulation the evolution of forests and their ecosystemic services under different forest management regimes and climate conditions
- / Fire simulation tools, helping to prevent their impact and to develop fire prevention plans

Notable PROJECTS

Riverside forest. Conservation, restoration and environmental awareness-raising activities of riverside spaces **(ALNUS) (LIFE)**

Integration of drone technologies in biodiversity and forest applications **(InForest JRU) (CTFC-CREAF)**

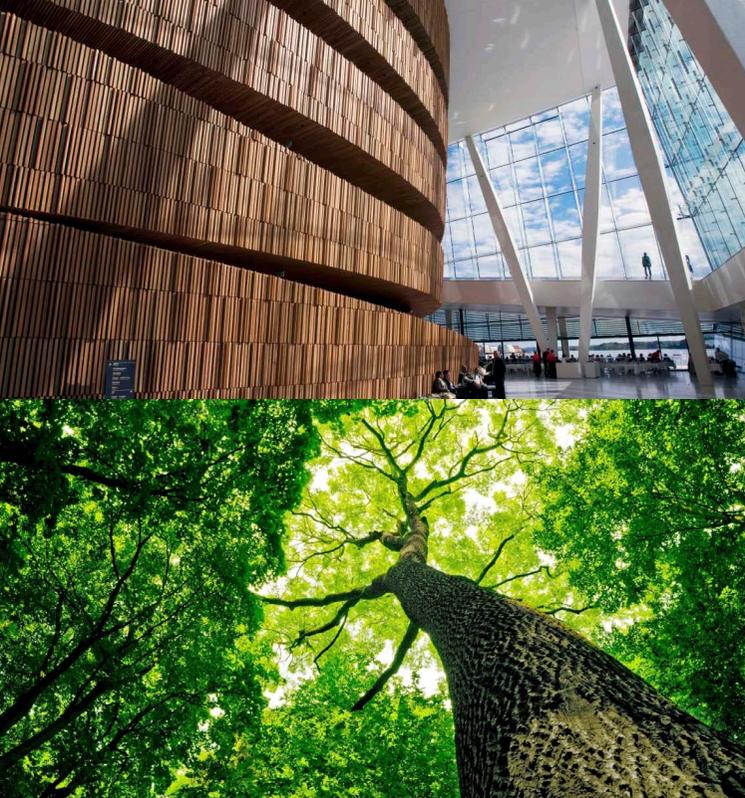
Silviculture and multi-objective decision-making support tools and models knowledge exchange in a context of global change **(SuFoRun) (H2020 MSCA-RISE)**

New precision tools for forest decision-making **(PrecFOR)**

Cross-border management network of flows and water, carbon and energy reserves in agricultural and pastoral ecosystems in the Pyrenees in a context of global change and changing soil use **(FLUXPYR) (Interreg POCTEFA)**

Natura 2000 network strategies for adapting to climate change **(AdaptaNatura 2000) (Fundación Biodiversidad)**

From biodiversity data to decision-making: improving the natural value through regional development policies **(BIDREX) (Interreg Europe)**



03

Bioeconomy and governance

The study and promotion of the **bioeconomy** is closely related to the research, innovation and the competitiveness of **value chains**, mitigation of climate change and economic and social development in **rural areas**.

The demand and markets for emerging products requires the establishment of new processes and **bioproducts** (cross-laminated wood, proximity biomass circuits, truffles, mushrooms, cork, aromatic and medicinal plants, etc.), aiming to fit the bioeconomy into the **circular economy** and promote new policies.



Bioeconomy and governance / CTFC

R+D lines and Transfer

- Value chain of forest, wood and non-wood products
- Bioenergy and agroforest bioproducts
- Forest economy
- Policy and governance
- Ecosystemic services and payment for environmental services
- Forest diseases and pests and their impact on value chains

Working areas

- / Forest use and wood products
- / Wood, derived technological products and their application in construction
- / Non-wood forest products: mushrooms, truffles, cork, aromatic and medicinal plants, forest fruits, pine nuts, etc.
- / Territorial analysis and data base management
- / Risk governance
- / Strategic forest planning
- / Cost-benefit analysis
- / Evaluation of externalities and political instruments
- / Economic evaluation of environmental projects
- / Design and evaluation of governance instruments



Notable PROJECTS

Catalan Forest Observatory (OFC)

Analysis, management recommendations and network collaboration on risks in European forests in a context of climate change (**NetRiskWork (European Union Humanitarian Aid and Civil Protection)**)

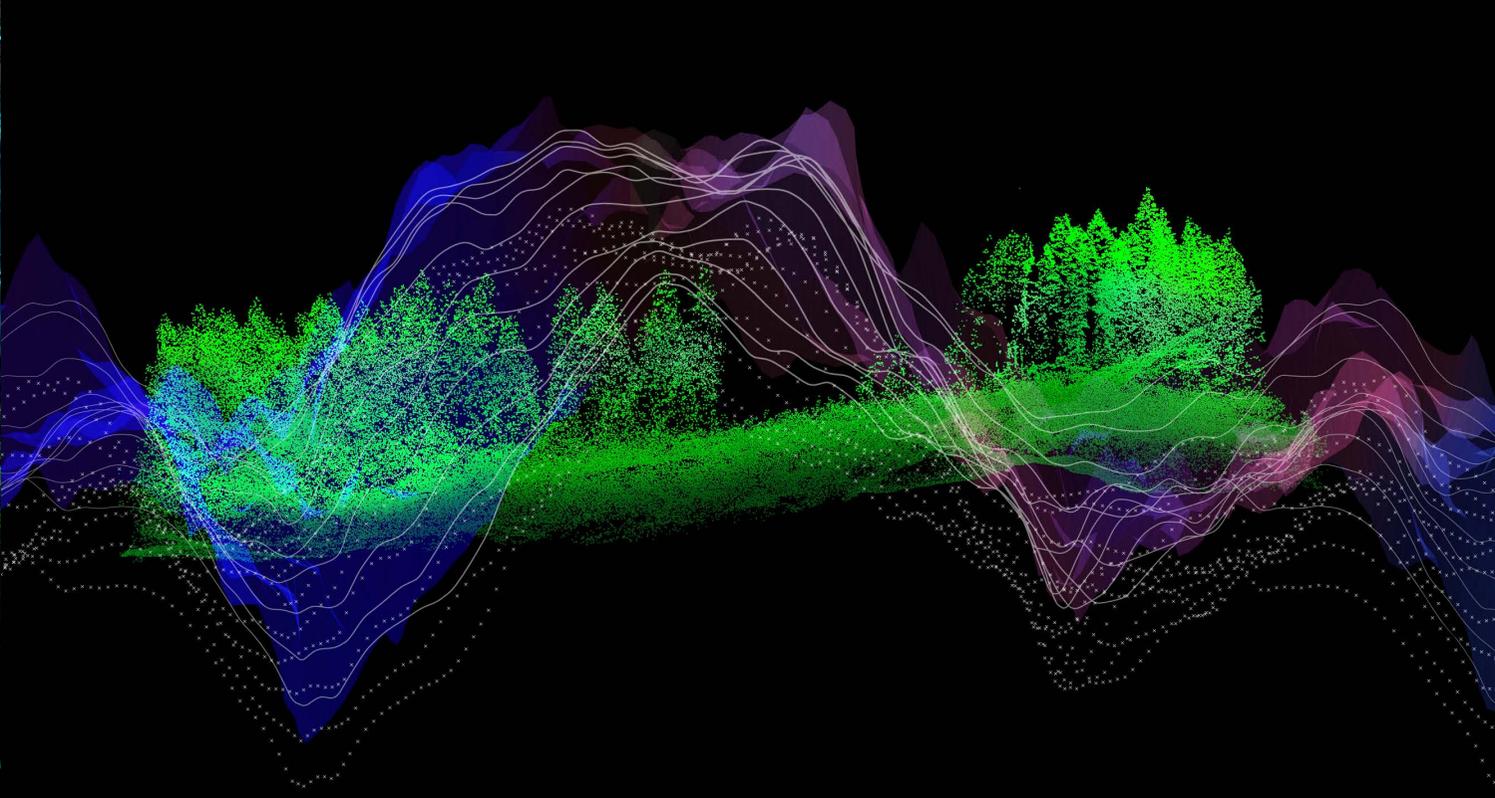
Sustainable regional bioenergy policies (**BIO4ECO (Interreg Europe)**)

Innovation in the mobilisation and transformation of wood in the Pyrenees (**iforWood (Interreg POCTEFA)**)

Assessment of aromatic and medicinal plants (**ValuePAM (Interreg Sudoe)**)

Social innovation in rural areas to encourage territorial development and exploit synergies between different local agents (**SIMRA (H2020)**)

Innovation networks for cork, resins and consumable forest products in the Mediterranean Basin. How non-wood forest products (NWFP) can play a relevant supporting role in forest management and rural development (**INCREDIBLE (H2020)**)



04

FBS / Transfer

Part of the activity carried out in the CTFC is transferred via the 'spin-off' company **FBS**, responsible for assessing the **CTFC**'s knowledge and making it known to the market, in the form of new high-quality products and services related to the experience of the technical-scientific teams of CTFC.





FBS / Transfer / CTFC

Main activity lines

- **Technological services in the study of soils/ fertilisers, biofuels, truffle production, and construction using wood**
 - Private assignments
 - Participation in projects
- **Technological consultancy**
- **R+D and innovation of products**
- **Evaluation of the CTFC portfolio of IPR products**

Working areas

1. Analysis Laboratory Area

- / Characterisation of agroforestry-based biofuels
- / Analysis and characterisation of soils, mineral fertilisers, organic solid fertilisers (peats and composts), and organic liquid fertilisers (liquid humus and biostimulants)
- / Evaluation of mycorrhizal plants: quality control for black truffle production

- / Quality control and characterisation of structural elements and wood derivatives (pavements, planks, packaging, etc.)
- / Identification of species, determination of the physical and mechanical properties of the wood and its derivatives

2. Services/Technological consultancy

- / Comprehensive management of reforestation/afforestation, agroforestry systems and productive forest plantations (high-quality wood, pine nuts of *Pinus pinea*, etc)
- / In-factory inspection and auditing for the DIN Plus certification (DINCERTCO) to produce pellets and other agroforestry-based biofuels
- / Inspection and auditing for the DBOSQ certification to produce forest wood chips
- / INCAFUST Advanced Technological Services (Inspection and diagnosis of wood elements and structures, training and technological diffusion)

3. R+D and Innovation of Products

- / INCAFUST: architectural construction and wood technology
- / Truffle cultivation training
- / Development and characterisation of new fertilisers / plant-based humic amendments as a substitute for fossil-based products
- / Assessment of the suitability of agroforestry-based biofuels for energy recovery processes

Notable PROJECTS

Ecological and management factors that affect truffle production. **Industrial doctorate programme. Regional Government of Catalonia.**

Technological solutions based on wood-derived panels. **Industrial doctorate programme 2015 (AEI).**

EFESC (European Forestry and Environmental Skills Council). The CTFC is a national agency accredited to issue certificates to training centres and examiners. This training and accreditation service is channelled via FBS. The aim is to facilitate the mobility of forest workers within the EU, accrediting and promoting the recognition of national qualifications between member countries.

DUAL training and education programme (in collaboration **with the Ministry of Agriculture, Livestock, Fisheries and Food**).

Innovative Pilot Project (creation of Operative Groups). Innovation in products, processes and marketing to break into the market of local woods with special characteristics of greater added value (coordinated by Forestal de Catalunya, SCCL).

CTFC in numbers

(amounts accumulated since the CTFC was established in 1996)



92 Employees
(as of 31 December 2018)

 46% women

 40% PhD



1227
Local, national and international R+D+i **projects** (84 of which were active in 2018)



775
SCI publications (89 in 2018)



1230
Agreements signed worldwide



550
Articles on projects undertaken



515
Conference presentations and other training activities

CTFC Group income:



* Forecast for 2019



275
Books in which we have collaborated



47
Doctoral theses defended (6 in 2018)



7
Mixed research units (2 JRU, 5 framework agreements)



2
GENCAT -accredited **research groups (SGR)**



>150 company assignments

- 1** 'spin-off' company (FBS)
- 1** patent
- 1** utility model
- 6** registered brands

CTFC around the world

We have participated in more than 200 international projects







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