

La bioeconomía circular: del bosque a la ciudad



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educajcyl.

28 Abril 2021

3.5.2021

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01 El Instituto Forestal Europeo (EFI)

02 Bioeconomía y Economía Circular

03 Bio-productos

Sector textil

04 Bio-ciudades

Construcción en madera

05 Sistemas agroforestales

06 Digitalización forestal

07 Conclusiones



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Sector textil

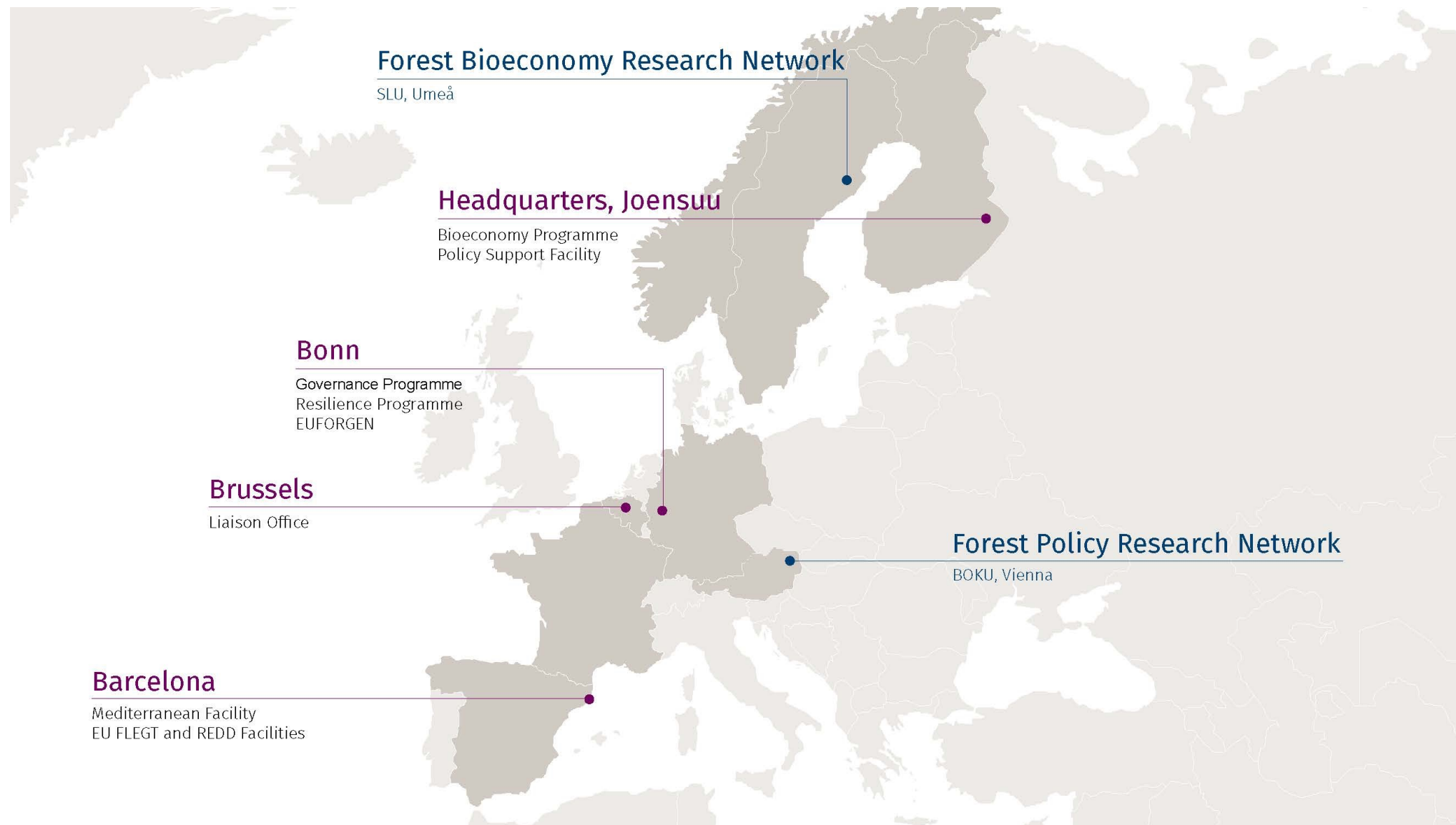
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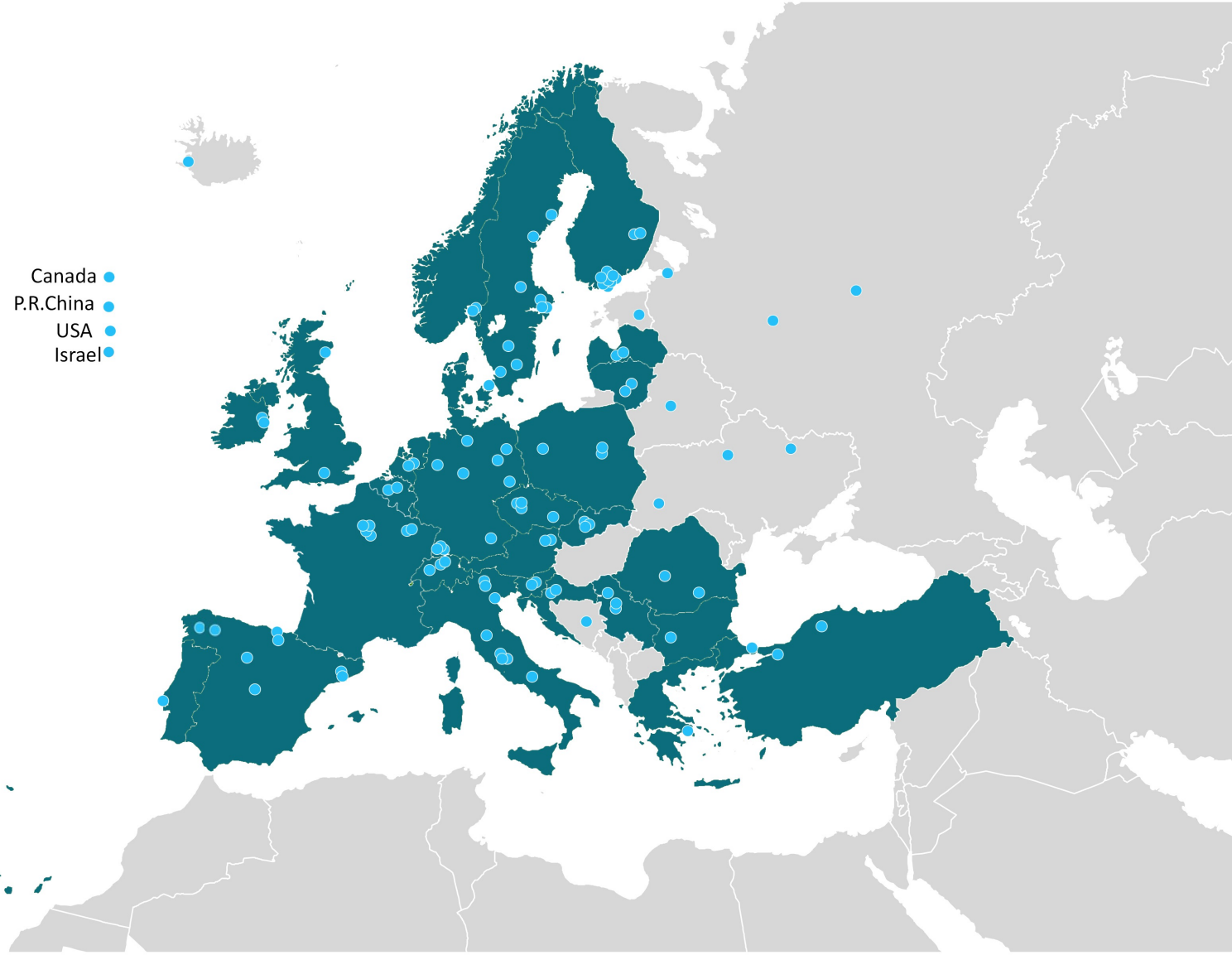
07 Conclusiones



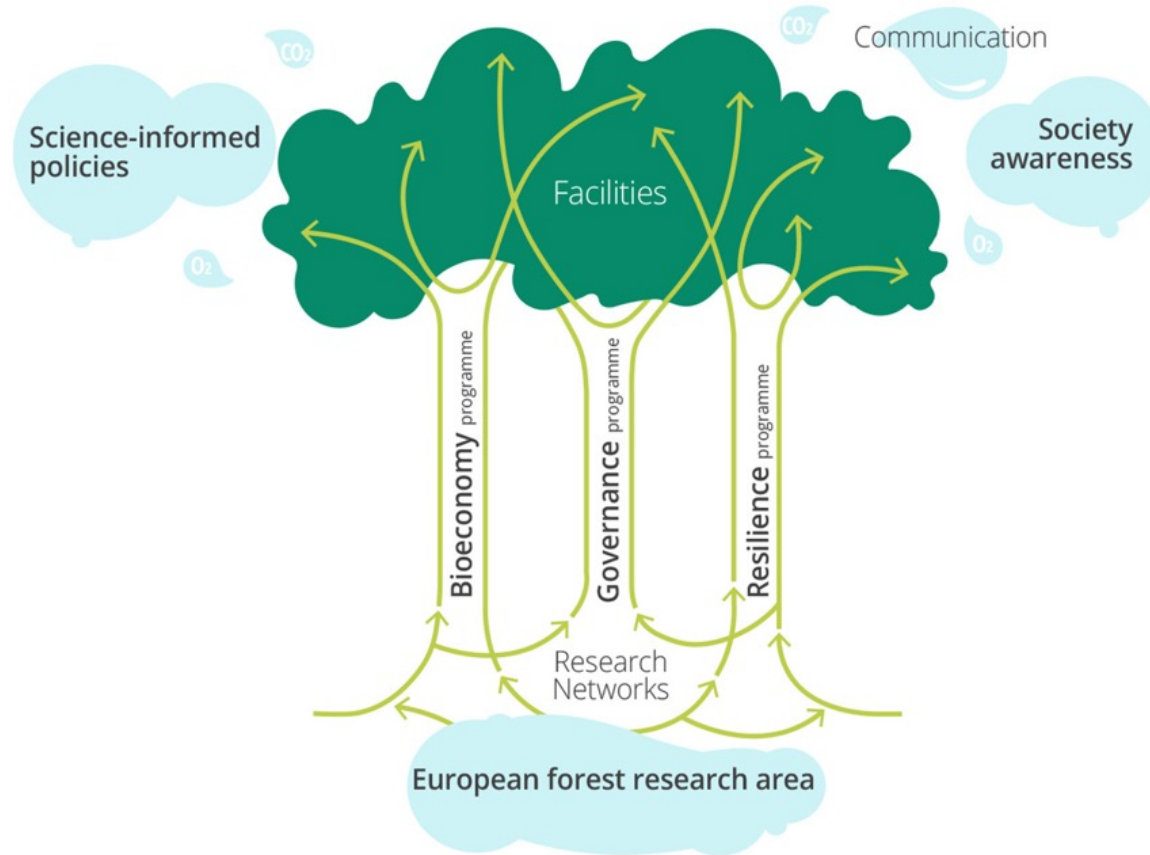
Miembros de EFI

- 28 países han ratificado el Convenio EFI (2005)
- 120 miembros en 38 países
- Instituciones de investigación, industrias propietarias forestales, organizaciones internacionales, arquitectos
- **España (10)**
 - Fundación Centro de Servicios y Promoción Forestal y de su Industria Castilla y León (CESEFOR), Soria
 - University of Valladolid, School of Agriculture, Food Technology and Forestry, Palencia

Canada ●
P.R.China ●
USA ●
Israel ●



EFI Estrategia 2025





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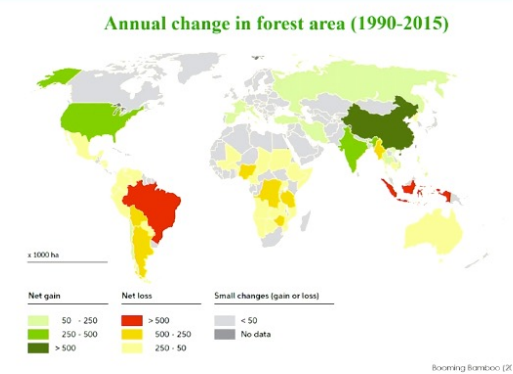
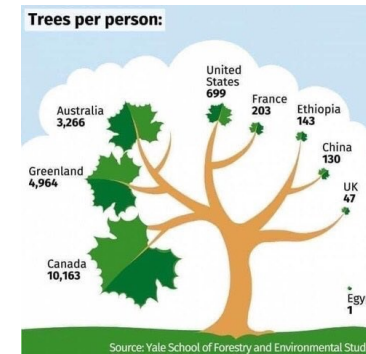
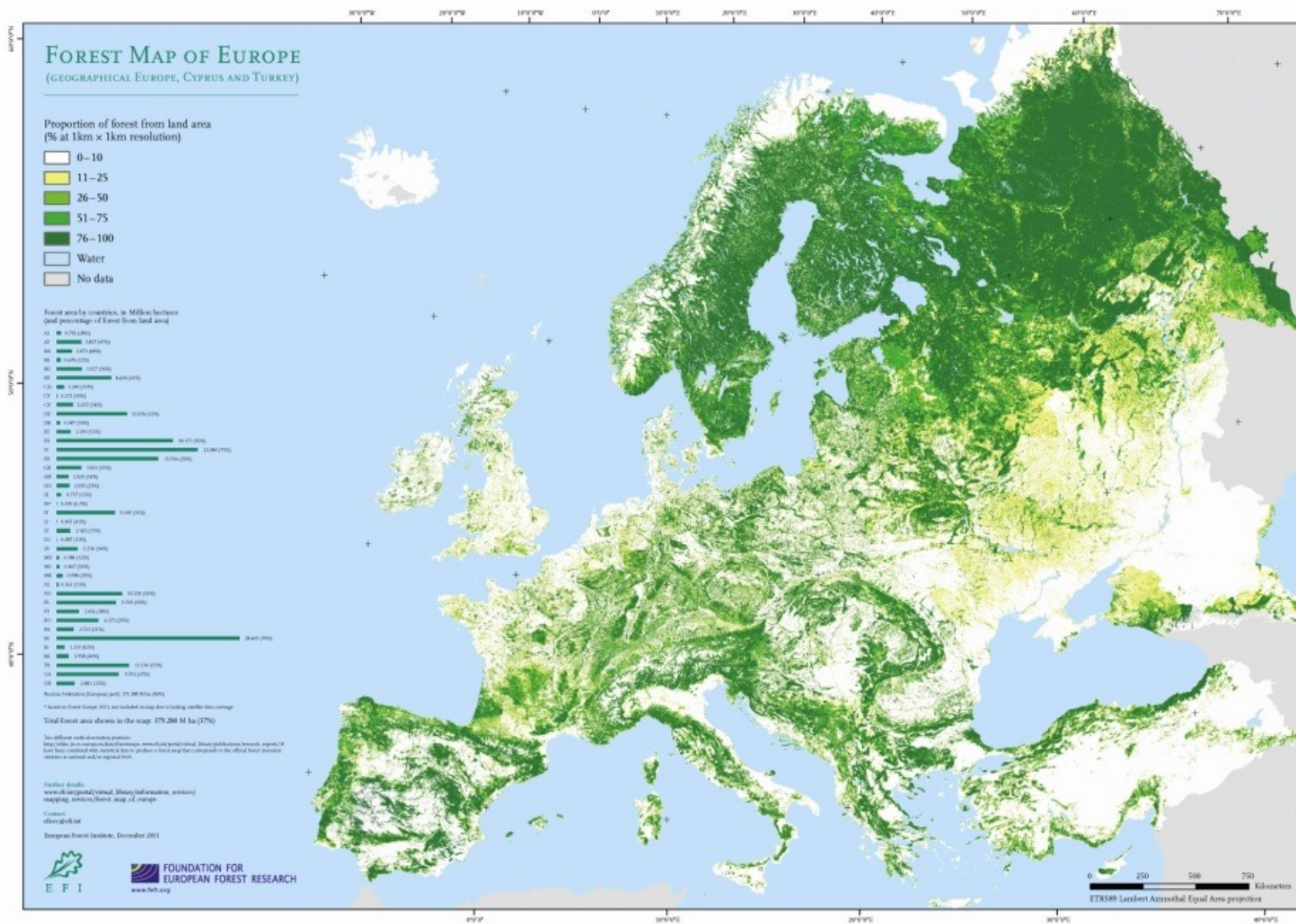
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Bosques en Europa



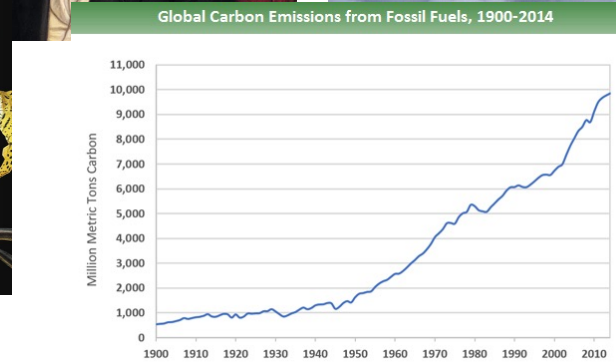
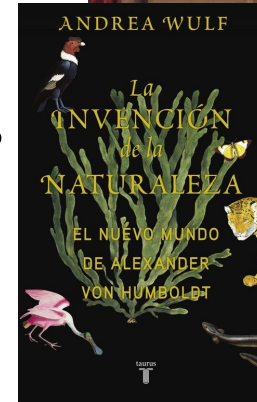
- 182 millones ha = 43% superficie
- Aumento del 9% en 25 años
- 470 millones m3/año madera
- Se corta el 63% del crecimiento annual
- 90% consumo de madera es de origen europeo
- Empleo: 3 millones de personas
- Fijan 13% de las emisiones de CO2 (> sumid terr)
- Principal fuente de recursos renovables no alimentarios
- Clave para la sostenibilidad de biodiversidad, agua y suelo

Cambio climático

- Aumento de la temperatura de mares y océanos
- Incremento del nivel del mar
- Olas de calor más intensas
 - 2015-2018 años más calurosos en 100 años
- Aumento de la duración e intensidad de eventos extremos (tormentas, inundaciones...)
- Mayor frecuencia e intensidad de los incendios forestales (Australia Dic 2019)
- ...

Objetivo: descarbonización

- IPCC > abandono inmediato de los combustibles fósiles
- Bioeconomía & Economía Circular
 - Plantaciones > Gestión Forestal Sostenible



CRISIS CLIMÁTICA >

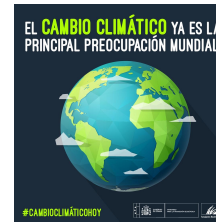
Los gases de efecto invernadero en la atmósfera marcan un nuevo máximo histórico

La Organización Meteorológica Mundial advierte de que la concentración de dióxido de carbono es la más alta desde hace tres millones de años



El Parlamento Europeo declara la emergencia climática

Notas de prensa [SESIÓN PLENARIA](#) [ENVI](#) 28-11-2019 - 12:50



Climate crisis: 11,000 scientists warn of 'untold suffering'

Statement sets out 'vital signs' as indicators of magnitude of the climate emergency
Most countries' climate plans 'totally inadequate' - experts



#nohayplanetaB



US Environmental Protection Agency

3.5.2021 | WWW.EFI.INT

5 prioridades ambientales, 1 solución

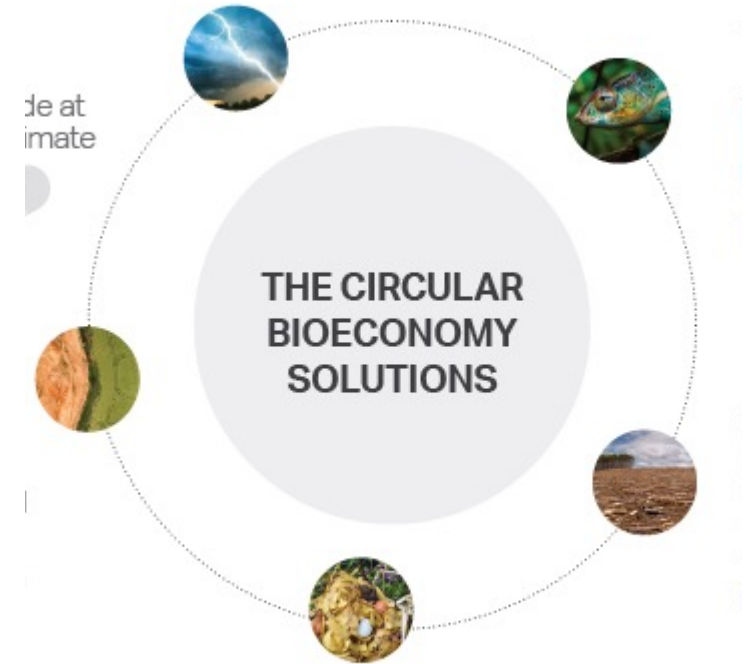
- Cambio climático
- Escasez de recursos (1970 x3)
- Pérdida de alimentos (1/3)
- Pérdida de biodiversidad (x10-100)
- Cambio/degrad de uso del territorio (3.000 mill personas)

2030

+ 50% alimentos
+ 45% energía
+ 30% agua

Objetivo: sociedad innovación y eficiente gestión recursos

- **Seguridad alimentaria**
- **Uso sostenible de recursos naturales en la industria**
- **Asegurar protección ambiental**



WDCSD, 2019. CEO Guide to Circular Economy

Qué es la bioeconomía

- Producción de recursos biológicos renovables y su conversión en productos y servicios de valor: alimento, bio-productos, bio-energía.
- Sectores: Agricultura ✕ Forestal ✕ Pesca ✕ Químico ✕ Biotecnológico ✕ Energético
- Potencial innovador (ciencias de la vida, sociales, tecnología...)

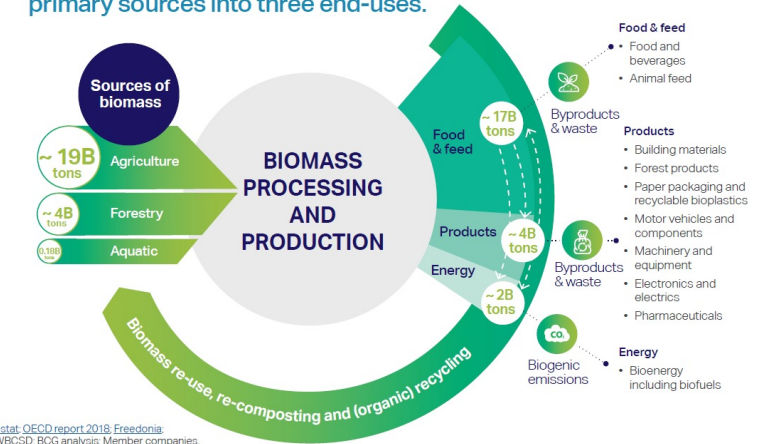


‘La transición de una economía ‘fósil’ a una bioeconomía es una necesidad, no una opción’

THE CIRCULAR BIOECONOMY

THE CIRCULAR BIOECONOMY

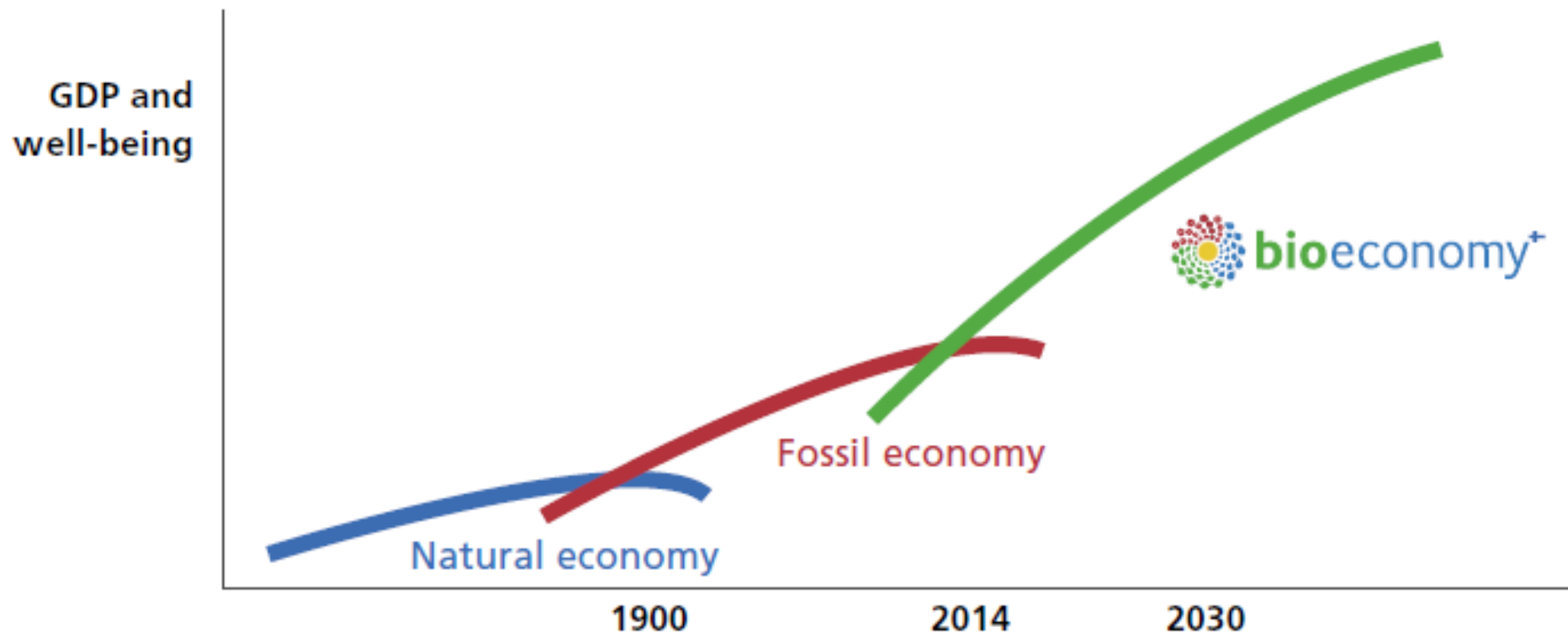
Biomass, the foundation of the bioeconomy, flows from three primary sources into three end-uses.



Source: Eurostat, OECD report 2018, Freedonia, WU Vienna, WBCSD, BCG analysis, Member companies.
CEO GUIDE TO THE CIRCULAR BIOECONOMY



Bioeconomía. Cambio de paradigma.

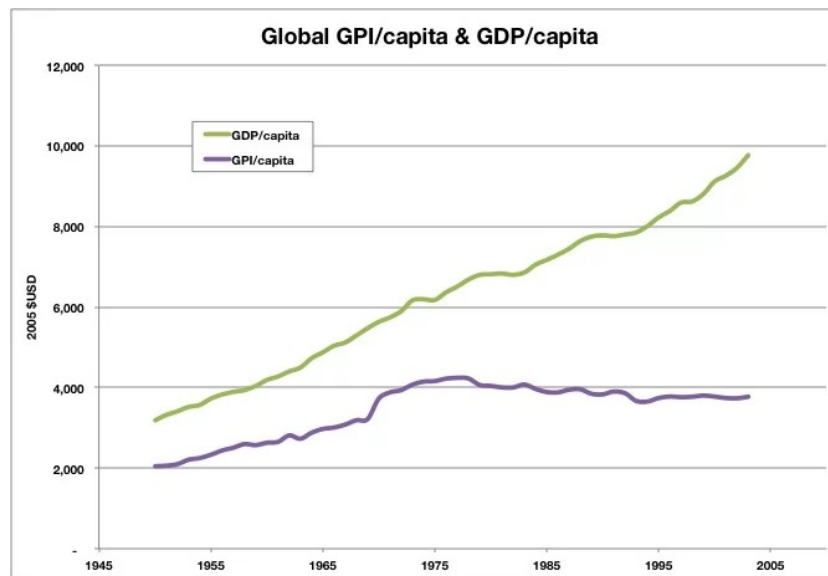


Source: Finnish Ministry of Employment and the Economy

Índice de progreso real/genuine IPG vs PIB

- Incremento real del bienestar económico
- Mejora del bienestar vs costes asociados al crecimiento
- IPG
 - Ayuda planificación a largo plazo, crecimiento sostenible
 - Valor de los servicios sin-Mercado
 - Coste de deterioro de los recursos naturales
 - Externalidades o valores de tiempo libre o trabajo voluntario difícil de cuantificar
- PIB
 - Sólo outputs, no efecto sobre estándares de vida de la sociedad
 - No externalidades negativas (polución, crimen, gentrificación > menor bienestar económico y menor felicidad)

Recomendación: uso complementario de los 2 indicadores

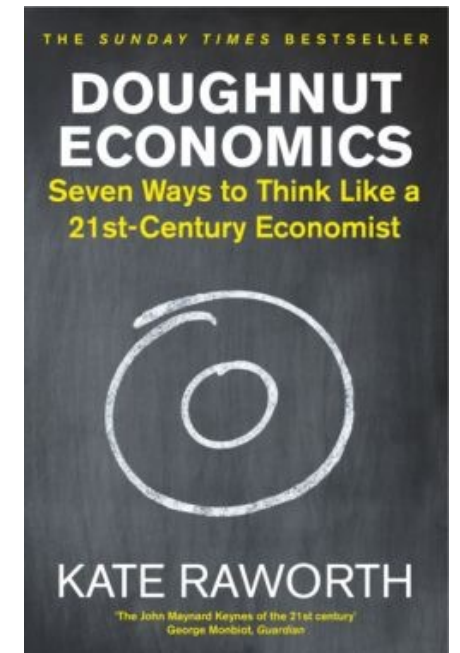
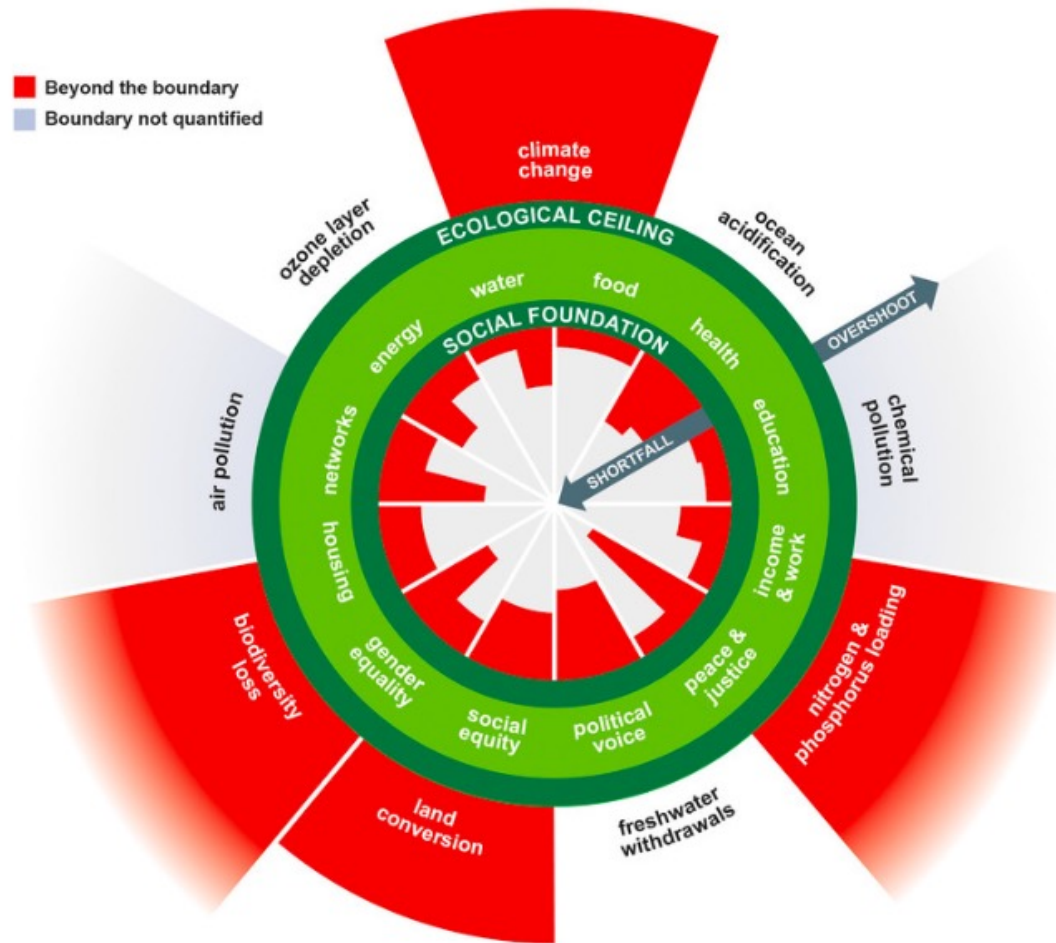


La ONU lanza una herramienta para integrar medio ambiente y economía

Naciones Unidas lanza un nuevo instrumento que permite medir la prosperidad económica y el bienestar humano incluyendo las aportaciones de la naturaleza, pensado para que los Gobiernos puedan integrar el medio ambiente en sus cálculos de crecimiento

Sistema de Contabilidad Ambiental y Económica Integrada

Doughnut economic model

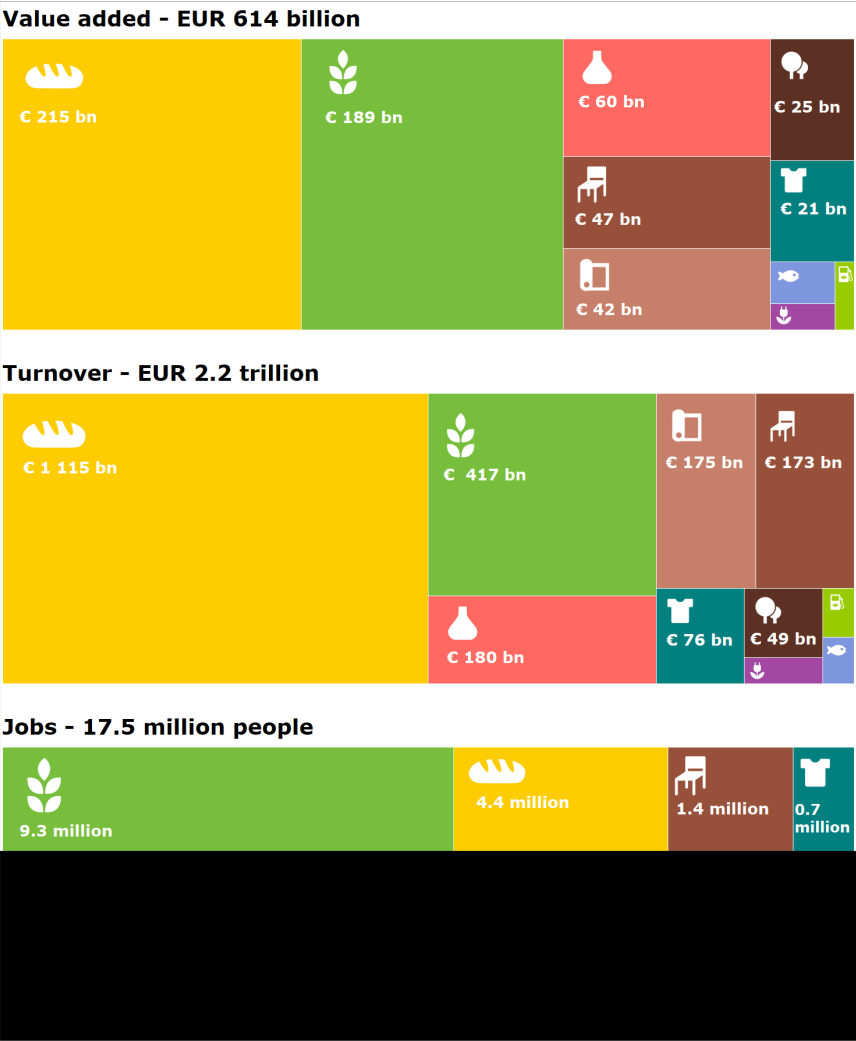


Bioeconomy EU27 2017:

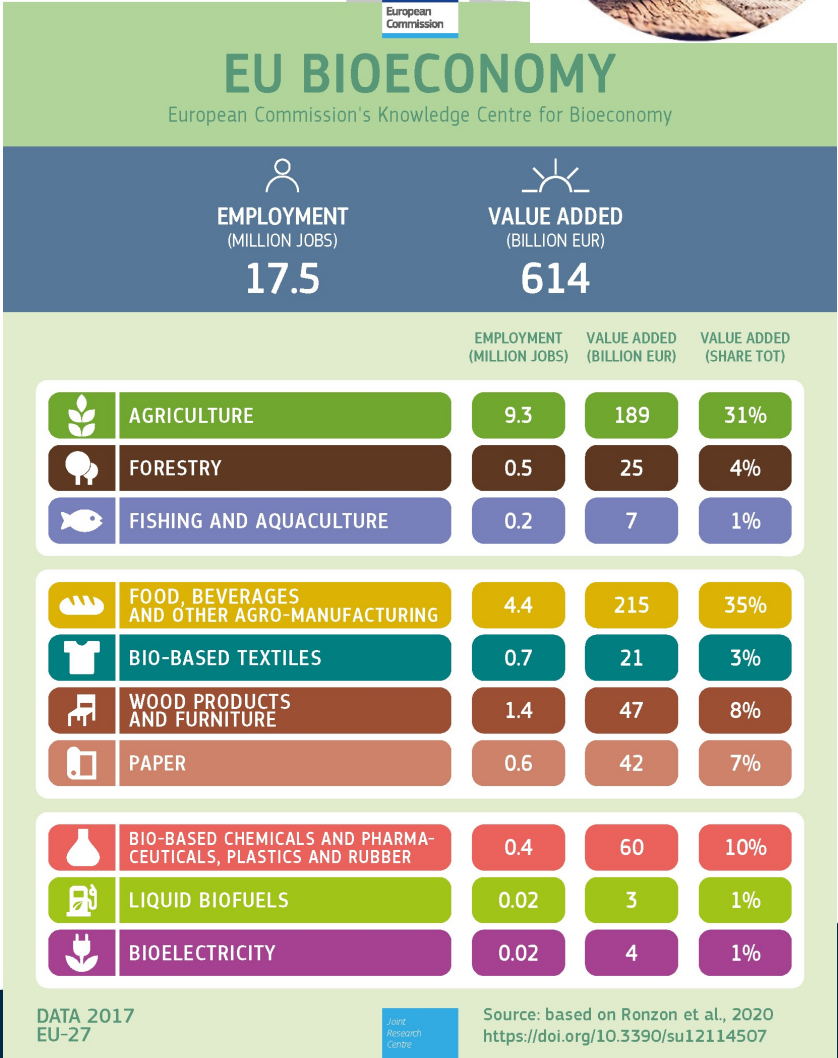
17,5 mill. empleos = 9% total

614 mil mill. valor añadido = 4,7% GDP

bio-based pharmaceutical sector (18%)
agriculture (12%).



Bio-based industries could create up to **1 million jobs by 2030** (industry estimate), in particular in **rural and coastal areas**



Estrategia Europea de Bioeconomía

- Estrategia Europea de la Bioeconomía 2012
- Actualización 2018
 - fomento bioeconomía sostenible
 - Agenda 2030 - ODS y Acuerdo de París
 - bioeconomía circular
 - políticas UE (clima, innovación, agricultura, energía, pesca etc)
- Desarrollo rural

Objetivos:

- Garantizar seguridad alimentaria y nutricional
- Gestionar los recursos naturales de forma sostenible
- Reducir la dependencia de los recursos no-renovables
- Mitigación y adaptación al cambio climático
- Fortalecer la competitividad europea y creación de puestos de trabajo



Líneas de acción

- 1 Fortalecer y escalar los sectores de bioeconomía, fomentar inversiones y mercado
 - Estándars, sellos y mercado de bio-productos
- 2 Fomentar bioeconomías locales en Europa
 - Acciones piloto
 - Apoyar el desarrollo de Estrategias de Bioeconomía nacionales/regionales
 - Promover la educación y formación
- 3 Comprender las fronteras ecológicas de la bioeconomía
 - Conocimiento biodiversidad y ecosistemas
 - Monitorización bioeconomía sostenible
 - Buenas prácticas
 - Fomentar los beneficios de la biodiversidad en la producción primaria (ej. **sistemas agroforestales, agricultura orgánica**)

Estrategias supra-nacionales, nacionales y regionales

- 9 países con estrategia dedicada

Finlandia 2014, Alemania, Italia 2017, Francia 2017, **España 2016**, Irlanda, UK, Austria 2019, Letonia

- 4 países en proceso

Estonia, Hungría, Lituania, Países Bajos

- 7 países bajo estrategia supranacional BIOEAST

Bulgaria, Croacia, República Checa, Polonia, Rumanía, Eslovaquia, Eslovenia

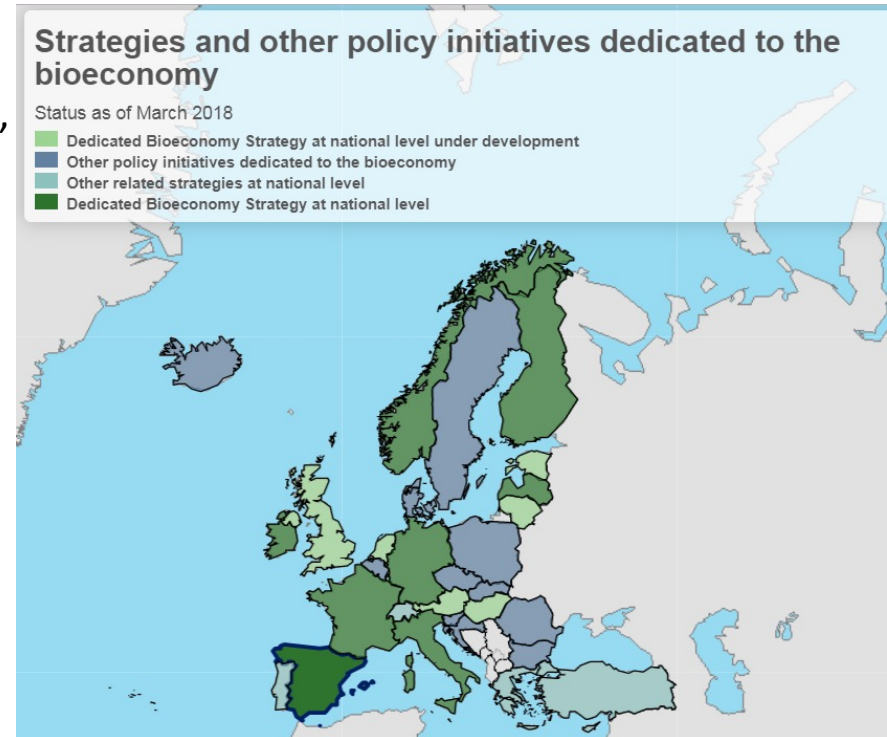
- 2 países bajo estrategia supranacional del Báltico EUSBSR

Dinamarca, Suecia, Letonia, Polonia, Estonia, Finlandia, Alemania, Lituania

- 6 Otras estrategias/iniciativas

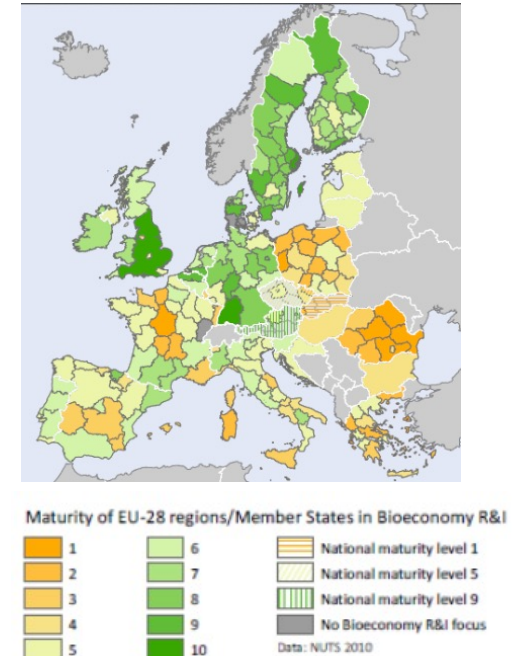
Bélgica, Chipre, Grecia, Luxemburgo, Malta, Portugal

Fuente: European Commission's Knowledge Centre for Bioeconomy



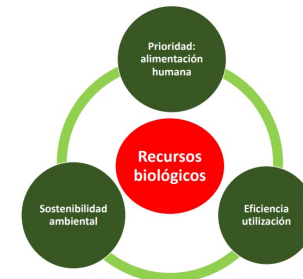
- Planes de acción anuales
- Recursos principales

50 regiones
estrategia de/incl
bioeconomía



Fuente: Spatial Foresight, SWECO, ÖIR, t33, Nordregio, Berman Group, Infyde (2017): Bioeconomy development in EU regions. Mapping of EU Member States'/regions' Research and Innovation plans & Strategies for Smart Specialisation (RIS3) on Bioeconomy for 2014-2020.

Estrategia Española de Bioeconomía



Observatorio Español de Bioeconomía
Planes Anuales de Actuación

2016

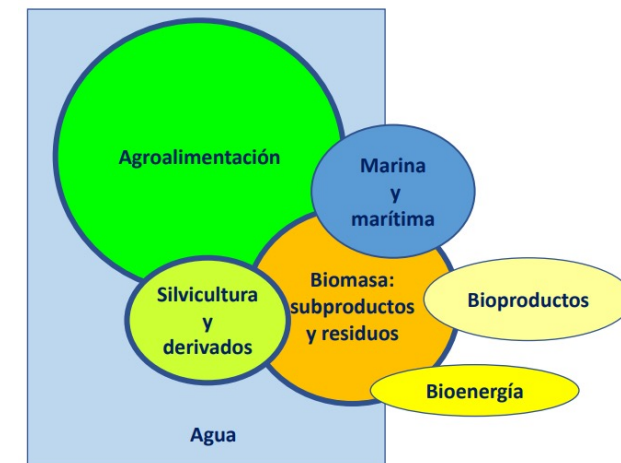


Sectores

- Agroalimentario
- Forestal
 - Madera, corcho, resina, papel, bioproductos
 - Bioenergía
 - Servicios ecosistémicos: productos no madereros, turismo, recreo
- Pesca

Objetivo 2030

- Empresas innovadores, competitivos y eficientes
- Economía diversificada y sostenible
- Recursos biológicos + valorización residuos agrícolas y urbanos + sub-productos >> biomateriales y bioenergía



Estrategias regionales

- Estrategia Economía Verde Ciudadana Extremadura 2030
- Estrategia de Impulso a la Economía Verde y a la Economía Circular de Cataluña
- Estrategia Andaluza de Bioeconomía Circular
- Agenda de Impulso a la Industria Forestal - Galicia (sept 2019)
- Alianza Vasca para la Bioeconomía
- Estrategia Gallega de Economía Circular (dic 2019)
- Estrategia Bioeconomía Agroalimentaria CyL (no incluye sector forestal)
- Estrategia Economía Circular País Vasco
- ...



Galicia (Sept 2019)



AXENDA DE IMPULSO DA INDUSTRIA FORESTAL

Nace para identificar accións que contribúan á **xeración de maior VALOR** na cadea monte-industria

Enfoque

A industria forestal como elemento central de **impulso á BIOECONOMÍA**, dando resposta ás necesidades da sociedade

En liña con

- ✓ Os obxectivos de **desenvolvemento sustentable**
- ✓ As **estratexias europeas de INNOVACIÓN**

A madeira e os produtos forestais como elemento central de **impulso á bioeconomía**

Economía Circular

- 2050 población mundial 9 000 millones de personas
- Se necesitará x3 más recursos que los usados en la actualidad
- El 80% es de un solo uso

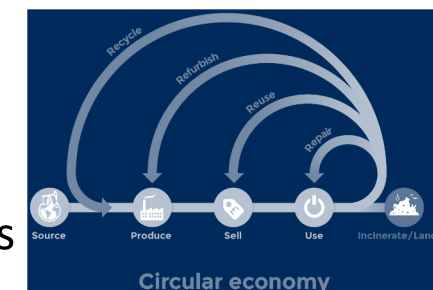
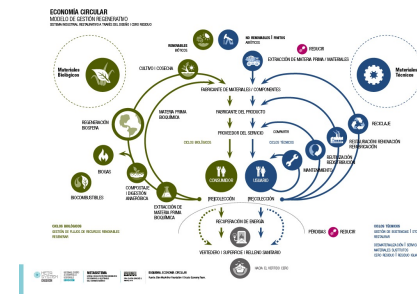
necesidad de contar con una **alternativa** al modelo actual de extraer-usar-tirar
la solución: «economía circular»

todo lo que se ha considerado tradicionalmente como **desechos** puede transformarse en un **recurso**

- cambio de mentalidad: legislación, inversiones, investigación, empresas, consumidores
- gestión más eficiente de todos los recursos a lo largo de su ciclo vital
- **Uso en cascada: reutilización, reparación, renovación o reciclaje** de materiales y productos



«La economía circular será el gran reto de innovación durante los próximos decenios»
 (Janez Potocnik)
 Presidente de EFI ThinkForest



La economía del plástico

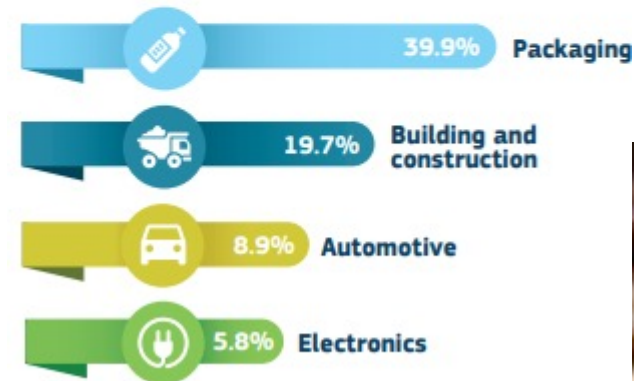
- En 50 años (1960) ha aumentado 20 veces.
- Producción global de plásticos: 322 Mt/año (2015)
 - Europa 49 Mt >> 26 Mt/año residuos
 - 40% embalaje / 20% construcción
- Resulta en
 - 390 Mt CO2 y
 - 8 Mt de plásticos al océano cada año
 - =700 kg/s = 1 camión/min
 - microplásticos: aire, cadena alimenticia

En 2050, demanda de plásticos 400% mayor:

- 20% de consumo de petróleo
- 15% de emisiones de CO2
- Más plástico que peces en los océanos



49 million tonnes



EU-28, Norway and Switzerland - Source: Plastics Europe (2016)

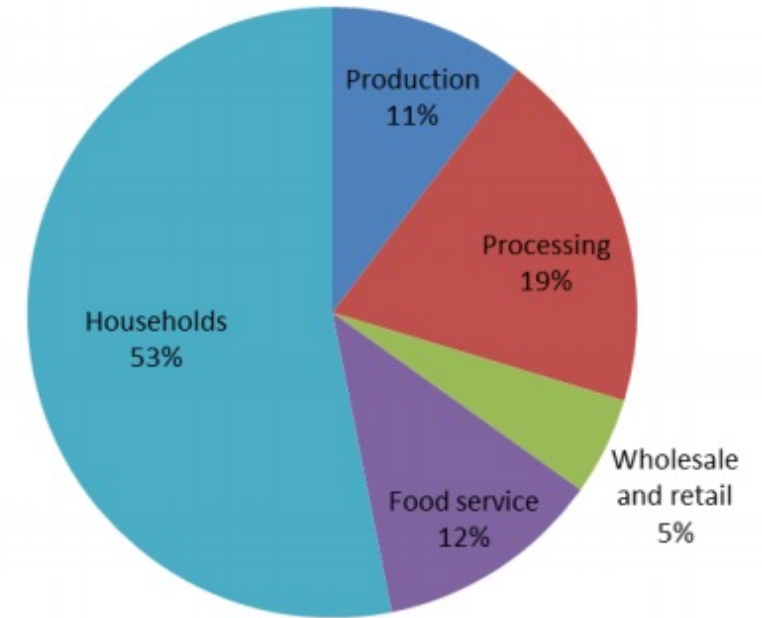


Estrategia Europea sobre plásticos en una Economía Circular

- La primera de EU que se centra en el ciclo de vida de un material específico para integrar diseño, uso, reuso y reciclaje en las cadenas de valor
- 2021 eliminación de plásticos de un solo uso
- 2030 todo el plástico en el mercado europeo es reutilizado o reciclable
- Cambio de patrones de consumo de los ciudadanos!
 - Product Environmental Footprint (PEF)
 - Organisation Environmental Footprint (OEF)

Desperdicios de comida

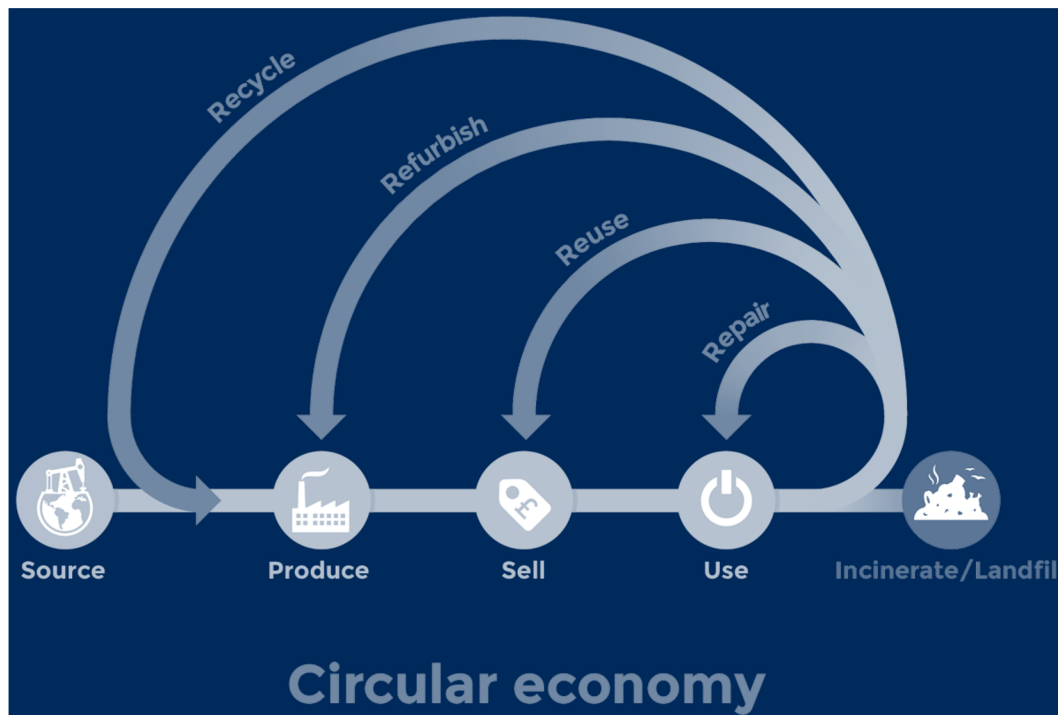
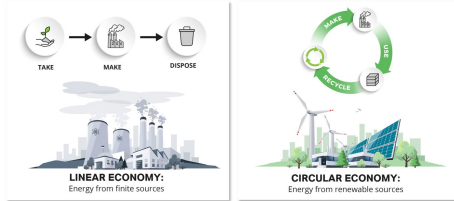
- UE 88 millones toneladas desperdicios/año
 - = 20% de toda la comida producida UE
 - = 143 mil mill € pérdidas
 - = 6% emisiones GEI
 - = 173 kg/persona
 - 50% en casa
- Deterioro ambiental
- Reducción desperdicios > ODS
 - Reducción de emisiones C
 - Redistribución de la comida, reducción hambre y malnutrición (43 mill UE problemas/2días)
 - Ahorro dinero agricultores, empresas y doméstico
- **Valorización** comida sin mercado consumo humano > animales / bioproductos



*Source: FUSIONS project, 2016
(based on 2012 data)*

Potencial de la economía circular

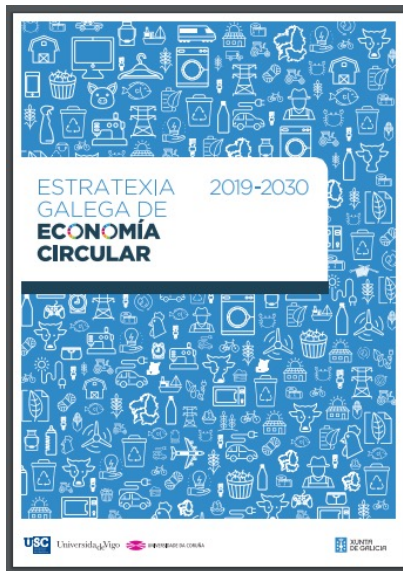
A CIRCULAR ECONOMY AIMS TO DECOUPLE VALUE CREATION FROM THE USE OF LIMITED RESOURCES



- Conversión de los sectores **alimentario, movilidad y construcción** podría suponer una reducción de gases de efecto invernadero de (vs 2012):
 - **48% 2030**
 - **83% 2050**

España Circular 2030

- La Estrategia Española de Economía Circular aprobada junio 2020
- marca objetivos para esta década que permitirán reducir en un 30% el consumo nacional de materiales y recortar un 15% la generación de residuos respecto a 2010
- Planes de acción trienales



La Estrategia Gallega de [#Economíacircular](#) publicada a finales 2019

Pacto Verde (Green Deal) UE

Ursula von der Leyen, CE (Diciembre 2019)

- Europa lanza (COP25) el nuevo Acuerdo Verde para implementar la **estrategia de bioeconomía** basada en la **economía circular**
- Medidas vinculantes en base al Acuerdo de París (Estados Miembro y Parlamento UE)
- Objetivo: neutralidad climática
- El objetivo a 2050 significaría una transformación de la economía de la UE que afectaría a todos los sectores, desde el transporte y la agricultura hasta la producción de energía y el diseño de las ciudades.
- ***futuro verde, digital y resistente ante el cambio climático***
- El fondo de reconstrucción post pandemia > pilares definidos en la Hoja de Ruta del Pacto Verde Europeo
- *Sector forestal no cuenta con la presencia que debiese*



European Commission   @EU_Commission · 13 dic.
The EU will be climate neutral in 2050. This requires action by all sectors.

1. Clean energy ⚡
2. Sustainable industry ⚙️
3. Building and renovating 🏠
4. Mobility 🚆
5. Biodiversity 🌿
6. Farm to fork 🍴
7. Pollution ☁️

More on the #EUGreenDeal: europa.eu/!Tr74bn

La Bioeconomía Circular no es un fin, sino una herramienta para conseguir objetivos globales



SUSTAINABLE
DEVELOPMENT GOALS



Acuerdo de París, 2015

- Limitar el aumento a 1,5 °C sobre niveles preindustriales
- Reducción GEI: mitigación, adaptación y resiliencia

Enfoque holístico

Servicios ecosistémicos

servicios de aprovisionamiento

servicios de regulación

servicios culturales

servicios de soporte

Biodiversity

Store carbon

Landscape

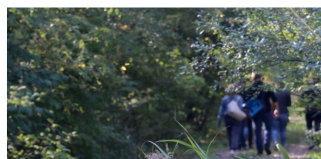
Clean water

Wood for societal needs

Support wildlife

The first forests in the world to have their positive impacts certified

HOME | EVENTS | THE FIRST FORESTS IN THE WORLD TO HAVE THEIR POSITIVE IMPACTS CERTIFIED



A number of Italian forests in the Veneto, Lombardia and Trentino-Alto Adige region scientifically calculated and verified the benefits their trees provide to humankind, procedures provided by the Forest Stewardship Council® (FSC®). This world record

Recreation

Berries and mushrooms

La Devesa da Rogueira, en O Courel, primer bosque en España en certificar la conservación de la biodiversidad

Ecosystem Services

- Ecosystem services have been defined as “the direct and indirect contributions of ecosystems to human wellbeing” (MA, 2005) or “the benefits that people obtain from ecosystems - the direct and indirect contributions of ecosystems to human wellbeing” (TEEB, 2010). People benefit from ecosystem (goods and) services. These benefits are, among others, nutrition, access to clean air and water, health, safety, and enjoyment and they affect (increase) human wellbeing, which is the key target of managing the socio-economic systems (<https://foresteurope.org/ecosystem-services/>)
- Three main international classification systems of ES have been implemented:
 - Millennium Ecosystem Assessment (MA 2005)
 - Economics of Ecosystems and Biodiversity (TEEB 2010) and
 - Common International Classification of Ecosystem Services (CICES 2013, 2018).

Table 4: Provisioning¹⁰ forest ecosystem services according to CICES v4.3 MAES 2014

Section	Division	Group	Class
Provisioning	Nutrition	Biomass	Reared animals and their outputs
			Wild plants, algae and their outputs
			Wild animals and their outputs
		Water	Surface water for drinking
			Ground water for drinking
	Materials	Biomass	Fibres and other materials from plants, algae and animals for direct use or processing
			Materials from plants, algae and animals for agricultural use
			Genetic materials from all biota
		Water	Surface water for non-drinking purposes
			Ground water for non-drinking purposes
	Energy	Biomass-based energy sources	Plant-based resources

Table 6: Cultural ¹² forest ecosystem services according to CICES v4.3 MAES 2014

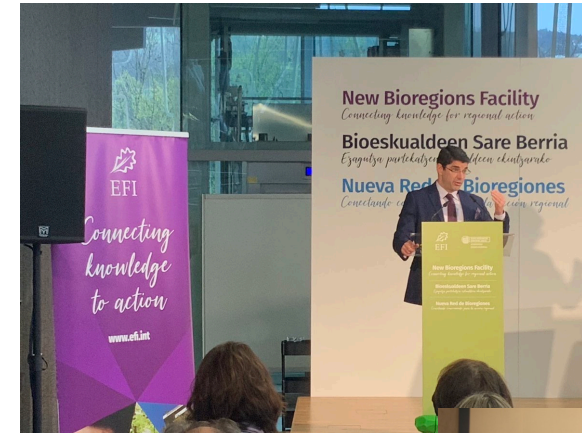
Section	Division	Group	Class
Cultural	Physical and intellectual interactions with biota, ecosystems, and landscapes	Physical and experiential interactions	Experiential use of plants, animals and landscapes in different environmental settings. And physical use of landscapes in different environmental settings
		Intellectual and representative interactions	Scientific, educational, heritage, cultural, entertainment and aesthetic
	Spiritual, symbolic and other interactions with biota, ecosystems, and landscapes	Spiritual and/or emblematic	Symbolic and sacred and/or religious
		Other cultural outputs	Existence and bequest

Table 5: Regulation and Maintenance^{II} forest ecosystem services according to CICES v4.3 MAES 2014

Section	Division	Group	Class
Regulation & Maintenance	Mediation of waste, toxics and other nuisances	Mediation by ecosystems	Filtration / sequestration / storage / accumulation by ecosystems
	Mediation of flows	Mass flows	Mass stabilisation and control of erosion rates
			Buffering and attenuation of mass flows
		Liquid flows	Hydrological cycle and water flow maintenance
			Flood protection
		Gaseous / air flows	Storm protection
			Ventilation and transpiration
	Maintenance of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Pollination and seed dispersal
			Maintaining nursery populations and habitats
		Pest and disease control	Pest control
			Disease control
		Soil formation and composition	Weathering processes
			Decomposition and fixing processes
		Water conditions	Chemical condition of freshwaters
		Liquid flows	Disease control
		Atmospheric composition and climate regulation	Global climate regulation by reduction of greenhouse gas concentrations
			Micro and regional climate regulation

BioRegions Facility – Red de Bioregiones

- Impulsada por EFI
- Miembros fundadores:
 - País Vasco (ES)
 - Karelia del Norte (FI)
 - Renania del Norte-Westfalia (DE)
- Lanzamiento 9 Marzo 2020 en Bilbao
- Objetivo: **dinamizar la transición hacia la bioeconomía**
- Conectando conocimiento para la acción local
- P.ej. compra verde pública



Alianza de Bioeconomía Circular

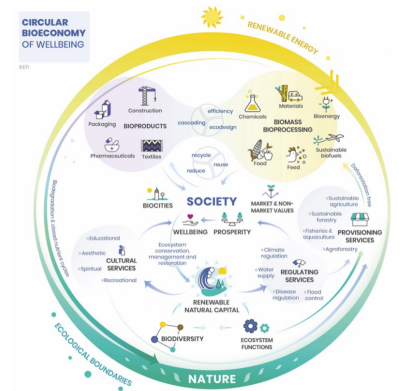
“We need to restore balance and put nature back at the centre of our economy” – Príncipe Carlos de Inglaterra

Acelerar el cambio a bioeconomía circular neutramente climáticamente, inclusiva y en armonía con la naturaleza: inversores y empresas, gobiernos, comunidades, investigadores.



10 Action Points which are needed to create a circular bioeconomy:

1. Focus on sustainable wellbeing
2. Invest in nature and biodiversity
3. Generate an equitable distribution of prosperity
4. Rethink land, food and health systems holistically
5. Transform industrial sectors
6. Reimagine cities through ecological lenses
7. Create an enabling regulatory framework
8. Deliver mission-oriented innovation to the investment and political agenda
9. Enable access to finance and enhance risk-taking capacity
10. Intensify and broaden research and education

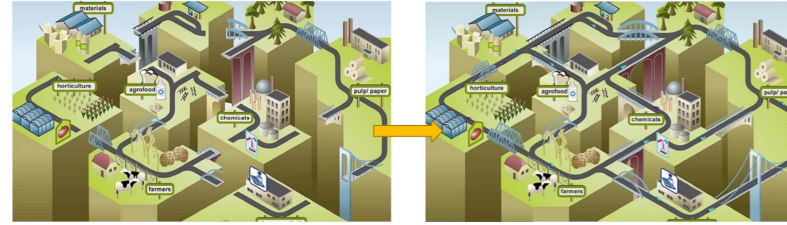


Monday 16th November 2020 19:00 GMT

**Driving Change:
Connecting Investors to
Sustainable Investable
Solutions**



#BioHeroes



- Potenciar el sector de las BioIndustrias a través de las conexiones entre los diferentes agentes decisores en Bioeconomía.



Naturaleza como base de la economía

‘Biodiversity and bioeconomy, the two sides of the same coin’

Marc Palahí
European Forest Institute

‘Save nature because only nature will save you’

Nick Lyth
GreenAngelSyndicate

‘It is not a matter of saving the planet, it is for saving humanity’

Frans Timmermans
Vice President European Commission



EUROPEAN FOREST
INSTITUTE

01 El Instituto Forestal Europeo (EFI)

02 Bioeconomía y Economía Circular

03 Bio-productos

Sector textil

04 Bio-ciudades

Construcción en madera

05 Sistemas agroforestales

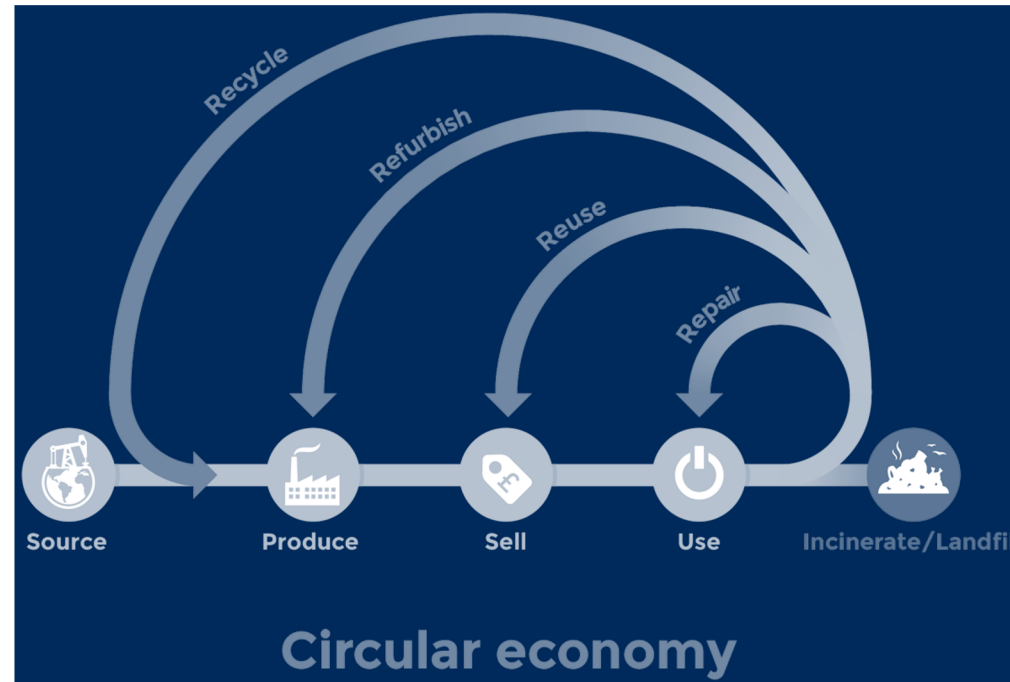
06 Digitalización forestal

07 Conclusiones

Productos 'circulares'

Poner en valor los residuos > uso en cascada

uso multiple de un recurso en diferentes formas



El uso en cascada da prioridad a los productos/ usos de mayor valor y re-uso y reciclaje, dando un uso energético cuando ya no hay más opciones

Restos de poda (forestal, setos vivos...)

- Bioenergía > redes de calor, cogeneración
- Biochar > fertilización suelos
- Hojas olivo como alimento ovejas

39
INNOVATION

AGROFORESTRY WOODCHIP FOR COLLECTIVE HEATING FACILITIES
 Maintaining the landscape by using woodchip for fuel



THE WHAT AND WHY

Pruning the hedges is not just a cost, it also produces fuel resources

Hedges are very important elements of the French landscape, especially to maintain the " bocage " (pastureland divided into small hedged fields interspersed with groves of trees). However, since the 70s, trees and hedges are seen by farmers and town representatives as a liability and a cost rather than a resource. Hence, hedges are not well maintained, and sometimes even pulled out. To keep these hedges healthy and managed, so that they can keep providing their ecological and agronomical services (e.g. biodiversity, protection against weather, erosion prevention), it is crucial to turn them into economic resources.

A serious lead for the valorisation of hedge products is wood-fuel for collective heating systems. Several actions are needed to truly develop a wood-fuel value chain: promote hedge restoration and replanting, train farmers on good hedge management practices, help small-scale woodchip-processing companies to find suppliers and promote installation of heating systems for city infrastructures, enterprises or farms.




A collective heating facility using woodchips in San-Ju-Belle, France, supplying heating to apartment buildings, a school, a high school, a hospital and even a shopping mall.
 Source: Lucien de Nard-messager (photo by Jean-Ben Auzan)

Shredding branches after the pruning of a hedge.
 Credit: Coline Bon Berger

HOW IS THE CHALLENGE ADDRESSED

Building up the woodchip value chains

Making woodchips for fuel is not a new practice, it has been used way before gas, oil or electricity, and the process is apparently very easy (just shred the pruning residues). However, it is a quite technical and expensive operation for a farmer, and to make it profitable is sometimes a real challenge. This is possible only thanks to well-structured value chains and a good demand. Today, both are lacking in many places to really develop agroforestry woodchips. Over the past few years several local organisations in France took up the challenge.

In Northern France, the **Regional Natural Park of Avesnois** launched an initiative in 2012 to promote the establishment of heating systems in the area, in partnership with an association that sources and processes woodchips: **Ardier Agriculture Avesnois Pâturables**. Now, more than 88 individual and 24 collective heating systems have been installed, and more than 458 tons of woodchips have been delivered. This represents an equivalent of 700 households powered with the exploitation of 600km of hedges.

Another good example is the **Bals Puyon** initiative, which is held by a group of 30 farmers in the Ariège department of South France. It began its actions by restoring existing hedges and then evolved to promote new agroforestry planting and knowledge transfer. Thirty-five hectares of land were converted towards agroforestry from 2015, creating several km of new hedges. Nowadays, ten of the farmers are gathered into a distribution company to process and sell directly high-value products from this "farmers' wood", aggregating direct value from a locally available resource. This company already signed 22 official contracts with groening and landscape shapers for products like mulch (municipal chipped wood), charcoal, and timber.










08
INNOVATION

USING OLIVE LEAVES BY-PRODUCTS IN GRAZED ORCHARDS
 The benefits of olive leaves for feeding sheep



THE WHAT AND WHY

Valorization of residues for high quality sheep nutrition

Olive leaves are fibrous with a low digestibility, especially in crude protein, and they promote very poor rumen fermentation. However, if adequately supplemented, they may be successfully use in animal diets, mostly fresh when the nutritive value of olive tree leaves is greater. When olive leaves are rich in oil, ruminal protozoa decrease, and this could increase the efficiency of microbial protein synthesis in the rumen. Furthermore, for lactating animals, olive tree leaves result in an improvement in milk fat quality due to the high linoleic acid content, compared to diets based on conventional forages. Feeding olive tree leaves to ewes also has a positive effect on the fatty acid profile of cheese and therefore improves its human nutrition quality. Olive orchard grazing can offer a lot of benefits: sheep reduce costs by controlling grass and suckers growing and increasing nitrogen recycling, while the olive leaves provide high quality feed in winter when the availability of grass is reduced.




Sheep in a traditional olive orchard in Oristano, Italy.
 Claudio Carrozzini

Sheep feeding on olive tree pruning residues.
 Claudio Carrozzini

HOW IS THE CHALLENGE ADDRESSED

A virtuous cycle made of synergies

The by-product "olive leaves" refers to a mixture of branch and leaves from both the pruning of olive trees as well as the harvesting and cleaning of olives prior to oil extraction. The production of olive leaves from pruning has been estimated to be 25 kg per olive tree.

There are different ways to include olive leaves in animal diets, varying from feeding it fresh, ensiled, dried or as a component of concentrate pellets and multi-nutrient feed blocks.

In a sheep pastoral system with sheep and olive groves, it is sufficient to leave pruned residues on the ground and, after the branches have been cleaned by sheep, place them in windrows for chopping. All these operations must be done during the winter. In the spring, despite the abundance of pasture, the sheep still continue to feed on olive leaves, contributing to the control of the suckers. In autumn, when it is the time of oil extraction, it is possible to keep the olive leaves to provide cheap energy and fibre to the animal.








Bateas

- Puertas, suelos...



Restos del procesado para cerveza

- Alimentación ganado
- Caja pizzas (Carlsberg)



Restos del procesado de aceituna/uva

- Bioenergía, biogas (incl hueso)
- Fertilizante
- Cosmética
- Paté de aceituna

60

BIOPRODUCTS

NEW BIO-PRODUCTS AND INNOVATIVE VALUE CHAIN FROM OLIVE PROCESSING

Promote the bio-economy of the olive value chain

THE WHAT AND WHY

The bio-products of the olive oil value chain

Traditional olive orchards account for a large share of the arable under in the EU, particularly in marginal areas. Traditional olive growing can contribute to improving farmer incomes and recognizing its multifunctional role. Italy is the second largest olive oil producer of the European Union, and Umbria can be considered as one of the most interesting regions because of the high quality production of extra virgin olive oil and its close connection with traditional knowledge and the local environment. The regional olive

oil chain involves

about 30,000 farms growing olive trees covering about 270,000 ha and including 270 million trees. The olive oil production phase comprises the extraction of the oil and additional by-products (leaves, pomace and olive mill wastewater) is very important; the olive oil mill wastes have a great impact on soil and water environment because of high toxicity (phenols, lipid and organic acids). On the other hand, such wastes may be potential valuable.

Production of olive pulp can be utilized only by improving the possibility to produce innovative products reduce the management of wastes at mills.

Andrea Pizzarello

Region	Olive mill (%)	Vegetable oil (%)	Olive pomace (%)
Castelli	~3.5	~2.5	~2.5
Montefiore	~3.5	~2.5	~2.5

Percentage of olive mill, vegetable oil and olive pomace generated by the quantity of olive harvested during the season. The yield of olive production is about 20% of the olive processed (data courtesy of Banca Banca).

HOW IS THE CHALLENGE ADDRESSED

Olive pâté from olive processing at oil mills

Currently often the prices of extra virgin olive oil do not guarantee an adequate income for the operators. The situation is aggravated by the fact that the processing residues resulting from the oil production (pomace and olive mill wastewater) represent a problem for the mills in terms of disposal. With an innovation it will be possible to obtain two products of the highest quality of olive oil.

The production of olive pâté has been empirically tested in October-November 2016. The experimental protocol has been set up adopting the following steps:

- 1 Check of the integrity and quality of the olives
- 2 Check of the integrity and quality of the new olive pomace extracted during the processing
- 3 Check of the use of the new material in suitable containers (stainless steel) to the processing laboratory
- 4 Processing with the addition of other ingredients and sterilization at pasteurization
- 5 Packaging of the final product (olive pâté)

The olive processed amount is estimated to be about 0.1 of the weight of olive production (olive SON controlled by the consortium)

© 2017 The Author(s)
Published by John Wiley & Sons, Ltd.
J. Food Process. Preserv. 41, 58–62 (2017)
DOI: 10.1111/jfpp.12762

Keywords: Bio-economy, olives, pomace, bio-products

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Otros residuos agrícolas

- Scoby: embalaje comestible para alimentos
- Bioplásticos (trigo > maíz, manzana, naranja) para embalajes, vasos, cubiertos, juguetes
- Textiles de mondas de cítricos
- Tintes (80% natural+20% sintético)
- Paja, ruibarbo y espárragos para bolsa de papel
- Cáscara huevo + piel tomates para negro de humo en neumáticos



ITALY'S ORANGE FIBER IS MAKING SUSTAINABLE VEGAN SILK OUT OF CITRUS FRUIT



Ganadería

- Restos de huesos como fertilizante
- Biogas del estiércol
- Textiles de leche agria
- Termoplástico soluble en agua de la leche agria
- Suero del queso como probiótico, conservante, bioestimulante
- Lana como aislante



Bioproductos

BIO = vida

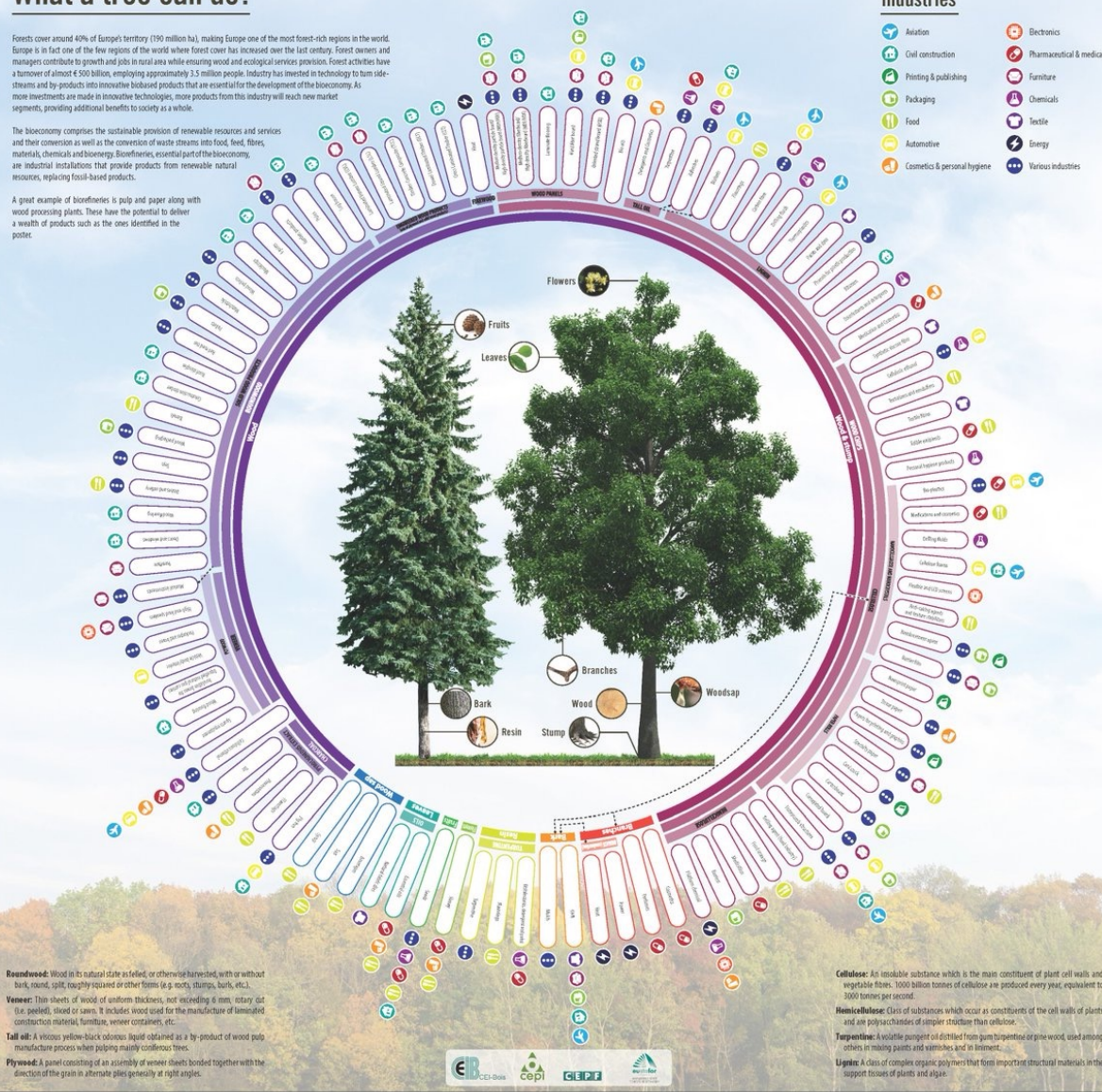
Productos hechos en base a materiales renovables, biológicos, en lugar de usar productos fósiles como petróleo.

What a tree can do?

Forests cover around 40% of Europe's territory (190 million ha), making Europe one of the most forest-rich regions in the world. Europe is in fact one of the few regions of the world where forest cover has increased over the last century. Forest activities have a turnover of almost € 500 billion, employing approximately 3.5 million people. Industry has invested in technology to turn side-streams and by-products into innovative bio-based products that are essential for the development of the bioeconomy. As more investments are made in innovative technologies, more products from this industry will reach new market segments, providing additional benefits to society as a whole.

The bioeconomy comprises the sustainable provision of renewable resources and services and their conversion as well as the conversion of waste streams into food, feed, fibres, materials, chemicals and bioenergy. Bioeconomy, essential part of the bioeconomy, are industrial installations that provide products from renewable natural resources, replacing fossil-based products.

A great example of bioeconomy is pulp and paper along with wood processing plants. These have the potential to deliver a wealth of products such as the ones identified in the poster.



Potencial bioeconómico de un árbol

‘Todo lo que se hace a base de materiales fósiles hoy, se puede hacer de árboles mañana’

Industries

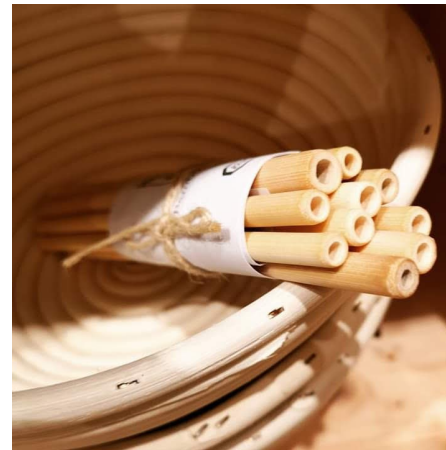
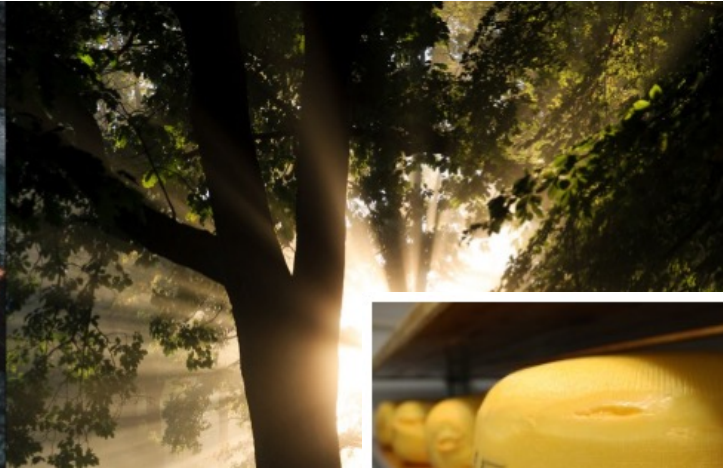
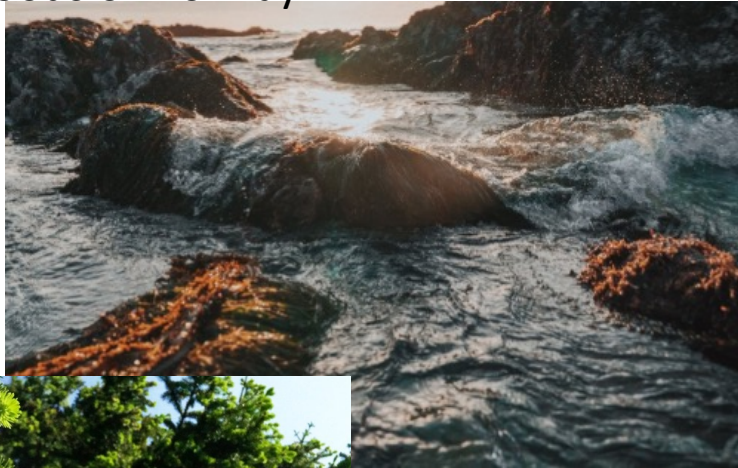


Bioproductos - fibras de madera



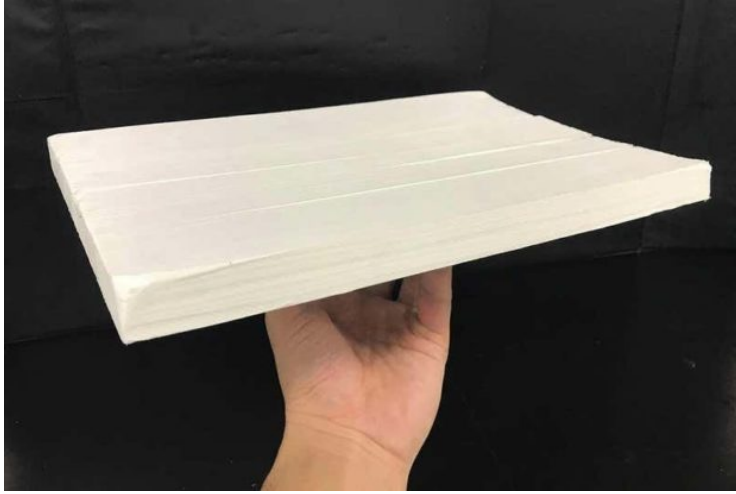
Bioproductos - fibras de madera

Foods of Norway



Bioproductos - fibras de madera

Desalinización de agua



Filtro de hormonas y medicinas



Fibra para cirugía, textiles... VTT



Aislamiento acústico



Contenedores



Salpicaderos



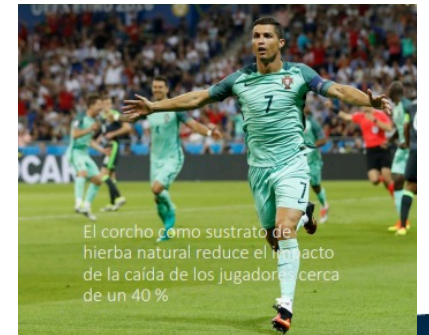
Automoción



Bioproductos - fibras de madera



Bioproductos - corcho



Bioproductos - resina

- Aguarrás
 - industria farmacéutica y cosmética, recubrimientos de pastillas o jarabes, aerosoles, fijador de perfumes
- Colofonia
 - cera para fruta, cera depilatoria, pinturas para la señalización del tráfico, empastes, tintas de impresión, plásticos, chicles...

Galicia

- 2014: 1.000 kg
- 2019: previsión 130.000 kg
- 1,07 €/kg
- 2-3 kg/año/árbol > 800 pies/ha > 2400 kg/año = 2400 €/ha/año

Castilla y León

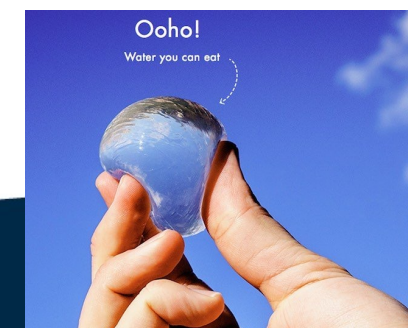
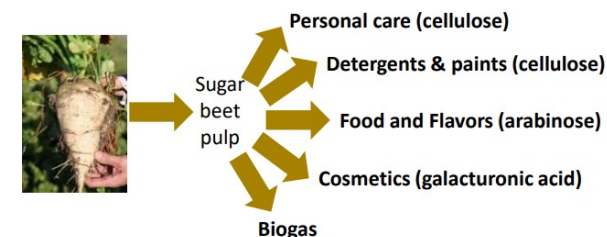
- 1961: 55.000 Tn
- 2005: 2.500 Tn
- **Luresa Resinas S.L.** tratamiento 50% resina en España



Bioproductos - cultivos



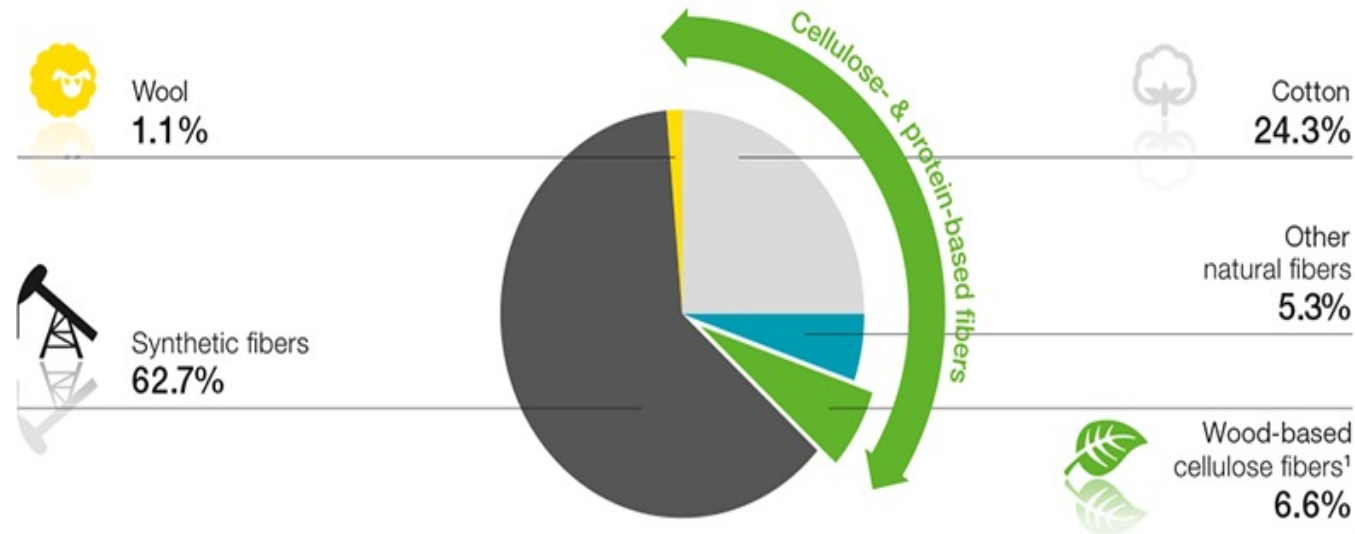
IKEA 2030: plásticos reciclados o bioplásticos



Sector textil

- Producción global de fibras textiles
 - 93 Mt (2016)
 - x3 = 250Mt (2050)
- 70% impacto en clima por producción
- Emisiones industria textil = transporte

- Huella de carbono de fibras textiles de madera puede ser hasta (5-6) 9 veces inferior a las sintéticas
- No microplásticos derivados
- Tencel 20 veces menos agua que algodón



Sources: ICAC, CIRFS, TFY, FEB, Lenzing estimates

Tendencia decreciente del algodón (3% Sup):

- terreno cultivable para alimentos
- gran uso de agua, recurso escaso
- 24% insecticidas
- 11% pesticidas

Fibras forestales:

- 5% producción pasta UE

Spanish Fashion Designer Maria Lafuente is Forest Forward

Thai tradition and sustainability play a leading role in Maria Lafuente's new collection.

By PEFC Spain - February 21, 2019

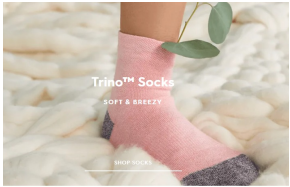
35



Photos: i



La colección "Triade" hecha por Maria Lafuente con tejidos forestales de Tencel Santanderina, expuesta en la sede de la ONU en Nueva York



Smallbirds

SIGN UP

ACCOUNT

HELP



TREE RUNNERS

TREE LOUNGERS

TREE SKIPPERS

First Lady celebrated Finland's independence in wood-fibre gown – closely followed by the whole nation

Published: 07.12.2018 10:25



loncell. Aalto University



Lenzing

Innovative by nature



INDITEX

QUIÉNES SOMOS

UN MODELO SOSTENIBLE

INVERSORES

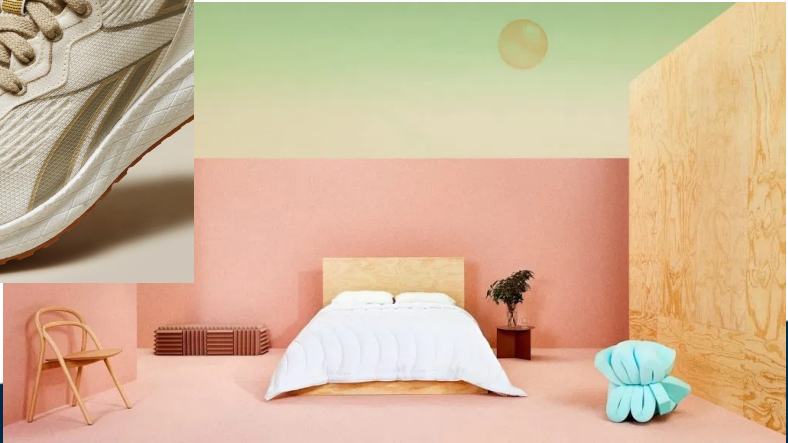


Lyocell y otras fibras procedentes de la madera

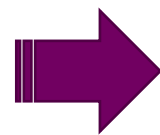
Reebok



Un abeto puede producir 200 pares de pantalones!

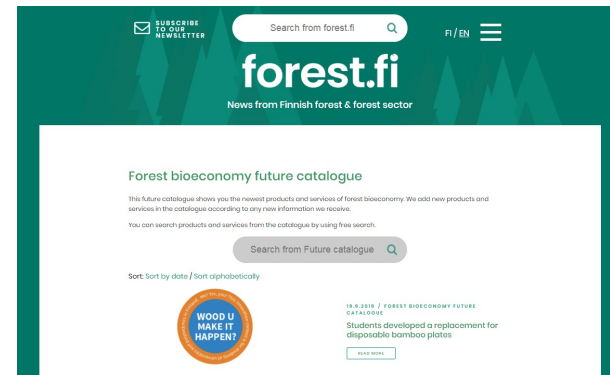
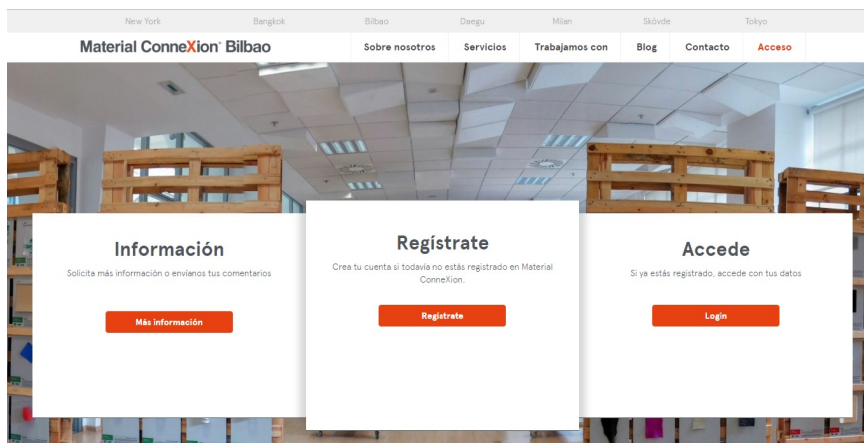
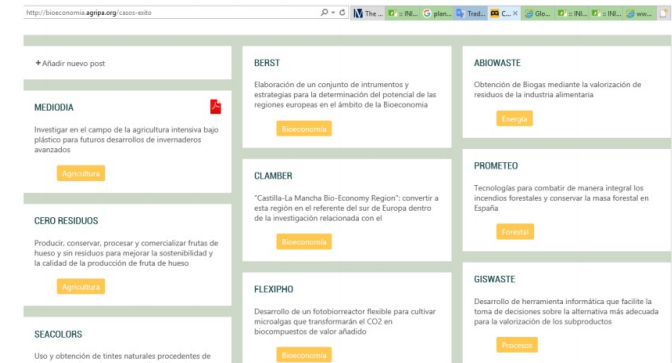
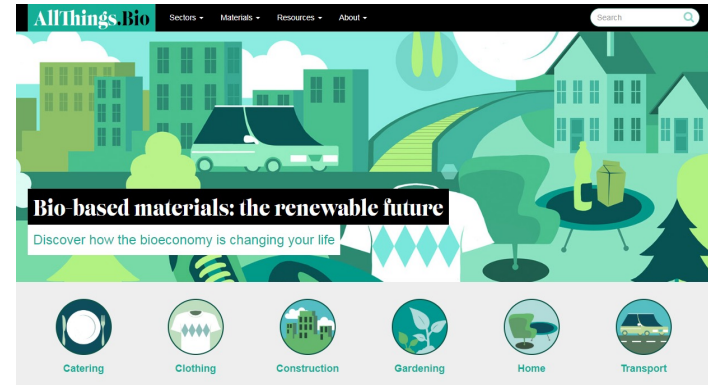
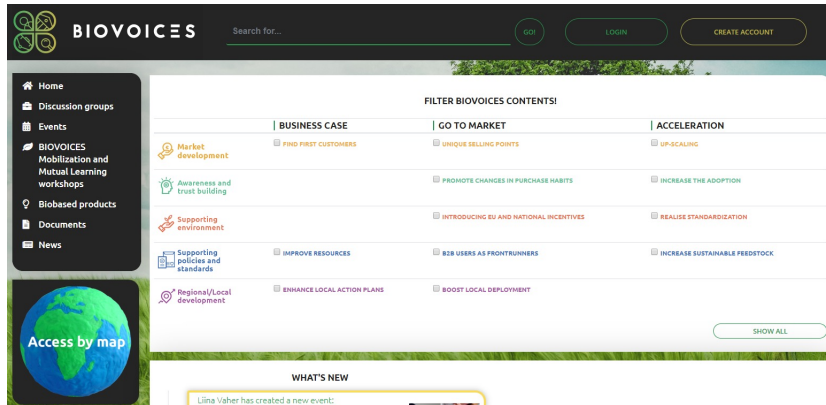


Galicia



Futura fábrica de textiles de fibras de madera

Plataformas bio-productos



Finnish Forest Association

Nuevos bio-productos cada día!!



BIOVOICES redes sociales

Galicia

Materioteca de Galicia (GAIN CIS Ferrol) (Junio 2019)

- Base de datos: catalogar y mostrar materiales desarrollados en Galicia y transferencia centros investigacion y empresas tecnologicas
- Naturales, metales, polímeros, vidrios, cerámicas #20
- Material Connexion: cada día +1 nuevo material ES
- *Workshop Novos materiais para packaging sustentable*



FINSA-CTAG



FINSA super-Pan





EUROPEAN FOREST
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03 Bio-productos

Sector textil

04 Bio-ciudades

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06 Digitalización forestal

07 Conclusiones

Bio-ciudades

- 2% superficie del planeta
- 2019 50% población mundial
 - 80% PIB
 - 75% energía consumida
 - 75% emisiones
- 2050 70% (2/3 población!)
- Megaciudades (>10mill hab)
 - 2005 - 25
 - 2019 - 40



Regla 3-30-300

"Everyone should see 3 trees from his house, have 30% canopy coverage in his neighborhood and be on a 300m distance from a nice park!"

Bosques urbanos:

- fijación de C
- reducción contaminación
- reducción 30% aire acondicionado
- reducción energía calefacción 20-50%
- reducción temperaturas extremas (verano – olas de calor)
- salud
- belleza y disfrute

Bosques en la salud pública

- ‘Síndrome de Heidi’ >> ‘shinrin-yoku’ (baños de bosque)
- El Instituto Nacional de Recursos Naturales de Finlandia fija la ‘dosis mínima’ en
 - **5 horas al mes espacios verdes locales o**
 - **naturaleza 2 ó 3 veces al mes.**
- [Nature Communications](#): *Los parques nacionales podrían proporcionar un valor económico de alrededor de 6.000 millones de dólares al año en todo el mundo por la mejora que provocan en la salud mental de sus visitantes. (tratamiento, atención, productividad reducida trabajo... +sufrimiento)*
- **Las ciudades deben pensar en los árboles como un infraestructura de salud pública**
 - Aarhus University: niños cercanos a vegetación, menor riesgo desorden mental adulto
 - Irlanda: prescripción paseos en la naturaleza
- Arquitectura biofílica: elementos de la naturaleza en el diseño de interiores:
 - Ventanas a la naturaleza
 - Jardines verticales
 - Muebles de madera
 - ...
- **Efecto COVID**



Bosque Vertical de Stefano Boeri, Italia



Diputación de Lugo



Hospital Sant Pau, Barcelona





Pastoreo urbano



Nueva York, Dusseldorf, Roma, Berlín, Madrid, Valencia...



Los rebaños se encargarían de limpiar espacios como el nuevo cauce del río Turia, donde crece la maleza. MONICA TORRES

Sector construcción actual

- Materiales principales: hormigón y acero
- Impacto en Europa:
 - 35% emisiones de C
 - 40% energía consumida
 - 50% consumo de materias primas
 - 30% desechos generados



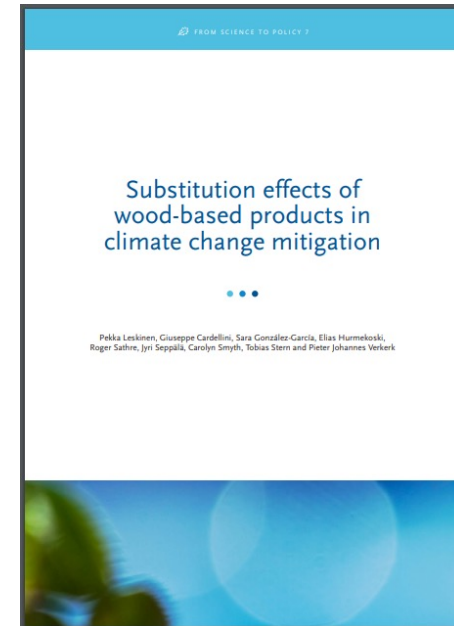
Sector construcción: alternativa

Madera: único material de construcción renovable y sostenible y capaz de almacenar CO2 en su estructura celular



Por cada **tonelada de madera** usada en vez de hormigón, hay una **reducción** de emisiones de **2.1 toneladas de CO₂**.

Excepcionalidad:
relación resistencia-peso de la madera
características estéticas



Austria



- ccto 1m3 madera en 1 sg
- Vivienda media = 40m3 madera >> 1 día = 2.160 casas de madera
- 1/3 ccto annual (total 30 Mill m3) > construcción de todas las edificaciones / año en madera

Holanda

- casas neutras a nivel energético en el año 2020
- CO2 almacenado casas de madera:
205m2
= 65 m3 madera + 96m3 de biomateriales
= 164 vuelos de i/v de Amsterdam a Bilbao.

Tall Timber Building, Västerås, Suecia
9 pisos, edificio más alto de Suecia en
madera maciza



Ho-Ho building, Viena
24 plantas (84 metros)
comercial y residencial
torre híbrida madera-hormigón más
alta del mundo (76% madera)



Edificio Mjøstårnet, Brumunddal, Noruega
18 plantas > 85 metros > edificio más alto
del mundo en madera



‘Lighttower’ Joensuu, Finlandia
14 plantas > el más alto de Finlandia

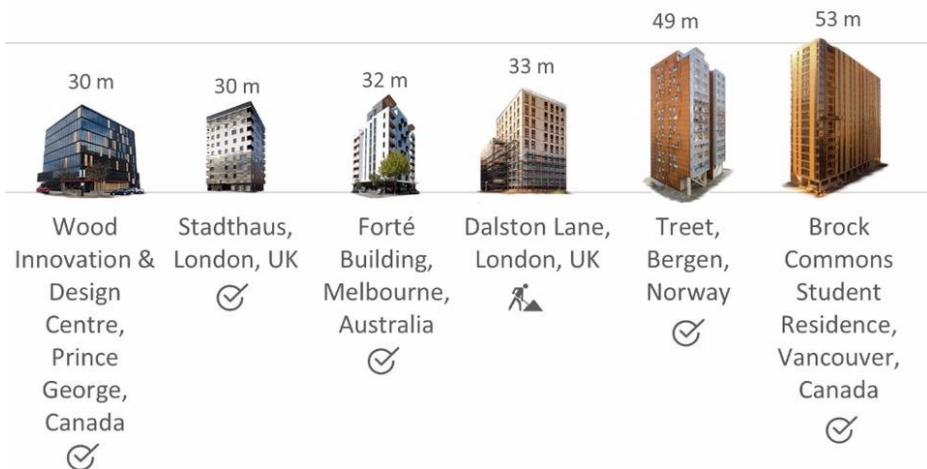


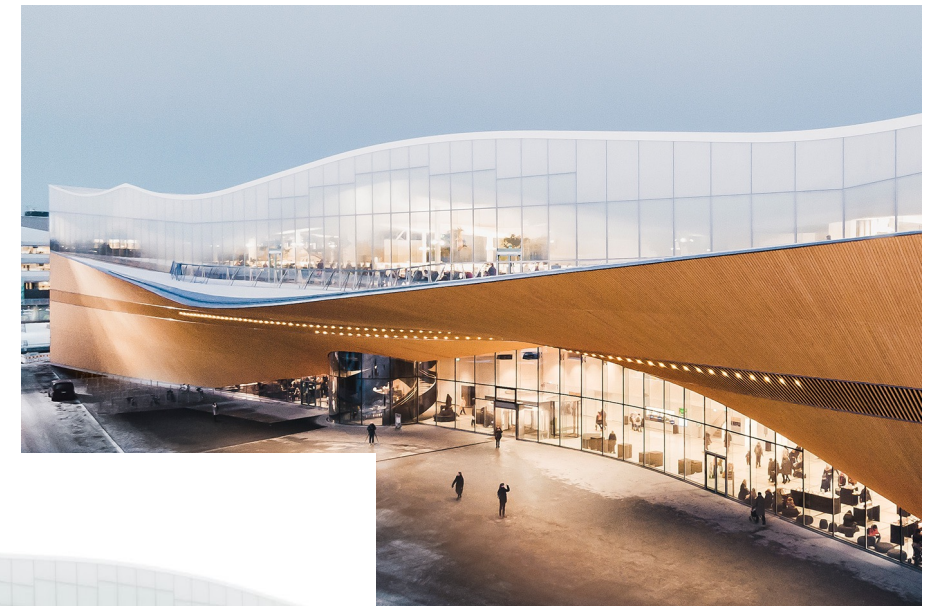
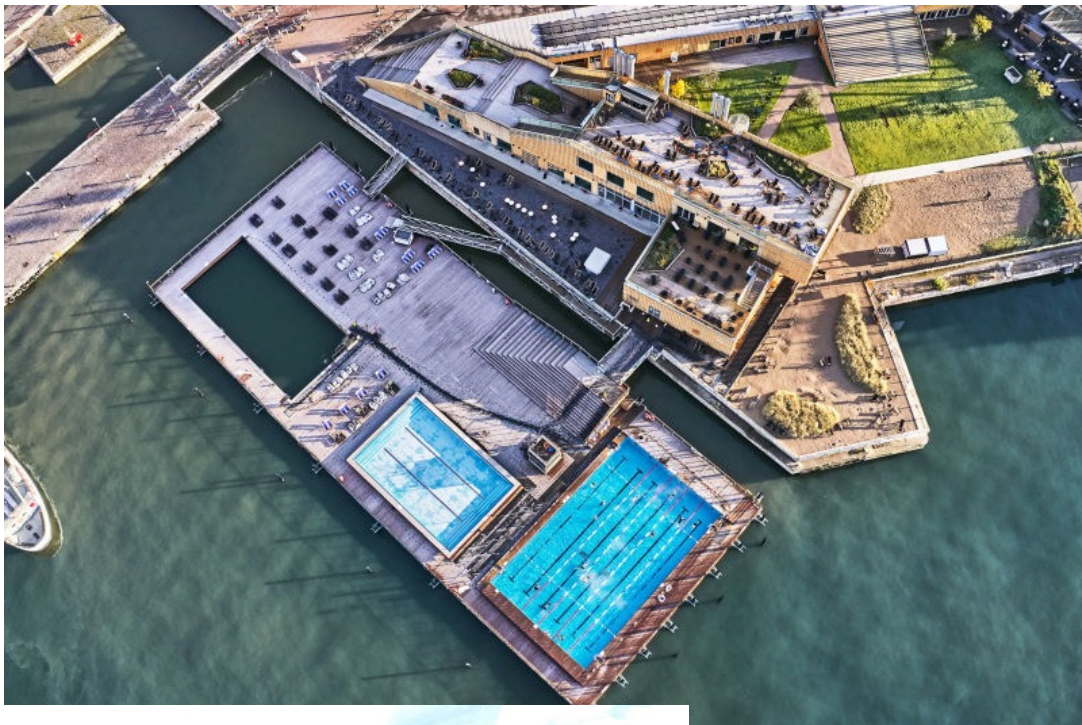
Australia is getting a 30-story apartment building covered in 1,000 trees and 20,000 native plants! It'll be the world's greenest residential building with 392 homes, a rooftop garden AND a public park! Scheduled to be complete in Brisbane in 2024

<http://koichitakada.com>

Planes en Tokio y Chicago de 70 plantas!

‘El cielo es el límite’





Oodi library, Helsinki



3.5.2021 | www.rehinkassa.fi



Allas Sea Pool, Helsinki



Nueva Bauhaus Europea

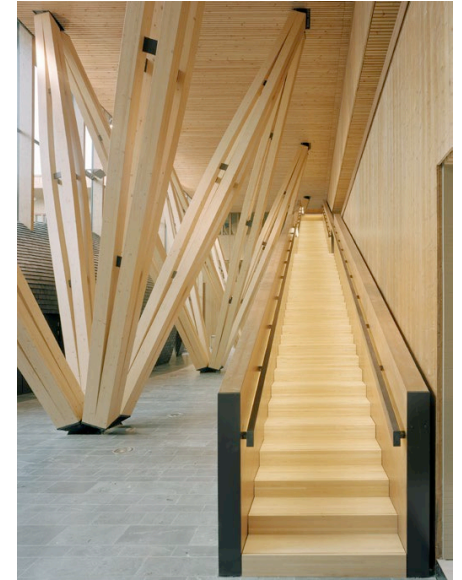


www.wood4bauhaus.eu

- Convertir a Europa en el primer continente neutro para 2050
- Reconciliar nuestro modo de vida con la naturaleza
- Acelerar la transición del entorno construido
- Ampliar los materiales basados en la naturaleza, para apoyar el diseño y la arquitectura circular
- Las ciudades europeas deberían capturar el CO2 en lugar de producirlo, podemos convertir nuestras ciudades en bosques urbanos

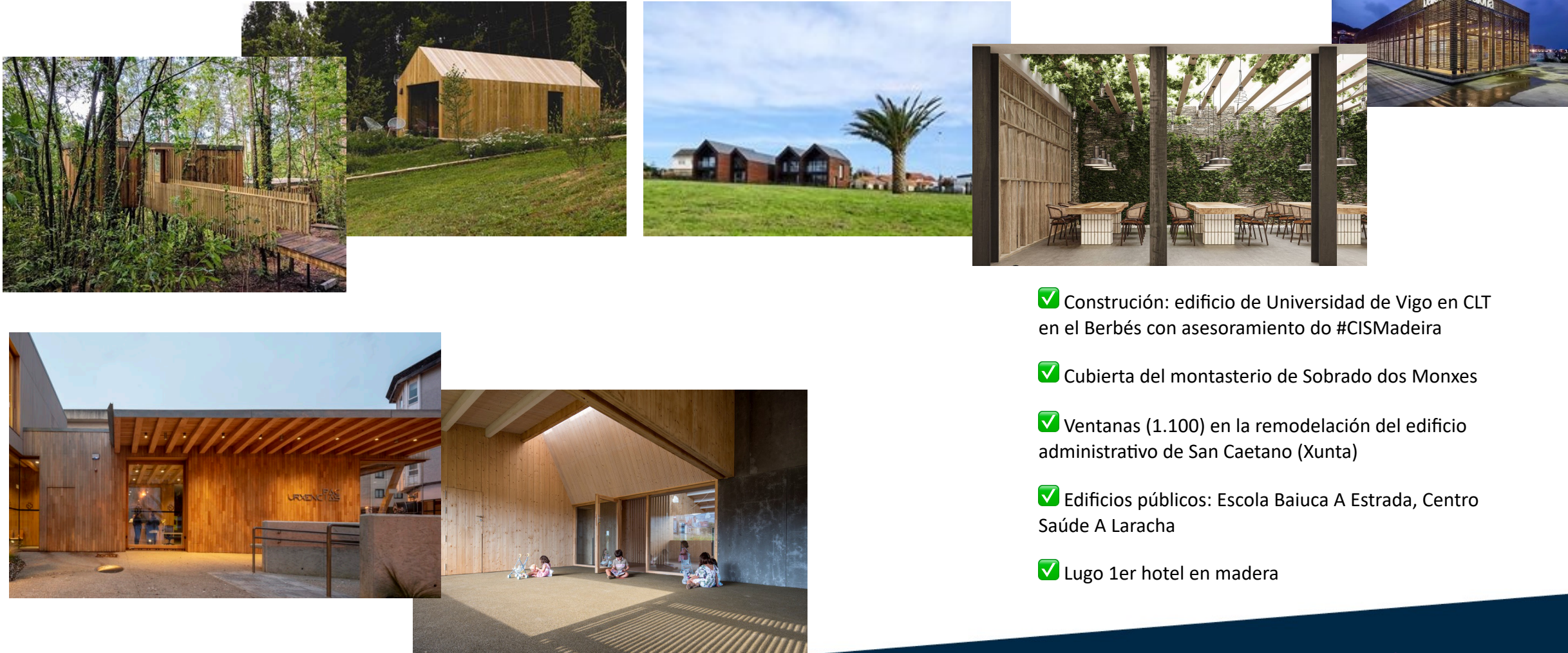
Ursula von der Leyen (22 abril 2021)

EFI Headquarters, Joensuu, Finlandia



Erkki Oksanen,
LUKE

Construcción en madera en Galicia



- ✓ Construcción: edificio de Universidad de Vigo en CLT en el Berbés con asesoramiento do #CISMadeira
- ✓ Cubierta del monasterio de Sobrado dos Monxes
- ✓ Ventanas (1.100) en la remodelación del edificio administrativo de San Caetano (Xunta)
- ✓ Edificios públicos: Escola Baiuca A Estrada, Centro Saúde A Laracha
- ✓ Lugo 1er hotel en madeira

Impulso verde, Lugo, Galicia, ES





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01 El Instituto Forestal Europeo (EFI)

02 Bioeconomía y Economía Circular

03 Bio-productos

Sector textil

04 Bio-ciudades

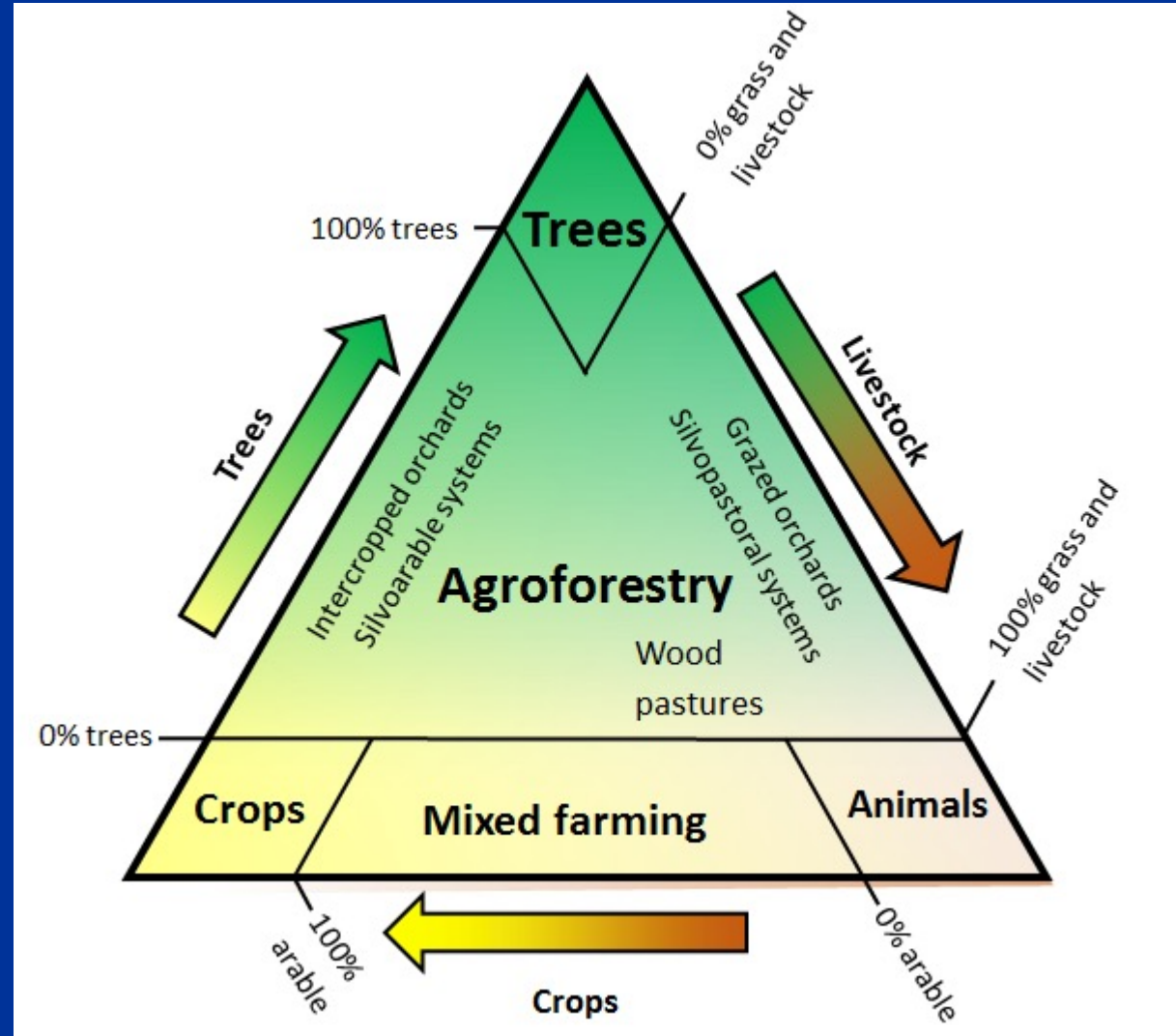
Construcción en madera

05 Sistemas agroforestales

06 Digitalización forestal

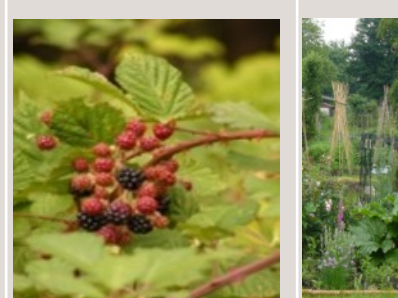
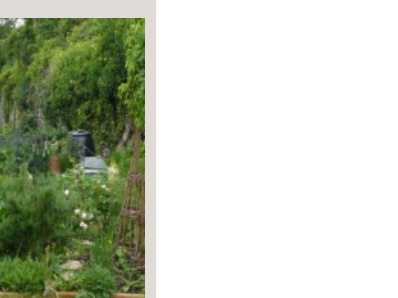
07 Conclusiones

Agroforestry:
the practice
of deliberately
integrating
woody
vegetation
with
crops and/or
animals



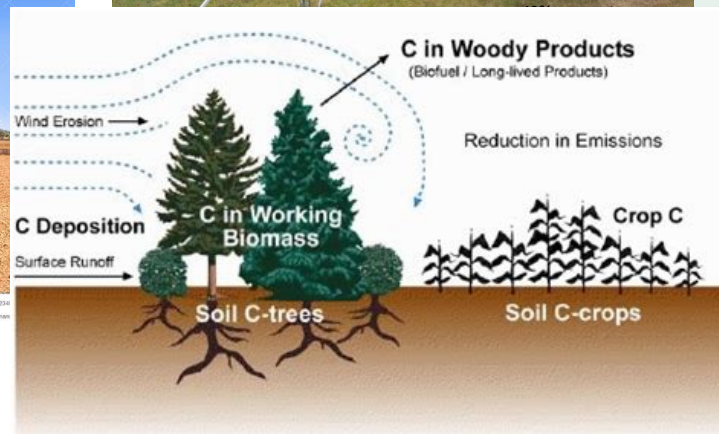
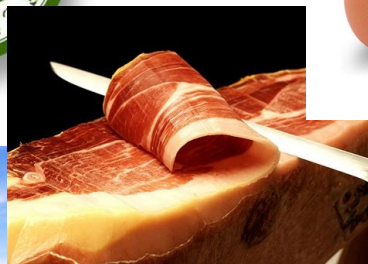
Agroforestry practices



Silvopastoral	Silvoarable	Hedgerows, windbreaks and riparian buffer strips	Forest farming	Homegardens
				
Combining trees and shrubs with forage and animal production	Widely spaced trees and shrubs inter-cropped with annual or perennial crops	Lines of natural or planted trees/shrubs bordering croplands/pastures to protect livestock, crops, and/or soil and water quality	Forested areas used for production or harvest of natural standing speciality crops	Combining trees/shrubs with vegetable production in urban areas

USDA, ICRAF, FAO

Beneficios de los sistemas agroforestales



- ☐ Resiliencia
- ☐ Diversificación
- ☐ Prevención de incendios

"With every 0,002€ invested in territorial management, we save 1€ otherwise spent on extinguishing forest fires"

Marc Castellnou

Agroforestry: CC mitigation & adaptation

- Reducing forest fires (risk & intensity) > reduce GHG
- Increase shadow for animals
- Nutrients recycling through vegetation and animals > reduce inputs (fertilization) (N fert largest emissions)
- Reducing nutrient run-off and soil erosion
- Water regulation
- Increase of organic matter (C) into soil and trees
- Eco-intensification: 20-80% increase production
- Short supply chains > reduce transport GHG and favour local economies
- Farm productivity and diversification > living in rural areas
- Landscape heterogeneity > biodiversity and resilience > reduction of pests > healthier products

Agroforestry: CC mitigation & adaptation

‘one of the most powerful tools to mitigate and adapt to climate change all over the world’

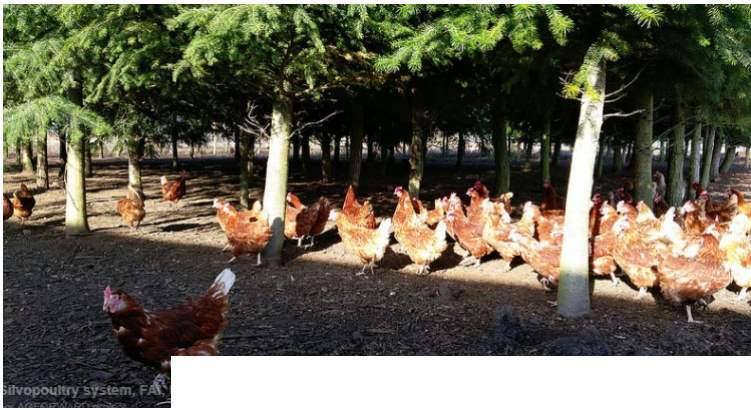
Buttoud, 2013; FAO, 2015, Sinclair et al., 2017

- Agroforestry is an excellent tool to increase **productivity** and provide **ecosystem services** if adequate species are mixed for a specific location
- Silvopastoralism offers an effective way to manage fuel load, i.e. preventing forest fires / limiting fire spread / reducing impacts / avoid emissions from mechanical clearance
- Agroforestry increases **resilience** in plots and farms while mitigating and adapting to climate change



Wakelyns Agroforestry, Suffolk UK, Hazel and potatoes June 2009 by ORC

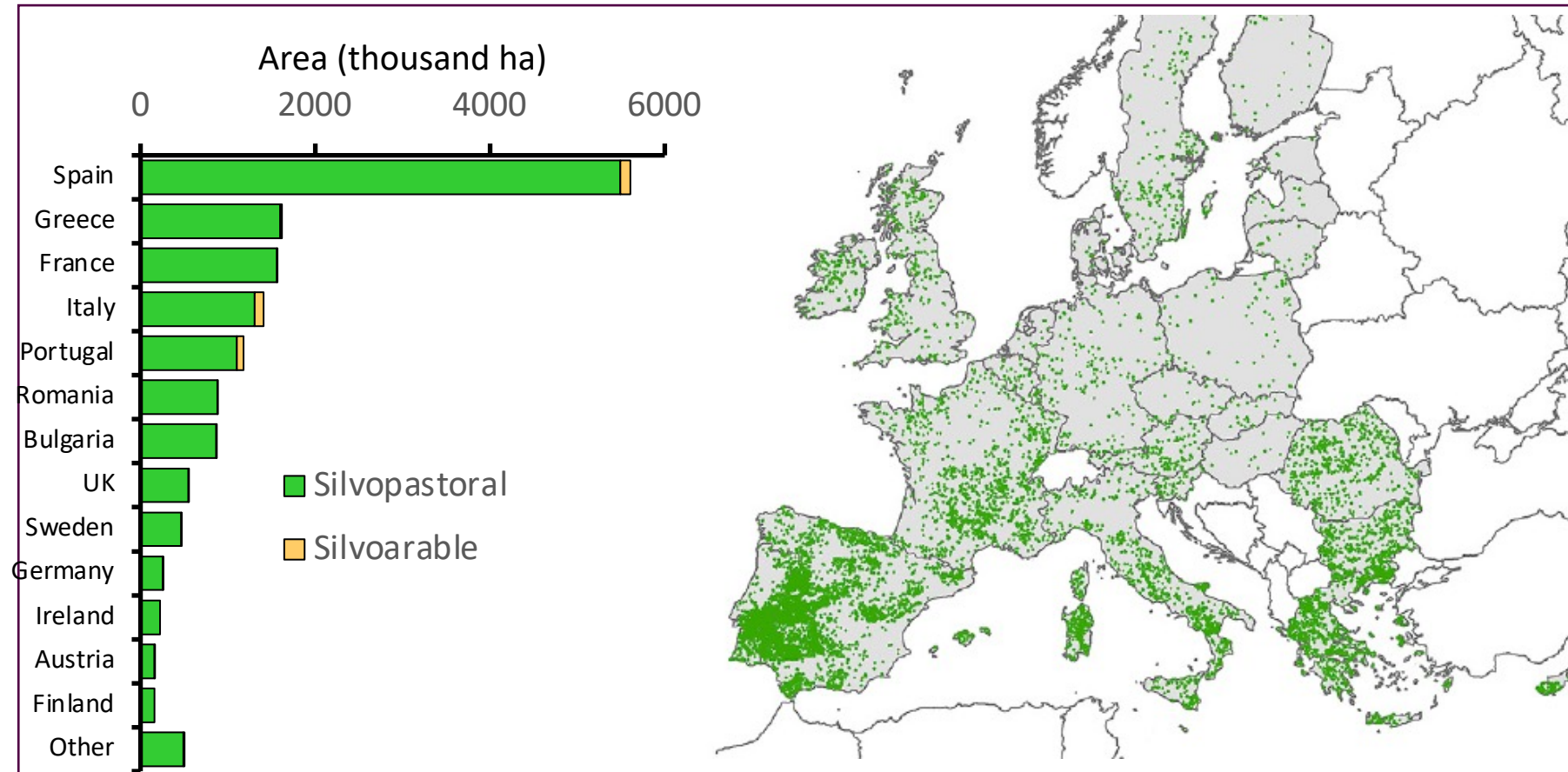




Sheep grazing high value apple trees in Northern Ireland Aug 2014



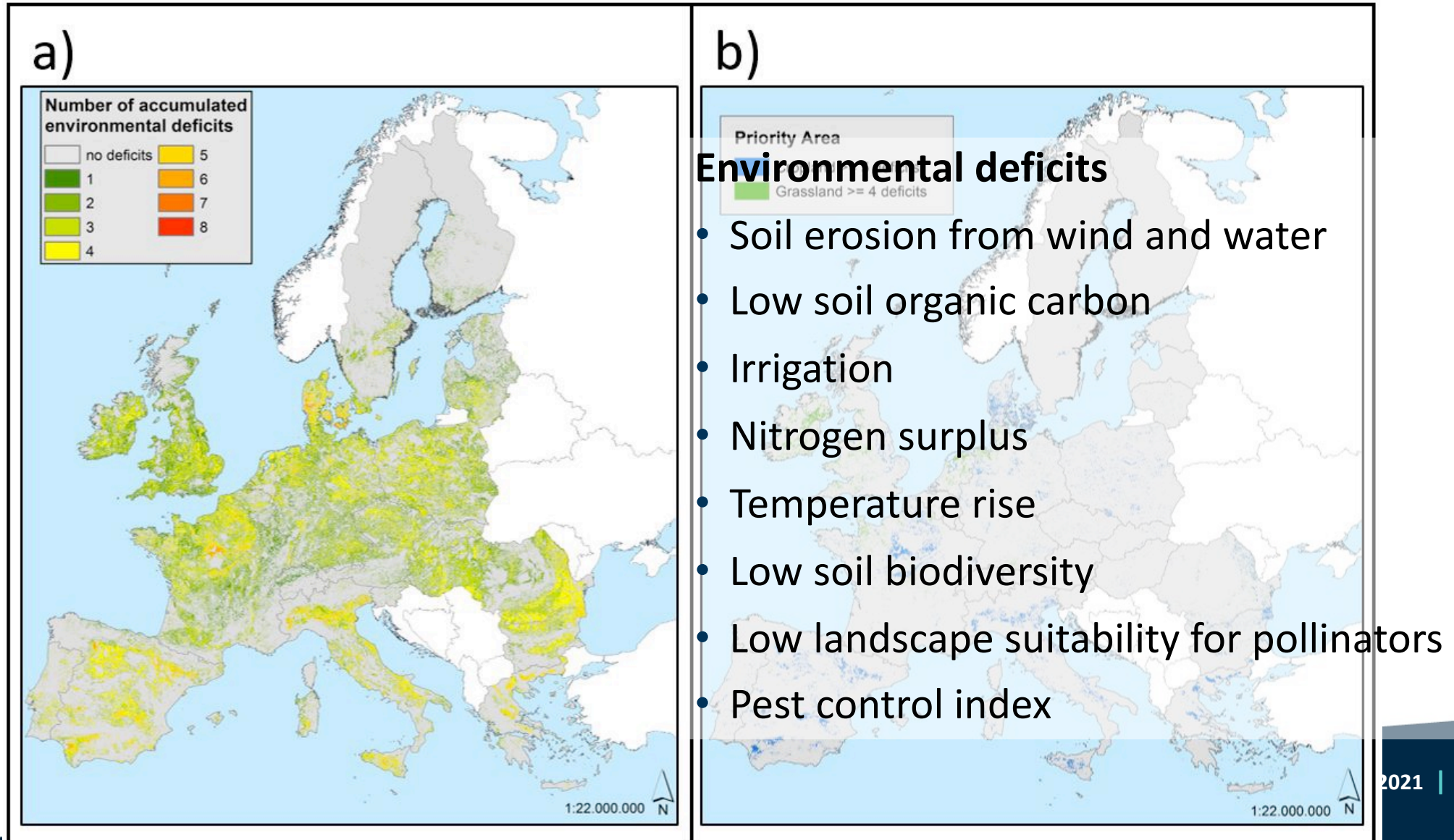
Current extent of agroforestry in Europe



Area of agroforestry: Using LUCAS data: 15.4 Mha (3.6% of total area and 8.8% of agricultural area) (den Herder et al. 2017). CAP2007-2013 trees vs CAP 2014-2020 woody component

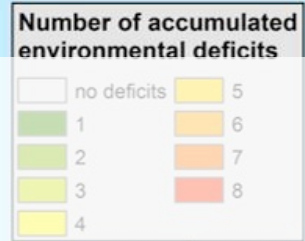
Environmental problems which could be solved by agroforestry

(From Kay, S. et al. submitted)

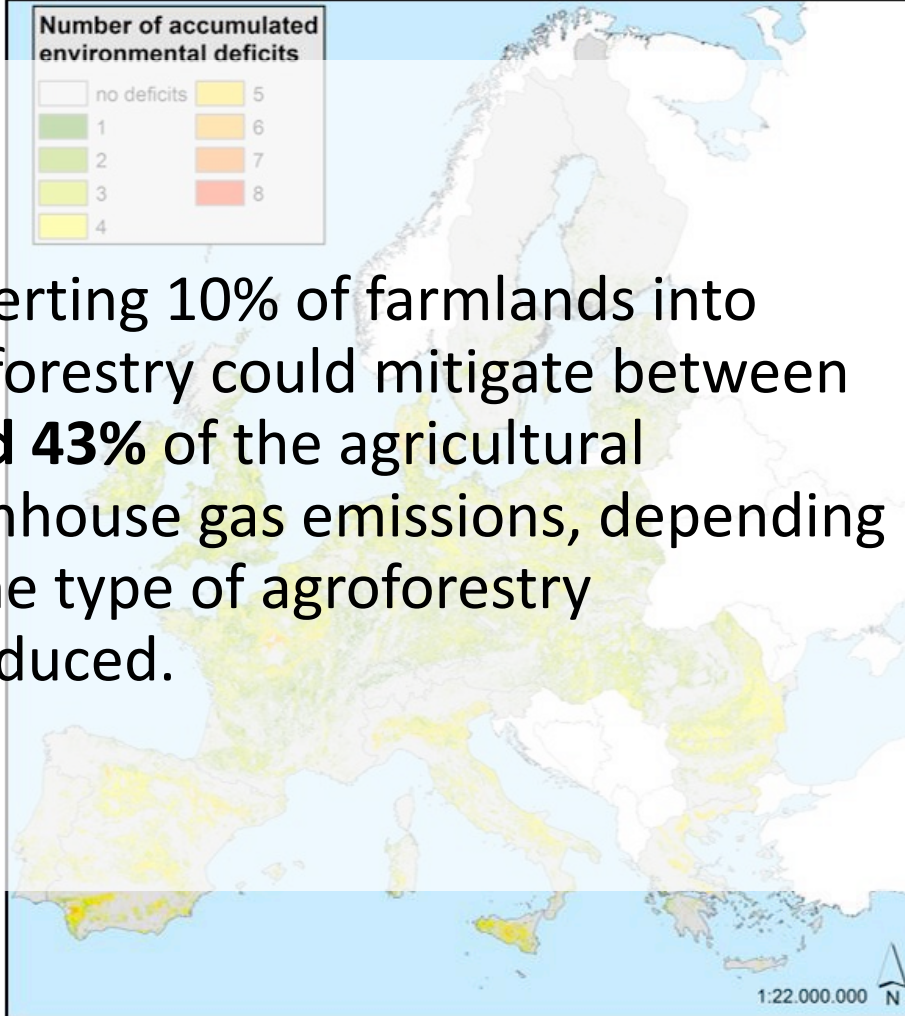


Environmental problems which could be solved by agroforestry

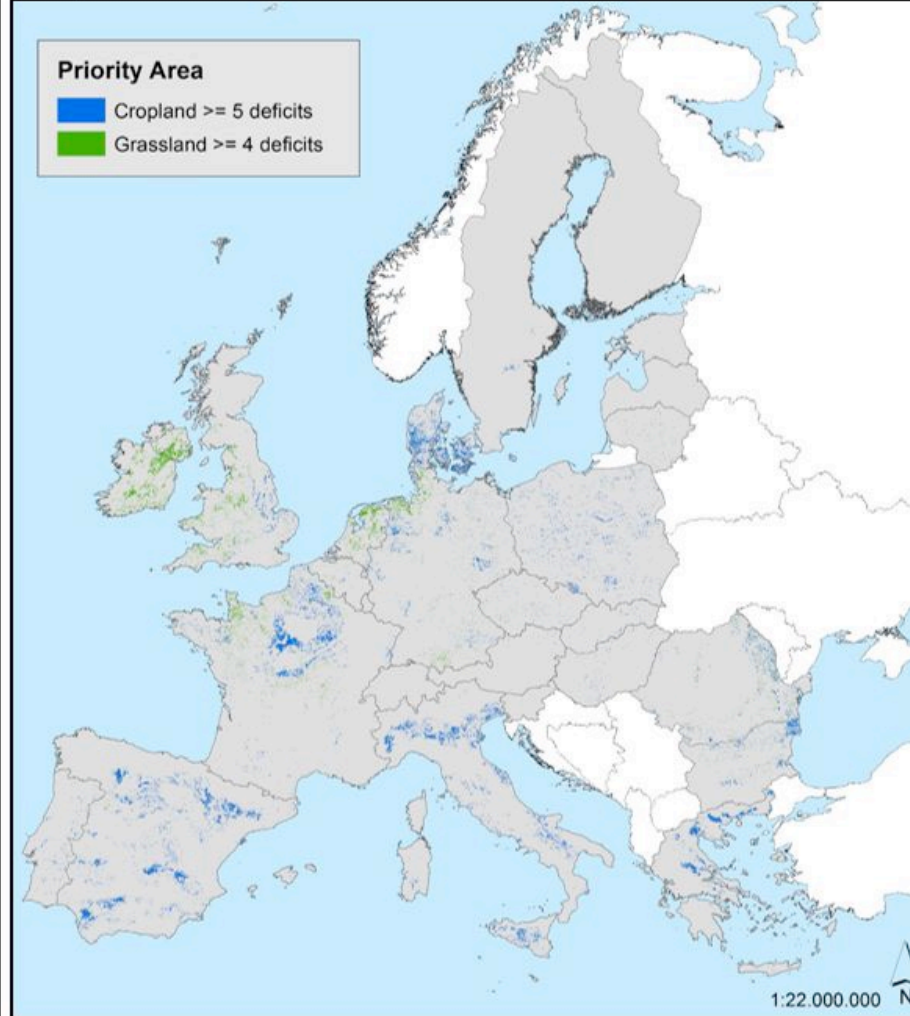
a)



converting 10% of farmlands into agroforestry could mitigate between **1 and 43%** of the agricultural greenhouse gas emissions, depending on the type of agroforestry introduced.



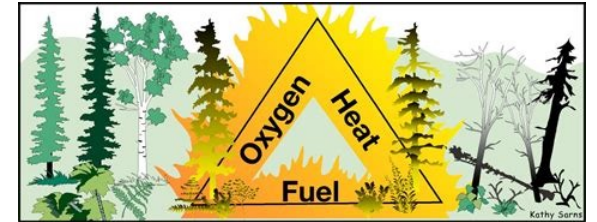
b)

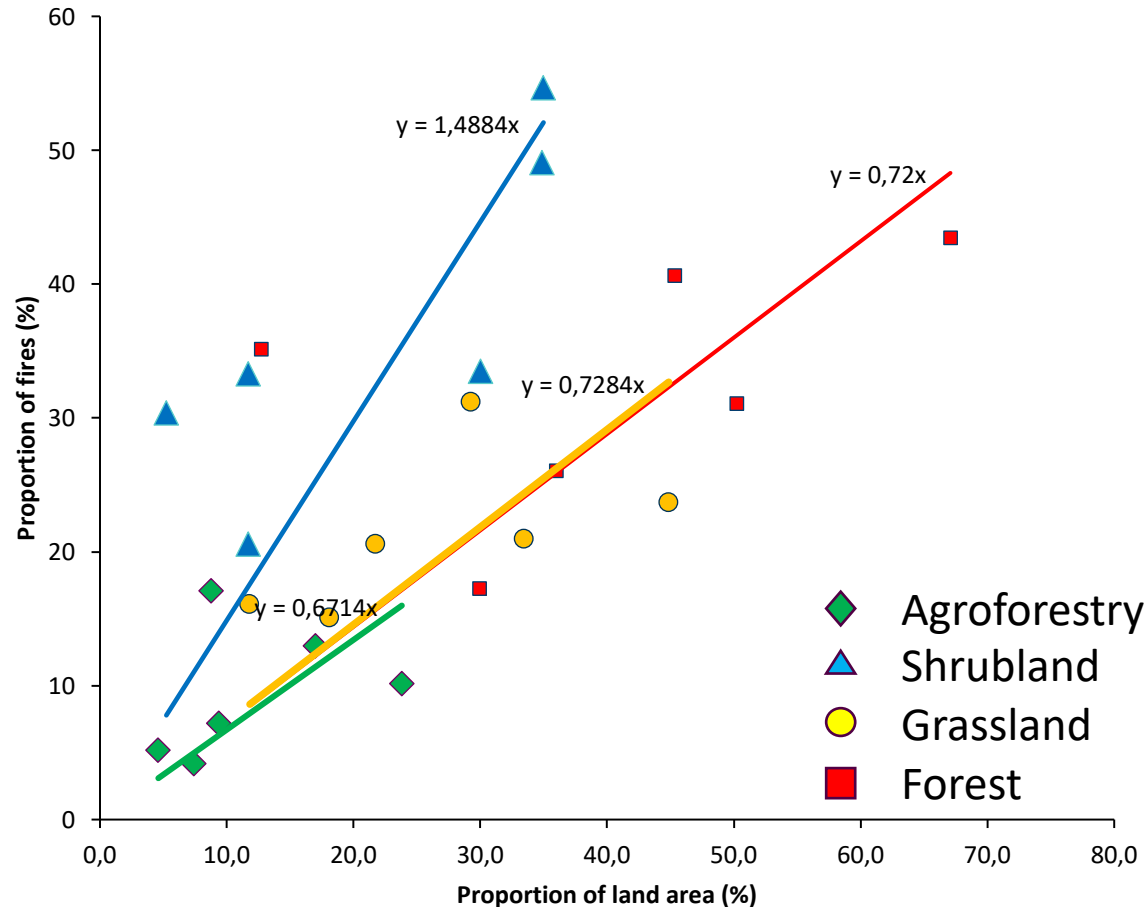


Agroforestry as a sustainable land use option to reduce forest fire risk in European Mediterranean areas

Christos Damianidis; J Javier Santiago-Freijanes; Michael den Herder; Paul Burgess; Maria Rosa Mosquera Losada; Anil Graves; Andreas Papadopoulos; Andrea Pisanelli; Francesca Camilli; Mercedes Rois; Sonja Kay; Joao Palma; Anastasia Pantera

- Frequency of megafires increasing
- Reasons: extreme + increasing temperatures and drought, strong winds, monocultures vs fragmentation, rural abandonment vs use and management of the understory/timber, increasing fuel load
- 2008-2017 93% of fires in Europe occurred in the Mediterranean area
- Countries Cyprus, France, Greece, Italy, France, Portugal and Spain
- 12 years fire data European Forest Fire Information System (EFFIS, 2018) > 30 ha + LUCAS & CORINE land use/land cover + GIS





Christos Damianidis et al. (submitted) Agroforestry as a sustainable land use option to reduce forest fire risk in European Mediterranean areas

- Fire incidents and the area burnt were lower in agroforestry areas
- In all the studied area only a small proportion (5.7%) of all fire incidents occurred in agroforestry land during the ten-year time span (2008-2017) compared to shrubland (40.6%) and forest (37.1%)
- Agroforestry with fewer wildfires than forests, shrublands or grasslands > **AGROFORESTRY is more RESILIENT landscape**

What are the main reasons for the farmers to practice conventional farming?

- 1 Tradition
- 2 Lack of knowledge on AF
- 3 Easier management
- 4 Small land to be maximized
- 5 Lack of time
- 6 Lack of subsidies for AF
- 7 High quality soil is a scarce resource to be maximized
- 8 Age
- 9 AF is not advantageous from an economic perspective, less productivity
- 10 Ownership of the land might be a limitation
- 11 Fine as they are
- 12 Might give AF a try



What are the main reasons for the farmers to practice agroforestry?

- 1 Tradition
- 2 Learning from others
- 3 Increasing diversification of products and their quality
- 4 Minimizing risks in production
- 5 Animal welfare
- 6 Aesthetics and cultural heritage
- 7 Primary vs second occupation
- 8 Research purposes
- 9 Environmental reasons
- 10 Improving quality of life
- 11 Marginal lands are not suitable for arable crops
- 12 Subsidies
- 13 Regulations



What are the main problems that the farmers face when implementing agroforestry?

- Problems with farm management (difficulty, work, animal management cost, fencing, finding animals, regeneration)
- Wild fauna problems (killing, stress, quality, local institutions not acting)
- Regulation (law) problems (forest land, forest service > no animals, no use of hedgerows)
- Property rights problems
- Lack of knowledge
- Bureaucracy problems
- Low profitability, expenses and product price fluctuations
- No problems



Farmer's study: main message

- The main **drivers** for the farmers, conventional or agroforestry farming,
 - **tradition** in the family or the region and continue with the existing system since old times
 - the **knowledge** on existing successful practices
- Lack of **awareness** on agroforestry in own farms
- Many farmers would be **willing** to implement agroforestry if they would have available more **knowledge** on those, their profitability, benefits and practical know-how.
- **Subsidies** within the CAP should favour this type of farming with more funding (25 measures simplified!), which should also be explained thoroughly and encouraged by the **extension services**, increasing the awareness of grants available besides the practical knowledge on the management and alternatives.
- Raising **awareness of the consumers** on the quality of the agroforestry **products** and the **ecosystem services** provided by the agroforestry systems is also essential for encouraging farmers to practice agroforestry.

Proyecto AFINET (2017-2019)



Seguir a @AFINETproject 1.230 seguidores

Tweets por @AFINETproject

AFINET retweeted
EURAKNOS
 @euraknos
 October newsletter is out, and available in 10 languages. Share thematic networks news! @ProjectDisarm @EU_PIG @Inno4Grass @SheepNetEU @AFINETproject mailchi.mp/d1e90371e0c0/e...



AFINET

Los sistemas agroforestales (SAF) son un tipo de práctica de *climate-smart agriculture* (CSA), que consisten en introducir deliberadamente vegetación leñosa (árboles o arbustos) en cultivos agrícolas y/o ganaderos, para beneficiarse de las resultantes interacciones ecológicas y económicas.

Basados en la importancia tanto económica como medioambiental de esta actividad, un consorcio de 13 socios de 9 países europeos lanzan AFINET (Redes de Innovación Agroforestal), una red temática destinada a promover el intercambio y la transferencia de conocimiento entre científicos y profesionales dedicados al sector agroforestal. AFINET actuará a nivel europeo para poner en práctica los resultados de diferentes investigaciones y promover ideas innovadoras que ayuden a los profesionales a superar desafíos y problemas. Para conseguir este objetivo, AFINET propone una metodología innovadora basada en:

- (i) La creación de una red interregional europea, formada por "Redes Regionales de Innovación Agroforestal" (RAINs, por sus siglas en inglés), grupos de trabajo en 9 regiones europeas estratégicas (España, Reino Unido, Bélgica, Portugal, Italia, Hungría, Polonia, Francia y Finlandia), interconectadas y articuladas en torno a los "Agentes de innovación". Las RAINs representan diferentes condiciones climáticas, geográficas, sociales y culturales, e incluyen un balance representativo de



19-09-2019

AFINET promueve el intercambio de experiencias agroforestales más allá de las fronteras



18-09-2019

Lee las fichas técnicas de innovación de AFINET que abordan las lagunas de conocimiento identificadas por los actores agroforestales durante las reuniones de RAIN



18-09-2019

Lee las fichas técnicas de AFINET que muestran innovaciones



THE WHAT AND WHY

Why mushroom cultivation?

For many of the more than 400 thousand private forest owners in Finland, forestry is an additional source of income. However, the income generated from harvesting small-diameter trees during thinning is quite low and amounts to just a couple of euros per tree. Active mushroom cultivation in forests can markedly increase the earnings from forests. Mushroom cultivation is a way to create value from forests, can yield anywhere between 1 year from inoculation to as much as 8 years with chaga (Pleurotus chaga). In addition, it is an ecologically friendly way of increasing forest production in

forests, instead of producing only wood as a raw material. The forest now also delivers high-quality food. Moreover, mushroom cultivation on living trees can be applied to an ecological forest management tool saving costs on thinning operations. There are intensive mushroom cultivation techniques which will produce a mushroom harvest every year, as well as more extensive techniques producing a mushroom harvest every 5-8 years. The more extensive techniques are particularly suitable for forest owners who live far away from their forest or for people without much time.



Shiitake mushrooms grow on birch logs, Finland. Photo: Michael van der Meer

Shiitake mushrooms grow on birch stumps in mixed forest on the Suomen Agrotietus in forest farm. Photo: Michael van der Meer

HOW IS THE CHALLENGE ADDRESSED

Managing a mushroom forest farm

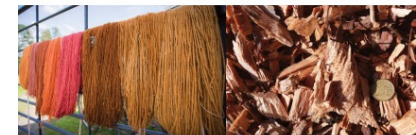
Shiitake, oyster (Pleurotus ostreatus) and lingzhi mushrooms (Ganoderma lucidum) are grown on logs. Shiitake and oyster for lingzhi is a medicinal mushroom species per log (about 10 cm in diameter). In general, from early in the logs with a 10-cm diameter, shiitake and lingzhi can be harvested twice during the growing season, with about 8 weeks between harvests. A log can produce mushrooms for about 3-4 years. Chaga is a medicinal mushroom used in Asia and it is grown on birch trees. After inoculation, the first chaga mushrooms are harvested after 5-6 years. Therefore, it is still possible to get two additional mushroom harvests every fifth year after the last harvest until the tree dies after about 15 years. However, there can be harvested and sold as the or fine wood. This mushroom cultivation method can be used as a forest management tool by selecting those birches which will be cut later on during thinning.



THE WHAT AND WHY

How can a farm contribute to circular bioeconomy?

Economic growth has usually been at the expense of the environment. The need to change our development to a more sustainable economic model, makes bioeconomy to be part of the solution to address some of the most eminent European and global challenges: climate change, biodiversity loss, forest fires, the ocean plastic... Furthermore generating less residues across the value chain and recycling those still produced is also key to



Various different colors

Wood chips being used for biomass

HOW IS THE CHALLENGE ADDRESSED

Which bio-based products can be produced in agroforestry systems?

Tree and shrub products
 Activities like pruning or felling produce biomass that can be used as fuel (pellets, biochar), soil amendment, compost or mulching material. These provide timber for construction, but also wood-based textile fibres (lyocell, viscose). These like birch and maple provide sap as drink or sweetener. Juice can also be made from spruce needles. Alternative uses of cork are insulation and floors, in transport vehicles and the aerospace industry.

Livestock products
 It is possible to make textile fibres from powdered milk. Other by-products from livestock are wool used for textiles or insulation materials, bone meal as crop fertilizer, or manure as mulch, fertilizer or biofuel. Dairy whey can have several uses as lactic acid in probiotics, green solvent, natural preservative, biostimulant and in bioplastics and personal care products.

Crop products
 Many fibre rich crops are now used as a source of carbon fibre for cars, planes, tennis rackets, wind turbine blades. Maize, wheat, sugarcane, sorghum can be used to generate bioethanol and bioenergy. Agricultural by-products can be converted into biogas and biochar. They can be used to produce bioplastics for packaging, cutlery, plates, or even toys. Sugar beet pulp provides cellulose for personal care products or detergents and paints, arabinose for flavors. Cane sugar provides organic acids for lubricants and cosmetics, and can be used for energy and feed. Fruits and vegetables not reaching a commercial quality can be used for juices, jams or as food for animals.

Responsible diversification innovation
 Responsible diversification innovation: agroforestry systems that produce multiple products, using little products reducing waste, risk and forest products.



FOODLEVERS (2020-2023)

LEVERAGE POINTS FOR ORGANIC AND SUSTAINABLE FOOD SYSTEMS

- Actualmente muchos sistemas alimentarios son insostenibles
- Puntos de intervención vs causas insostenibilidad
- Buscar puntos de intervención con más relevancia (Abson et al. 2017):
 - Re-connect people to nature
 - Re-structure institutions
 - Re-think knowledge sharing

FOODLEVERS

Organic and sustainable food production systems across different European countries

Casos de studio

- Biodynamic farming (DE, UK)
- Silvopastoral systems with walnut and olive grazed by hens (agroforestry)(IT)
- Grass-fed organic and silvopastoral systems (agroforestry)(PL)
- Permaculture (RO)
- Mushroom cultivation in forest farming (FI)
- Certification, production techniques, Community-Shared Agriculture (CSA)(BE)

- Sistemas multidisciplinarios y multiactor > dimensiones, actores, sinergias y trade-offs
- Evaluación de sostenibilidad (SAFA) y servicios ecosistémicos (CICES), Análisis Ciclo de Vida
- Sistema innovador vs Sistema de referencia (orgánico convencional)
- Modelizar escenarios: potencial de cambios pequeños que puedan favorecer una transformación a cambios mayores hacia sistemas alimentarios más sostenibles y resilientes



Mainstream conventional shiitake cultivation

Indoor cultivation

Polar shiitake Oy, Rääkkylä

Farm in Kitee?





Innovative mushroom cultivation

Shiitake & oyster mushrooms
in forests

Truffle orchards

Innovative mushroom cultivation – case II (optional)

- A circular urban mushroom farm
- Oyster mushrooms



Helsieni oy, Espoo

Innovative mushroom cultivation – case III (optional)

- Cultivation of medicinal mushrooms in forests, chaga and lingzhi (reishi)



Chaga mushroom *Inonotus obliquus*



Reishi (Lingzhi) mushroom
Ganoderma lucidum



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Digitalización forestal

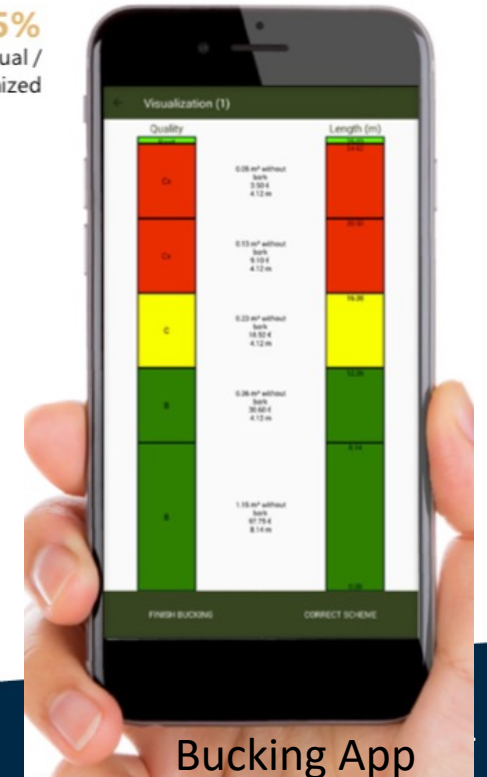
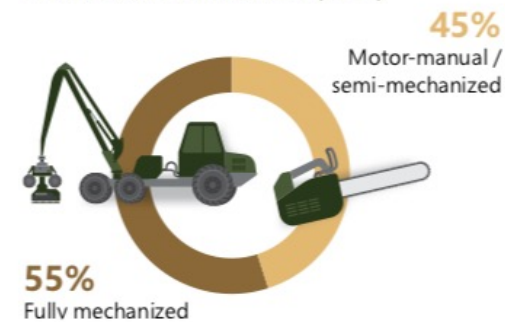
TECH4EFFECT

Ante aumento demanda de madera

- Mejorar la eficiencia de la gestión forestal:
 - Gestión de datos (obtención, tratamiento, flujo)
 - Mejora tecnología (sensores, extracción terrenos pendiente, seguridad,, vibraciones, consumo combustible...)
- Acceso y movilización a los recursos madereros
- Eficiencia corta, infraestructura, datos
- Reducir impactos en el suelo, árboles... (mapas, sensores)
- Equilibrio: ambiental, económico y social

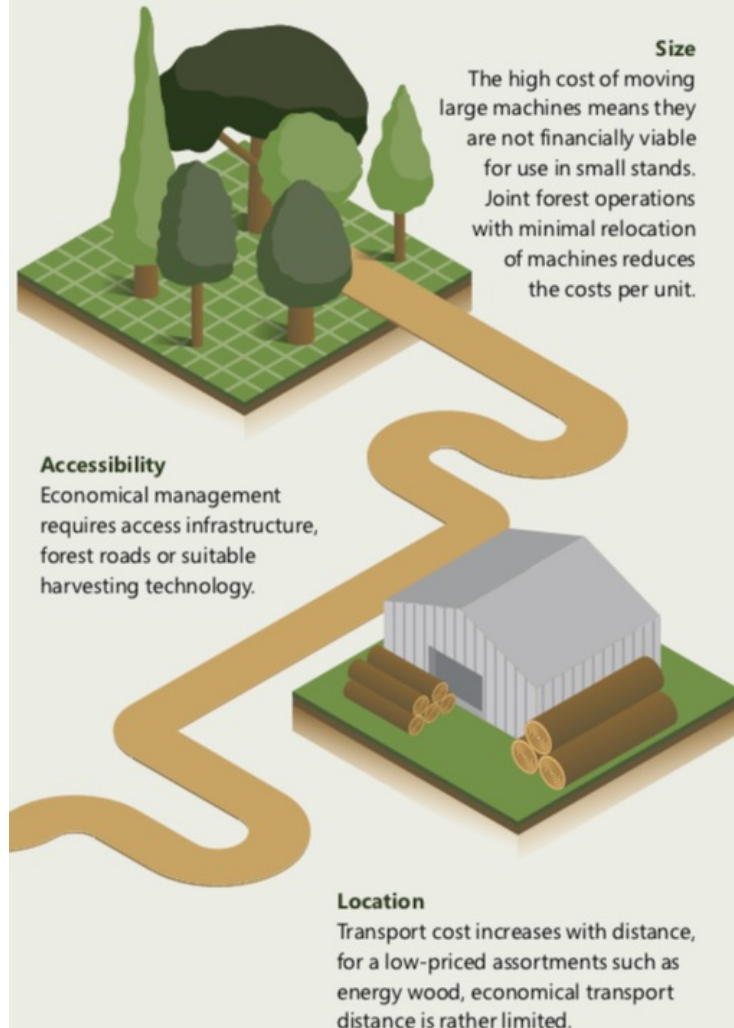


CURRENT WOOD VALUE CHAINS (EU-28)



WHAT FACTORS AFFECT THE MOBILIZATION VOLUMES OF FOREST BIOMASS?

Forest stand characteristics



Forest owner characteristics

Age and location

Older owners typically live near their forest, while younger generations often live in urban areas far away from forests they may have inherited.

Education

Owners with traditional knowledge or formal training in forestry are likely to be more aware of the various aspects of forest management.

Motivation

The question of whether owners wish to produce timber or want to use their forest differently, e.g. for recreation.



External factors

Cost

(Precommercial) thinnings are an investment that may not bring high or immediate financial return.

Policies and legislation

Guidance for forest owners is available, but not necessarily easy to find and interpret for non-professionals.



WHAT FACTORS AFFECT PRODUCTIVITY?

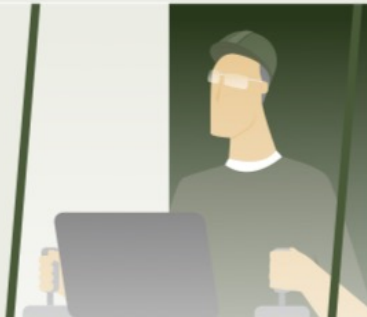
Used technology

The choice of technology has the biggest impact on productivity.



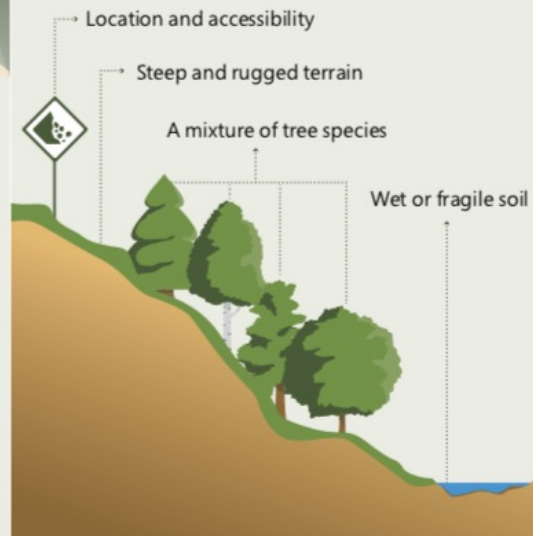
Operator

The person handling the machine has a pronounced influence on the productivity, the so-called Driver effect³.



Stand characteristics

The forest can determine the productivity of the operation. Characteristics that make the operation more difficult, slower and less productive include:



Average stem size (in dm^3 or m^3) and removal volume (m^3/ha)

The bigger the harvested trees are and the more trees are removed during one felling, the more volume can be handled per machine hour.



Unit size

Felling operations on a bigger forest stand (ha) or on connected forest sites reduces the amount of time (and costs) for relocating the harvesting machinery and thus also increases productivity.



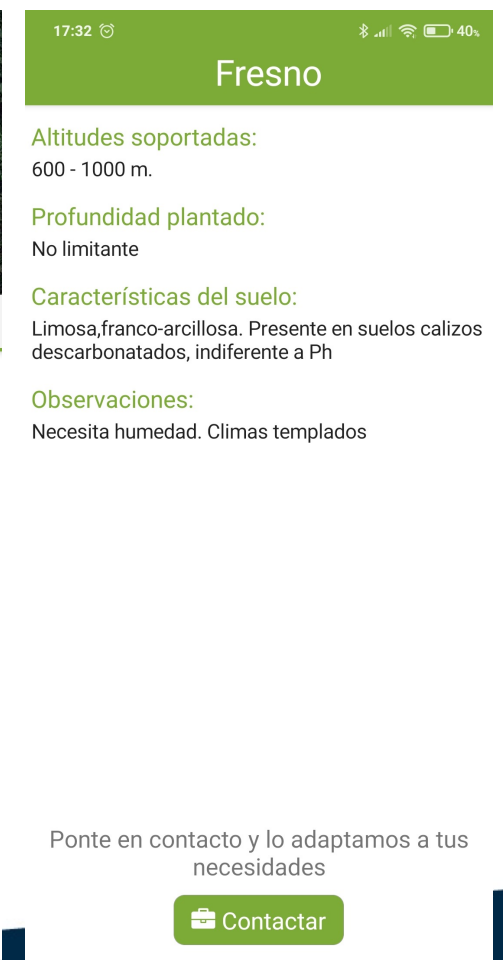
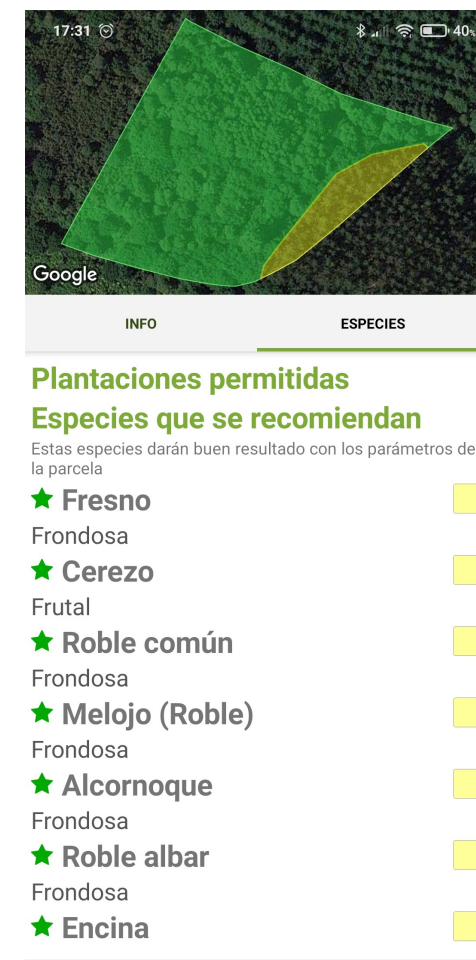
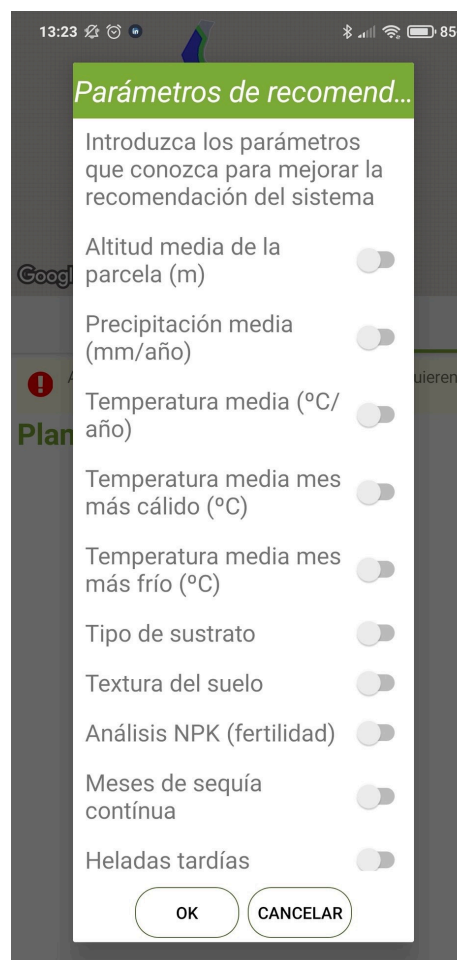
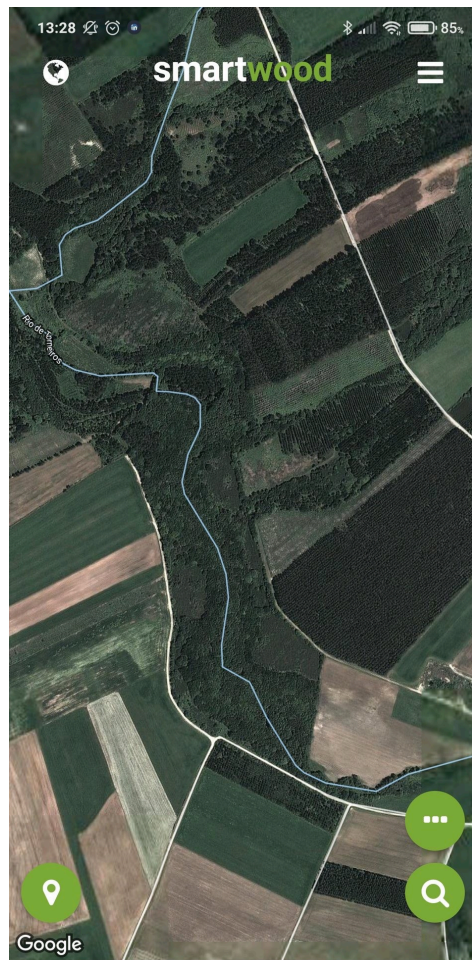
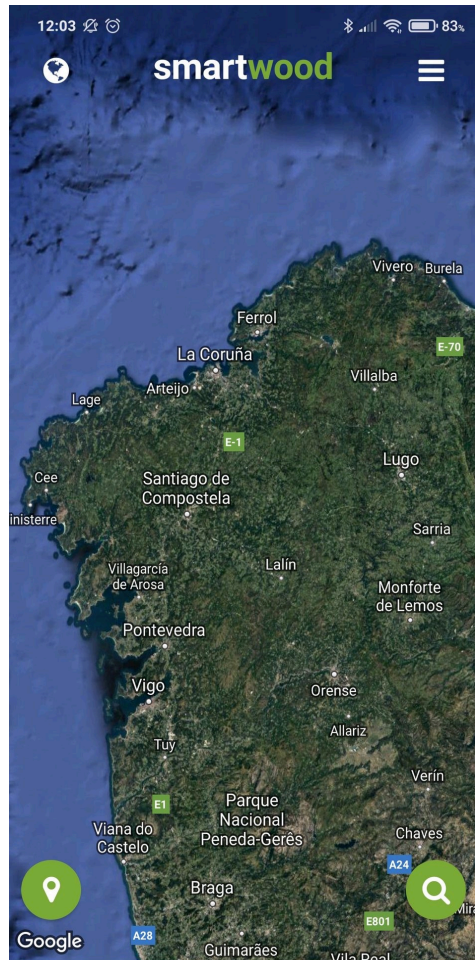
Number of assortments

Each assortment requires separate sorting: first presorting while cutting by the harvester in the forest stand to speed up the hauling process for the forwarder. And then at the forest roadside by the forwarder as different hauls and heaps.



Digitalización forestal

FOE Forest Ownership Empowerment



Digitalización forestal

FORTRA Forest Traceability



Idiomas
disponibles

PRODUTO Nome e características técnicas.
Nome da compañía e contacto (páxina web).
Cantidade: número e unidades.
Cálculo valor pegada de carbono (-kg).
Deforestación "O".
Data de elaboración.



ORIXE (un ou varios lotes de corta):
Porcentaxe de uso de cada lote
Localización (lugar e ref. catastral)
Nº e data expediente admin. de corta.
Enlaces web localización cartográfica.
Especies, volumes, CO₂ absorbido.
Certificación forestal.
Fotografías (opcional).



OPERACIÓNS DE PROCESADO
Relación de todas as operacións:
Número lote, unidades.
Data de operación.
Localización centro procesado
→ política proximidade (Qm "O").
Fotografías (opcional).



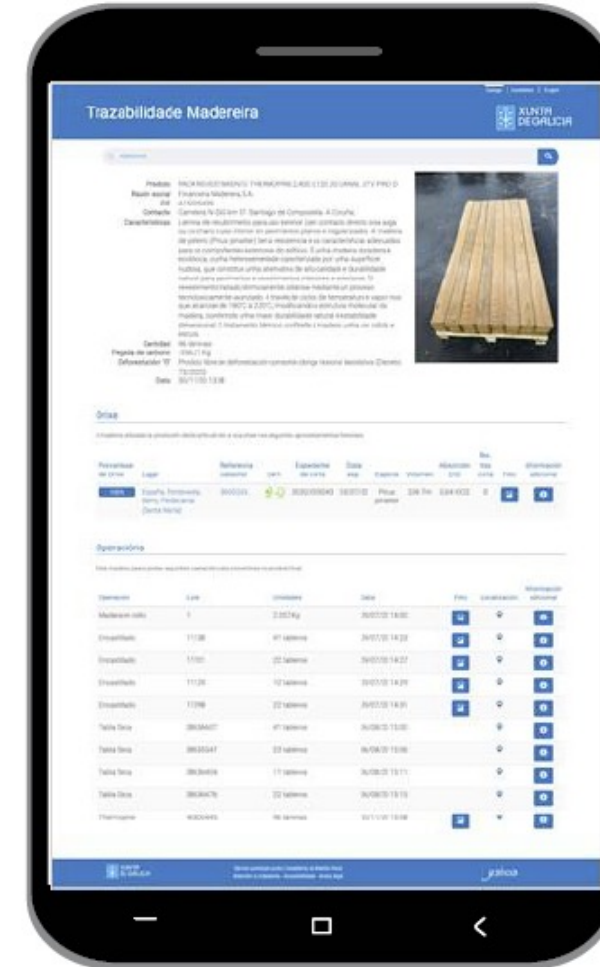
BLOQUE 1 BLOQUE 2 BLOQUE 3



APLICACIÓN
WEB PÚBLICA



O cliente ou consumidor escanea un código QR na etiqueta do produto.





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Por qué educación forestal? #Hazlasuma

*"La **educación** es el arma más poderosa que puedes usar para cambiar el mundo". (Nelson Mandela)*

+

*"Los **bosques** son vitales para alcanzar los Objetivos de Desarrollo Sostenible 2030". (Naciones Unidas)*

*"La **educación forestal** es el arma más poderosa para cambiar el mundo con desarrollo sostenible".*



Juan Picos, UdV, 2021

Conclusiones

- Necesitamos transformar una **economía lineal** basada en **combustibles fósiles** en un **bio-economía circular**
> **ODS y Acuerdo de París**
- Pandemia COVID > reconstrucción verde
- El **uso de la madera** aumentará en el futuro: construcción, textiles, embalaje, químicos, biocombustibles (energía), prótesis, alimentación...
- **Absoluta oportunidad para nuestros bosques!**
 - Agricultores y propietarios forestales, pieza clave en la bioeconomía, reto y oportunidad para el rural
 - Formación a todos los niveles (primaria – universidad, agricultores/selvicultores)
 - Diálogo productores/extension/investigación/industria/administración
 - Gestión inteligente climáticam. (especies, gestión, turnos...) > diversificación especies, selvicultura de calidad (ej. ARUME)
 - Cooperación con otros sectores: construcción, automóvil, textil, etc
 - Desarrollo industria 2a transformación, diversificación productos
 - Impulso: políticas adecuadas, compra pública, colaboración público-privada
 - Pagos por servicios ambientales PES
 - Concienciación social: demanda de los consumidores finales, cambio de patrones de consumo



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Gracias!

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