

OBIETTIVO TERRA 2030 VS 2050

LE TRANSIZIONI DEL XXI SECOLO, PRINCIPI ESG



SI PUÒ INVERTIRE IL TREND

ORE 17.15 PRESSO IPLA

CORSO CASALE, 476 - TORINO

Foreste, clima e transizione ecologica

Renzo Motta

Università di Torino

SISEF

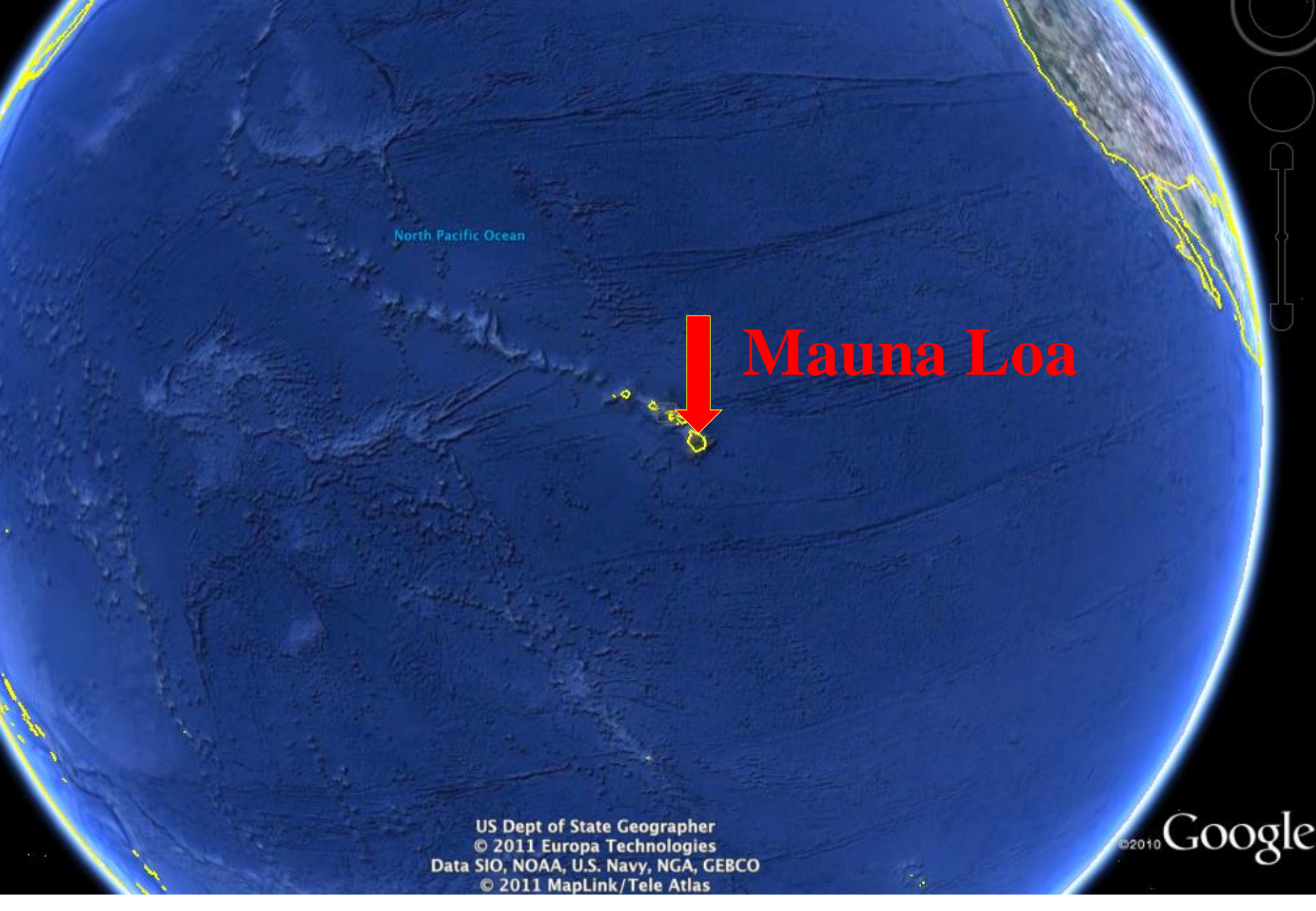
Fond. Alberitalia



UNIVERSITÀ
DI TORINO

Alberitalia





North Pacific Ocean

Mauna Loa

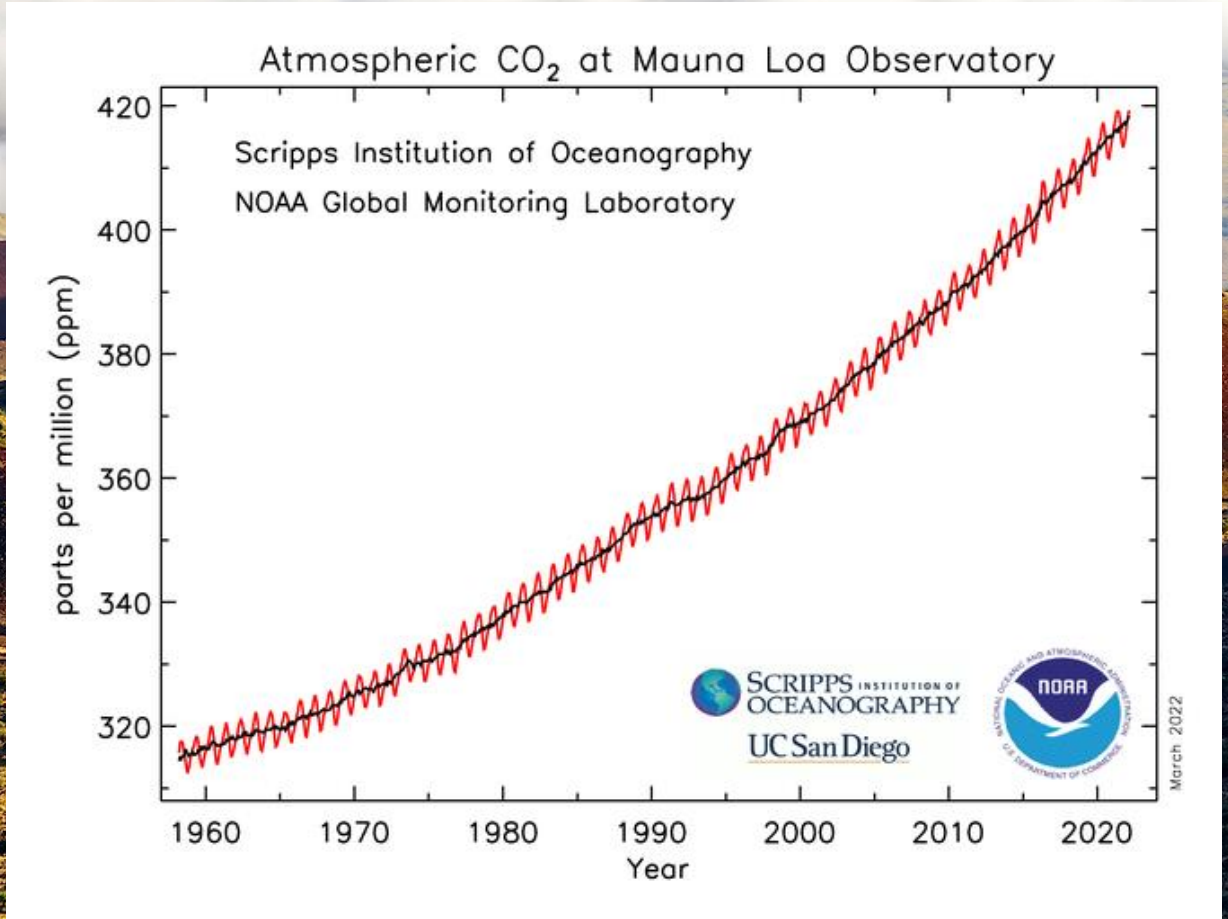
US Dept of State Geographer
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REWARDS AND PENALTIES OF MONITORING THE EARTH

Charles D. Keeling

Scripps Institution of Oceanography, La Jolla, California 92093-0220





United Nations
Climate Change



UN CLIMATE CHANGE
CONFERENCE UK 2021

IN PARTNERSHIP WITH ITALY

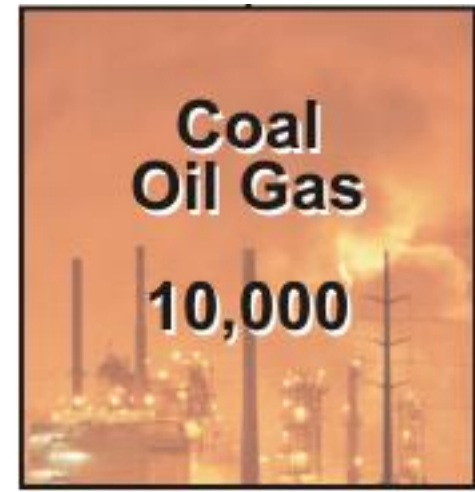


COP 26 Glasgow: le foreste al centro del mondo

Global sinks of carbon



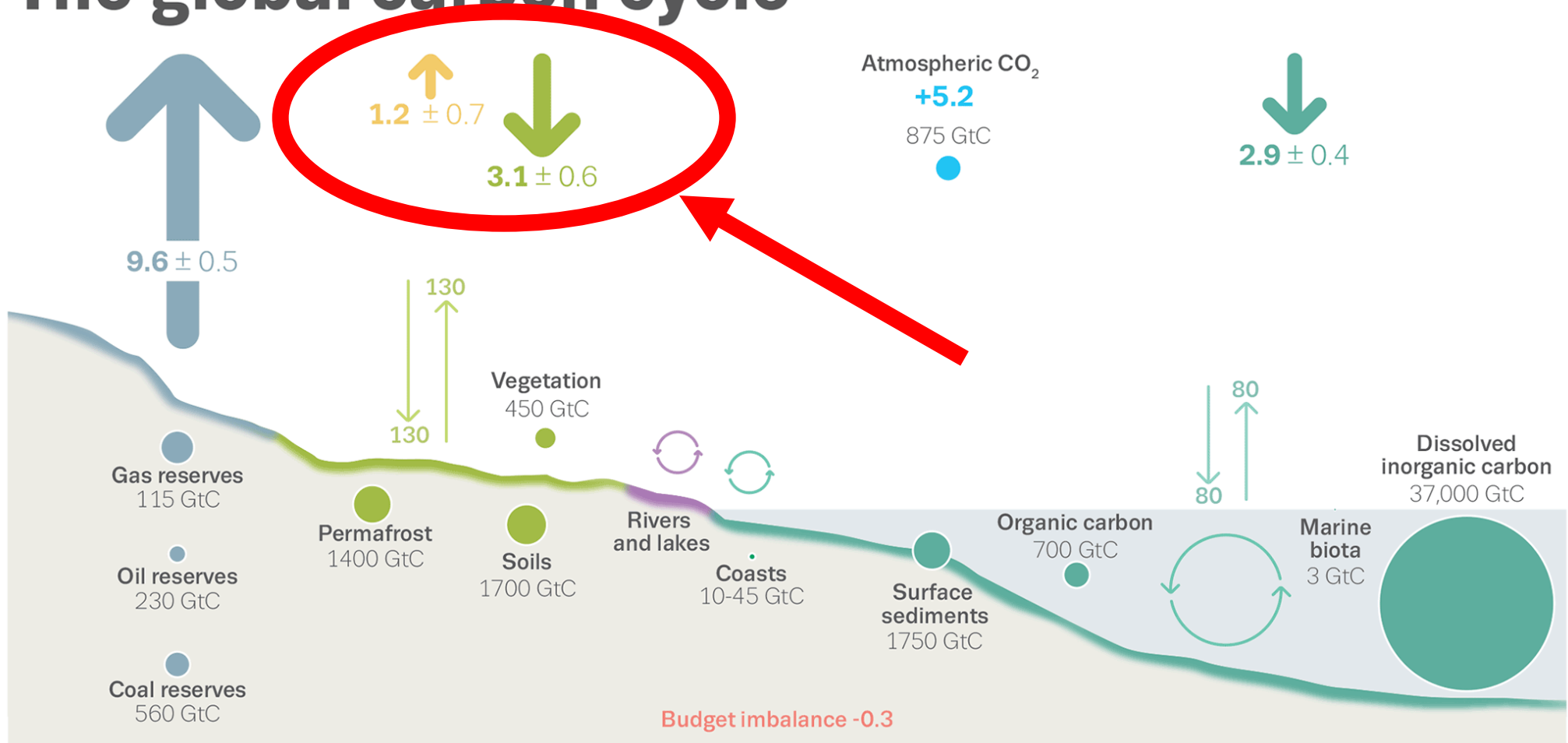
Relatively small sink



The planet earth is (approximately) a closed system

Gigatonnellate di carbonio (1Gt = 1 miliardo di tonnellate)

The global carbon cycle

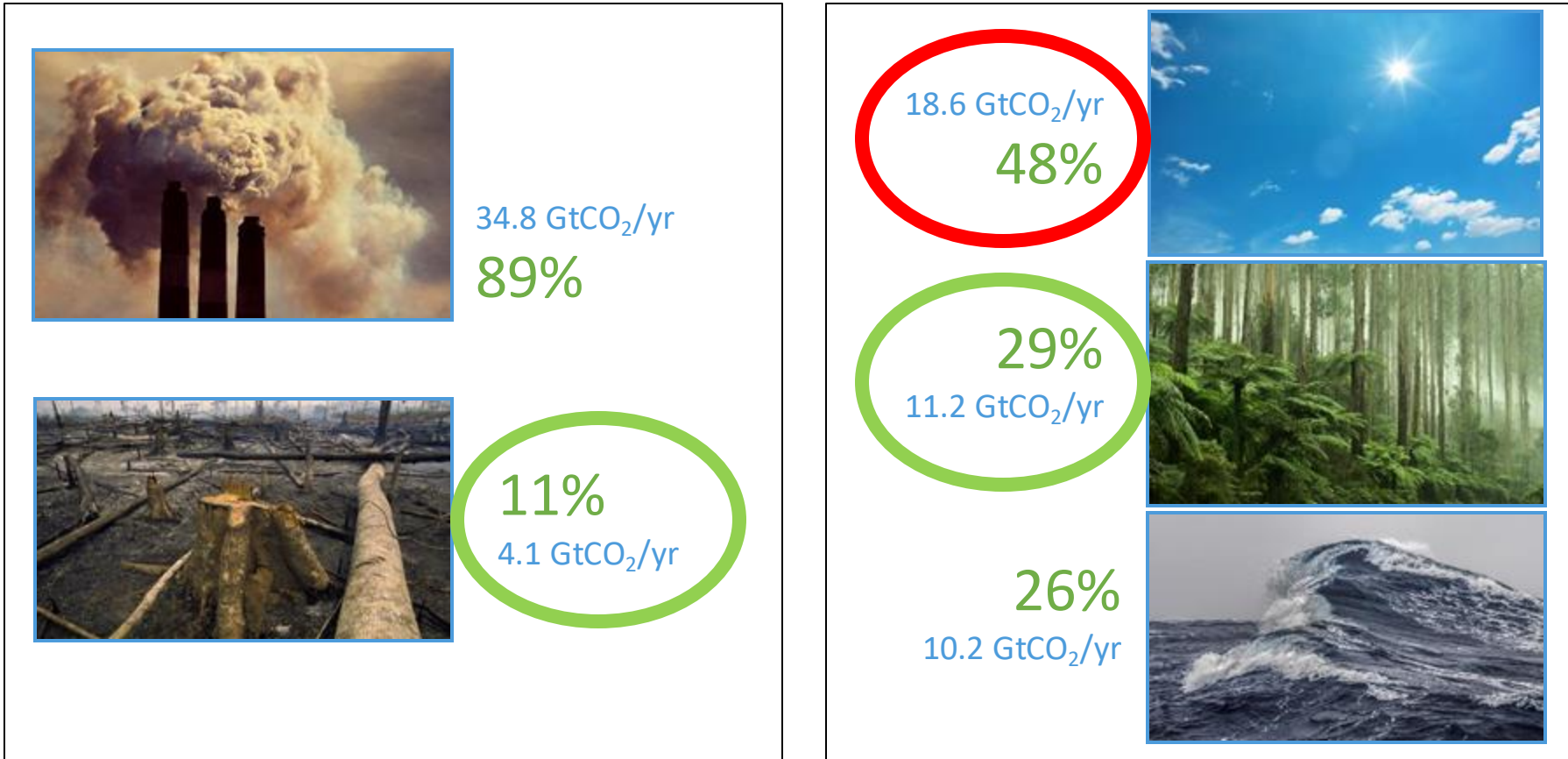


Anthropogenic fluxes 2012-2021 average GtC per year

- ↑ Fossil CO₂ E_{FOS}
- ↓ Land uptake S_{LAND}
- ↑ Land-use change E_{LUC}
- ↓ Ocean uptake S_{OCEAN}
- ↑ Carbon cycling GtC per year
- Stocks GtC
- + Atmospheric increase G_{ATM}
- Budget Imbalance B_{IM}

Fate of anthropogenic CO₂ emissions (2011–2020)

Sources = Sinks

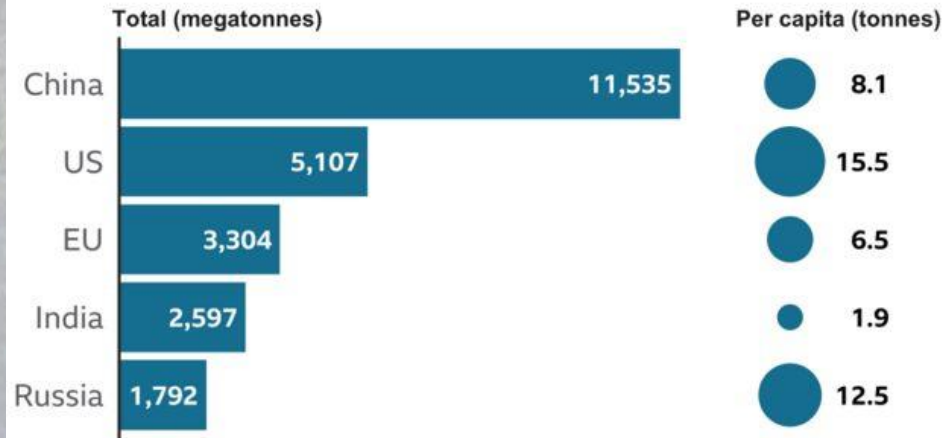


Budget Imbalance:
(the difference between estimated sources & sinks)

3%
-1.0 GtCO₂/yr

Countries which emit the most carbon dioxide

Total and per capita emissions of CO₂ per year

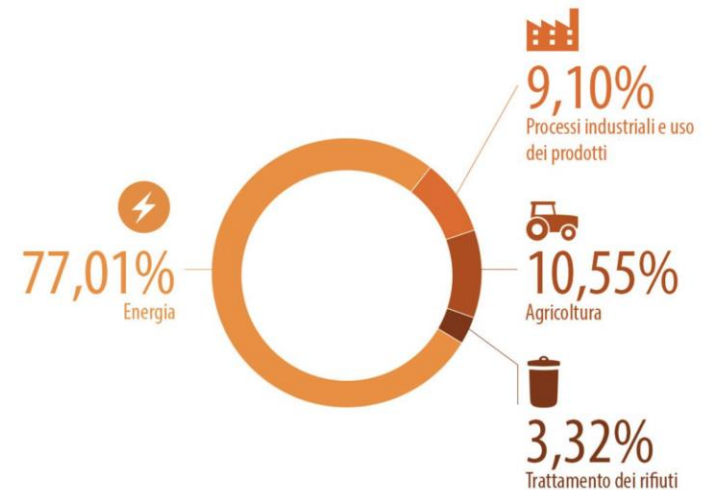


2019 data, EU includes UK
One megatonne = 1,000,000 tonnes

Source: EC, Emissions Database for Global Atmospheric Research



Emissioni di gas serra nell'UE divise per settore* nel 2019



*Tutti i settori esclusi uso del suolo, cambiamenti di uso del suolo e silvicoltura (LULUCF)

TOTAL GREENHOUSE GAS EMISSIONS



1990

2020

Source: World Bank

Europe's Terrestrial Biosphere Absorbs 7 to 12% of European Anthropogenic CO₂ Emissions

Ivan A. Janssens,^{1*} Annette Freibauer,² Philippe Ciais,³ Pete Smith,⁴ Gert-Jan Nabuurs,^{5,6} Gerd Folberth,³ Bernhard Schlamadinger,⁷ Ronald W. A. Hutjes,⁵ Reinhart Ceulemans,¹ E.-Detlef Schulze,² Riccardo Valentini,⁸ A. Johannes Dolman⁹

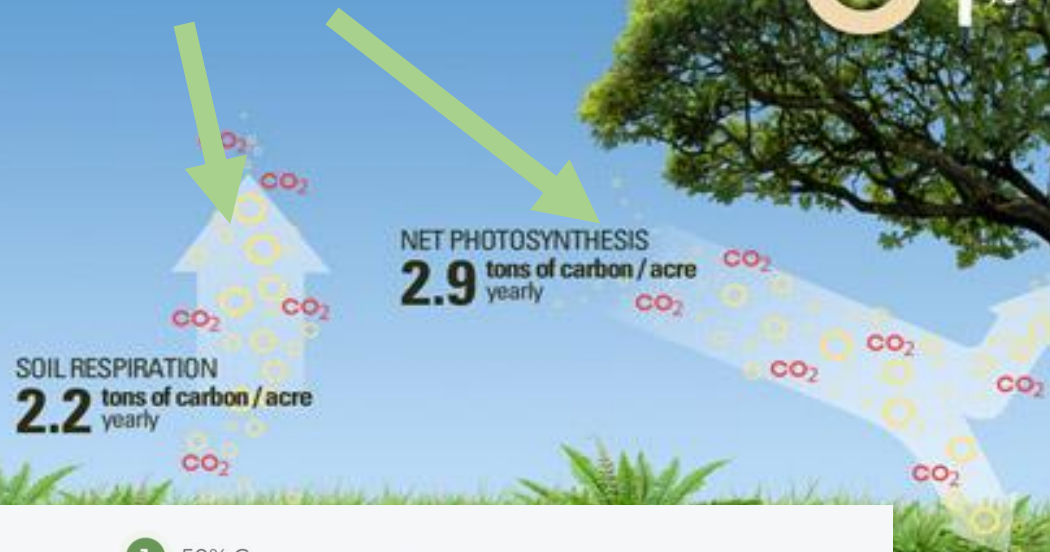
Most inverse atmospheric models report considerable uptake of carbon dioxide in Europe's terrestrial biosphere. In contrast, carbon stocks in terrestrial ecosystems increase at a much smaller rate, with carbon gains in forests and grassland soils almost being offset by carbon losses from cropland and peat soils. Accounting for non-carbon dioxide carbon transfers that are not detected by the atmospheric models and for carbon dioxide fluxes bypassing the ecosystem carbon stocks considerably reduces the gap between the small carbon-stock changes and the larger carbon dioxide uptake estimated by atmospheric models. The remaining difference could be because of missing components in the stock-change approach, as well as the large uncertainty in both methods. With the use of the corrected atmosphere- and land-based estimates as a dual constraint, we estimate a net carbon sink between 135 and 205 teragrams per year in Europe's terrestrial biosphere, the equivalent of 7 to 12% of the 1995 anthropogenic carbon emissions.

Science
JOURNALS AAAS

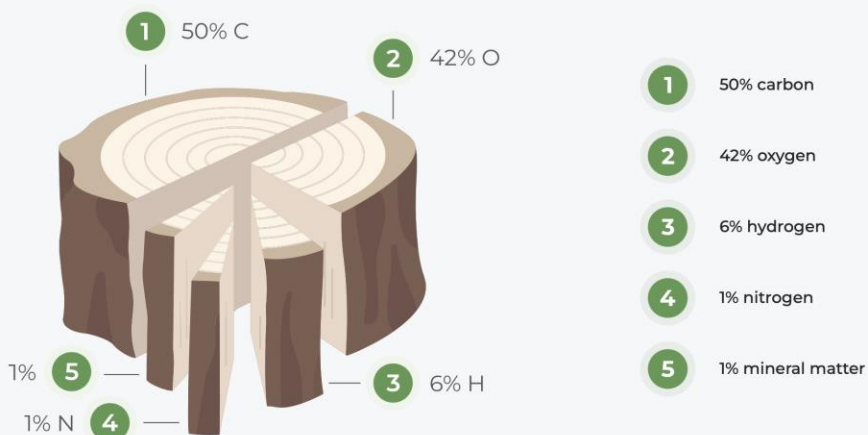
WHERE DOES CARBON GO?

CARBON STORAGE IN A GREAT LAKES FOREST

Fluxes



Stock





Background Analytical Study



Forests and Climate Change

Duncan Brackⁱ

1) Sequestration/surface

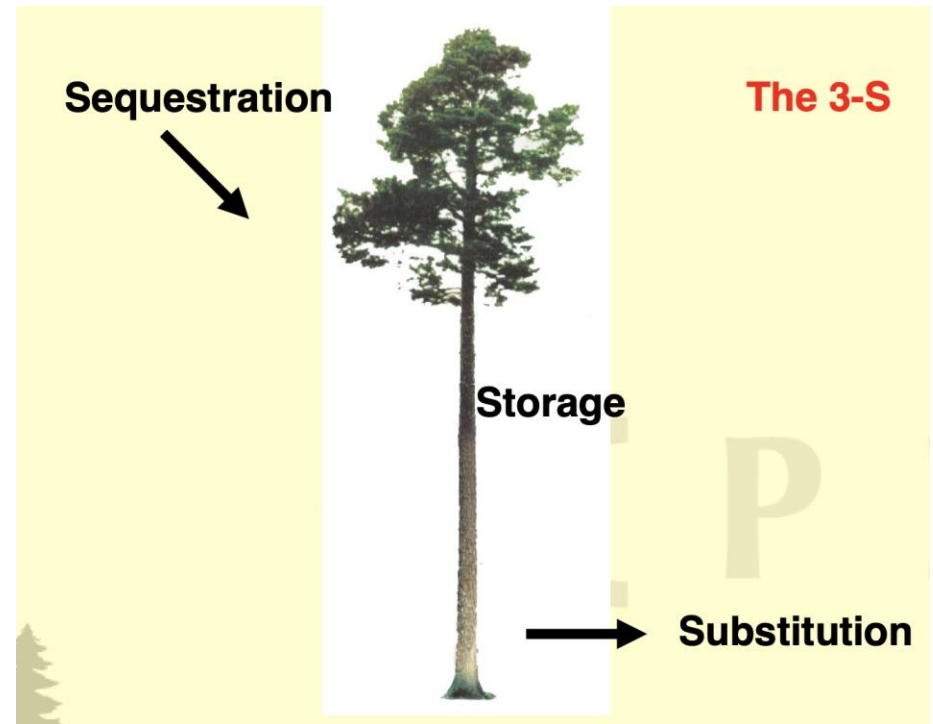
Reduce REDD, afforestation

2) Storage/biomass

Sustainable forest management, Forest reserves, prevent/mitigate natural disturbances

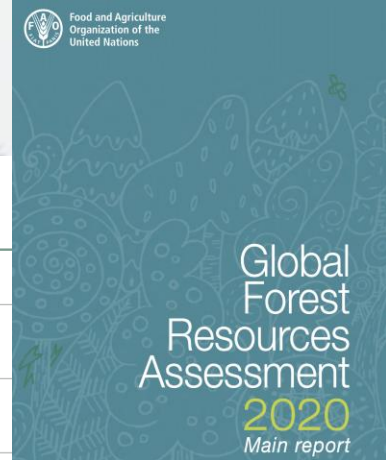
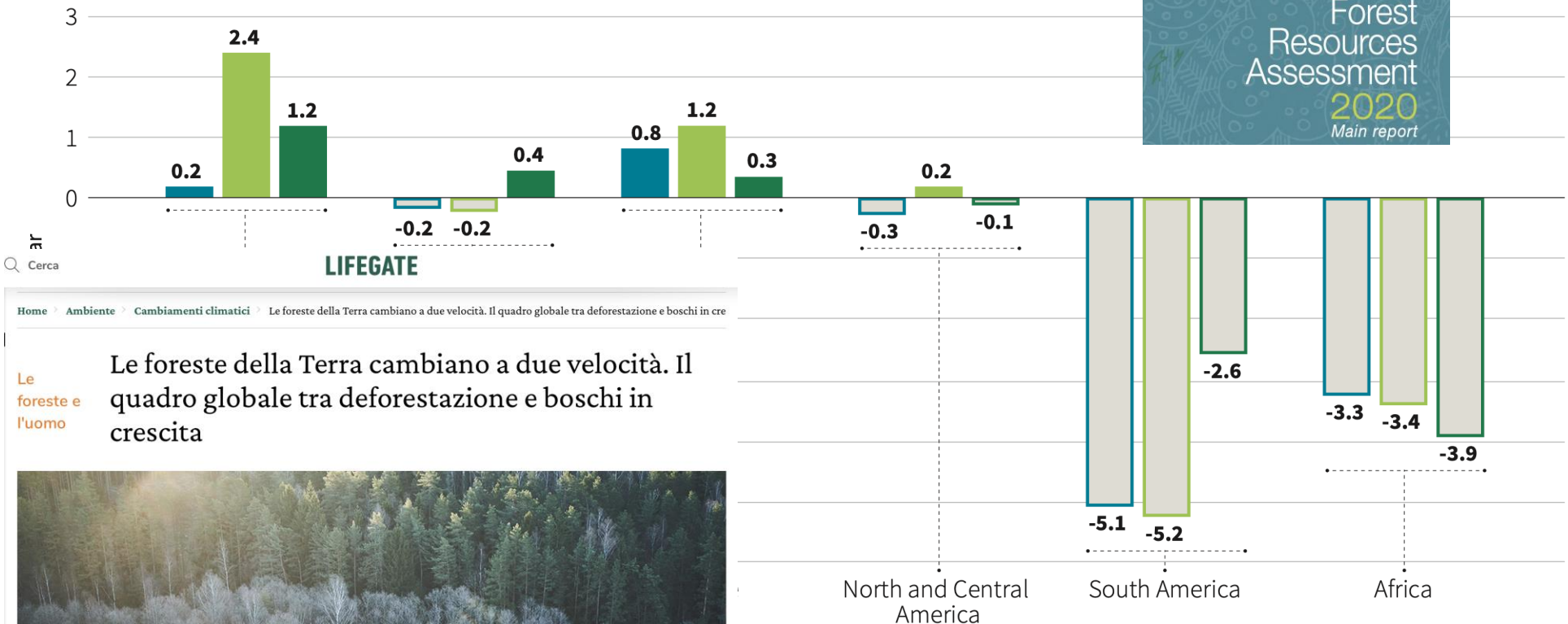
3) Substitution/products

Wood products, bioenergy



1a) REDD

Annual forest area net change, by decade and region, 1990–2020



Home > Ambiente > Cambiamenti climatici > Le foreste della Terra cambiano a due velocità. Il quadro globale tra deforestazione e boschi in crescita

Le foreste della Terra cambiano a due velocità. Il quadro globale tra deforestazione e boschi in crescita

Le foreste e l'uomo

Le due velocità delle foreste della Terra © Unsplash

DEFORESTATION CONTINUES, BUT AT A LOWER RATE

REDD Reducing Emission from Deforestation and forest Degradation in developing countries

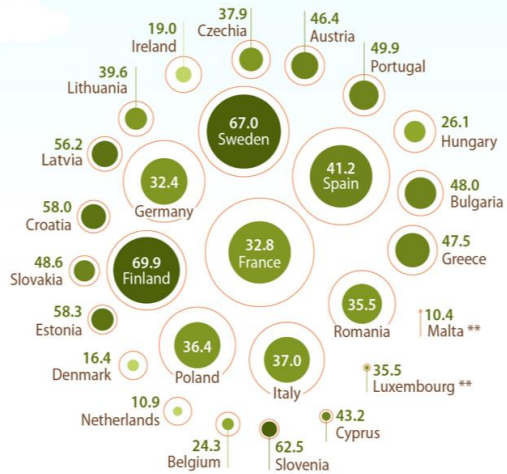
FORESTS IN THE EU

[2020] **159 million hectares**
of forests in the EU*

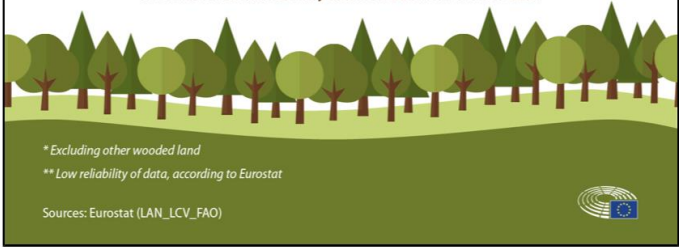
FORESTS* OCCUPY

[2018] **43.5%**
of the land in the EU-27

country surface |  % of forest ecosystems in comparison to the total land area



The forest area increased by almost **10%** from 1990 to 2020



* Excluding other wooded land

** Low reliability of data, according to Eurostat

Sources: Eurostat (LAN_LCV_FAO)

Quante foreste ci sono nell'UE?

REDD Reducing Emission from Deforestation and forest Degradation in developing countries

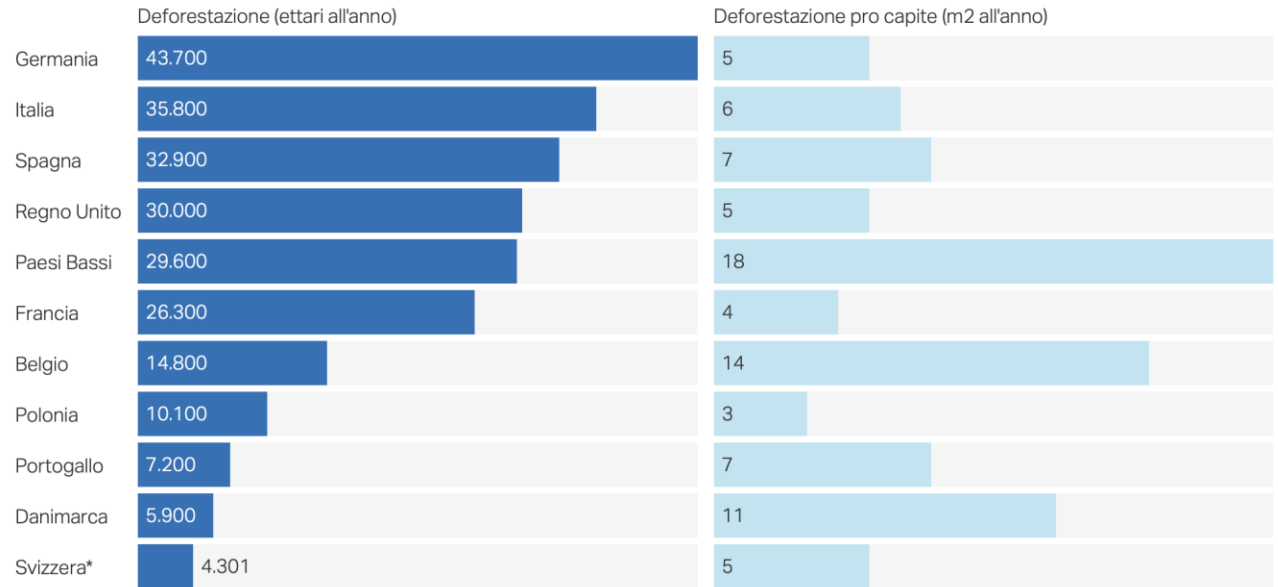


DEFORESTATION MADE IN ITALY



La "deforestazione importata" dell'Europa

Deforestazione tropicale causata da materie prime importate, usate e consumate nell'Ue nel periodo 2005-2017: lista dei dieci Paesi europei (più la Svizzera) con l'impronta di deforestazione maggiore.



* I dati relativi alla Svizzera si riferiscono al 2013 e si basano su uno studio dell'Università di tecnologia Chalmers di Göteborg

Fonte: [WWF](#) • [Scaricare i dati](#)

Climate and Environment

More than 100 world leaders pledge to halt deforestation by 2030

While the nations involved represent 85 percent of the world's forests, these pledges frequently fall short.



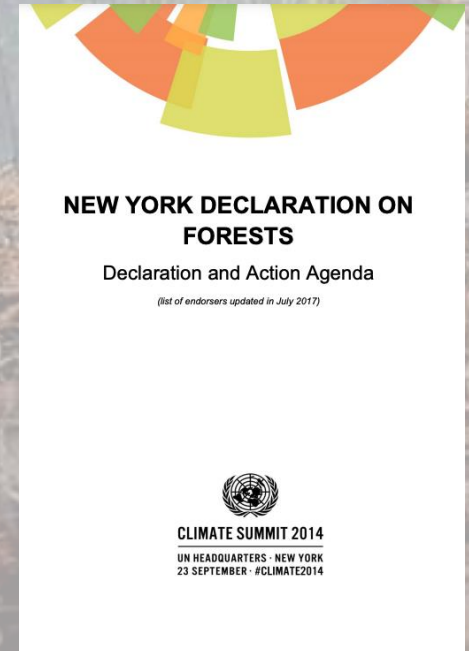
Cop26: world leaders agree deal to end deforestation

Historic declaration at Cop26 commits countries to ending major cause of CO2 emissions



An Objective already defined in the New York Declaration on Forests (2014) and even before in 1990 by ITTO: the "ITTO 2000 Objective"

With our varying mandates, capabilities, and circumstances, collectively we commit to doing our part to achieve the following outcomes in partnership, including by ensuring that strong, large-scale economic incentives are in place commensurate with the size of the challenge: at least halve the rate of loss of natural forests globally by 2020 and strive to end natural forest loss by 2030.





EU BIODIVERSITY STRATEGY

Bringing nature back into our lives



"Making nature healthy again is key to our physical and mental wellbeing and is an ally in the fight against climate change and disease outbreaks. It is at the heart of our growth strategy, the European Green Deal, and is part of a European recovery that gives more back to the planet than it takes away."

Ursula Von der Leyen, President of the European Commission



2,634,105
trees planted in the EU
as part of the 3 Billion Trees Pledge



Comunità Laudato si'

Un albero in più
HOME PAGE RETE DELLE COMUNITÀ ▾ DOWNLOAD ▾ NEWS MEDIA ▾ FORUM ▾ ATTI ▾ CASA F

Mancuso: «Piantiamo un albero per ogni italiano e ci salveremo»

Settembre 12, 2019, 5:13 pm 2857

Le Comunità Laudato si' che, prendendo a ispirazione l'enciclica di Francesco, si sono moltiplicate in Italia, lanciano l'appello albero in più. L'obiettivo è di piantare, in Italia, 60 milioni di alberi nel più breve tempo possibile



AMBIENTE

«Climate change? Basterebbe una foresta grande come gli Usa»

Parla il neurobiologo delle piante Stefano Mancuso: 900 milioni di ettari piantati ridurrebbero di due terzi i gas serra. «Cambiare stili di vita? Serve troppo tempo»

di Sandro Orlando



Stefano Mancuso: al pianeta servono mille miliardi di alberi in più

di Laura Solieri | 04 ottobre 2020

Il biologo: "Sembra un'enormità ma pensate che se solo utilizzassimo le terre abbandonate dall'agricoltura dagli anni Novanta ad oggi, potremmo mettere a dimora, in Italia, fino a sei miliardi di alberi". Il costo? "Non ci dovrebbe interessare perché qualunque sia la cifra sarebbe comunque una frazione irrilevante rispetto ai danni che subiremo se non mettiamo a dimora questa quantità"

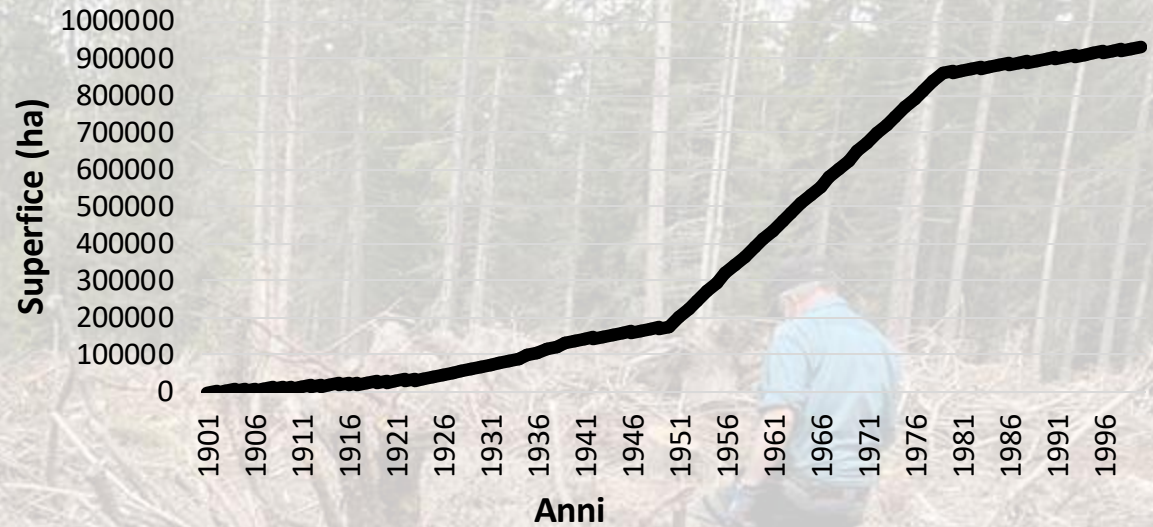


2023?

1.b1) unrealistic....

- No seeds
- No nurseries
- No plants
- No land
- No workers
- Leakage (land cost, social impacts, Land grabbing, albedo, biodiversity...)
- No time... (planning)

Superficie totale imboschita e rimboschita (ha)



	1950	2015
Public nurseries	>400	<100
Plant production	130 millions	4 millions
Workers	40000	<1000

Regione Emilia-Romagna

SVOLTA ECOLOGICA
per ricostruire

In Emilia-Romagna
uno per ognuno
dei suoi abitanti

4,5 MILIONI
DI NUOVI ALBERI
I primi 500mila già quest'anno

Dal 22 giugno
BANDO per i VIVAL regionali
dove in autunno chiunque potrà
RITIRARLI GRATUITAMENTE
e PIANTARLI

Dalla Regione
INVESTIMENTO VERDE da 14 milioni

Fondazione
Giuseppe Angelini
e Centro Studi
nella Montagna

Comune
di Belluno

Università
del Friuli
di Udine

TESAF

SISEF

mipaft MINISTERO
NATIONALE
2014/2020

crea

Accademia Italiana
di Scienze Forestali

8 febbraio 2019 ore 9.30
Sala Eliseo Dal Pont "Bianchi"
Viale Fantuzzi, 11 - Belluno

LA TEMPESTA VAIA:
DISASTRO O OPPORTUNITA'
PER LE FORESTE DEL NORD-EST?

1.b5) tree planting is not a simple solution. Green washing?

Received: 25 August 2020 | Accepted: 13 October 2020
DOI: 10.1111/gcb.15498

GCB REVIEWS

Global Change Biology WILEY



Ten golden rules for reforestation to optimize carbon sequestration, biodiversity recovery and livelihood benefits

Alice Di Sacco¹ | Kate A. Hardwick¹ | David Blakesley^{2,3} | Pedro H. S. Brancalion⁴ | Elinor Breman¹ | Loic Cecilio Rebola^{1,5} | Susan Chomba⁶ | Kingsley Dixon^{7,8} | Stephen Elliott⁹ | Godfrey Ruyonga¹⁰ | Kirsty Shaw¹¹ | Paul Smith¹¹ | Rhian J. Smith¹ | Alexandre Antonelli^{1,12,13}

DI SACCO ET AL.

Global Change Biology WILEY 5

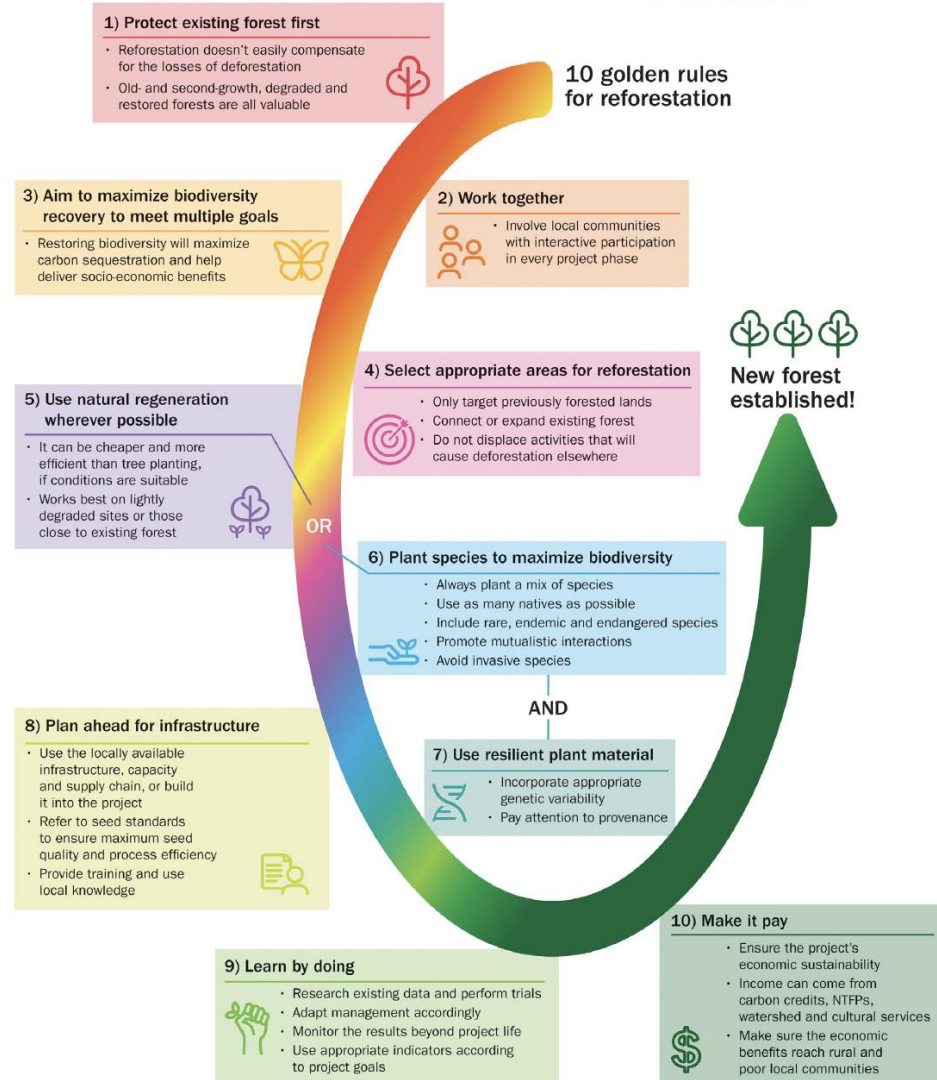


FIGURE 2 Ten golden rules for a successful reforestation project. The order of the rules matches the order in which tasks should be considered during project planning and implementation, although some are interdependent and should be considered in parallel. See text for details



AlberItalia

IL POSTO
GIUSTO PER
GLI ALBERI
GIUSTI...

...contro la crisi
climatica



INDICE

Linee guida AlberItalia

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LA SCELTA DEL LUOGO IN CUI PIANTARE

PAG. 6

Questa raccolta di principi si occupa di un'ambiente in particolare: quello dentro e intorno alle città. In Italia, fortunatamente, le foreste si stanno espandendo in modo naturale in molti territori montani e collinari. In pianura, invece, domina ancora il consumo del suolo e le nostre città subiscono in modo particolarmente intenso gli estremi climatici, sempre più intensi e frequenti.

PAG. 18

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È qui che dagli alberi e dalle foreste si possono ottenere dei "super benefici". Nelle aree urbane e periurbane possiamo contare sul fatto che gli alberi sottraggono CO₂ dall'atmosfera e la fissano nel legno (come i loro ben più numerosi fratelli "di campagna") e ciò ci permette di contrastare la crisi climatica. Ma c'è di più: attraverso gli alberi urbani è possibile migliorare la salute e il benessere, incoraggiare l'attività all'aperto, assorbire il rumore e l'inquinamento atmosferico, ridurre le alte temperature estive e mitigare le piogge intense.

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Per ottenere tutto ciò, il **primo passo** quando si progetta di piantare un albero, costituire un bosco in città o una foresta in area extraurbana, è **conoscere le caratteristiche della "stazione", cioè del luogo in cui saranno messe a dimora le piante**. Le informazioni che



AlberItalia

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raccoglieremo influenzeranno tutte le decisioni successive.

Decisioni prese in base a informazioni corrette consentiranno all'albero di realizzare il suo potenziale e di ottenere da esso tutti i suoi possibili benefici. La posizione di alberature e "foreste urbane" dovrebbe essere una delle prime e più importanti decisioni da prendere quando si progetta lo spazio.

Il contesto è molto diverso da quello delle piante per i cittadini che vivono in città.

Inoltre, **frequenti contenziosi creati dall'urbanizzazione**, servizi di uti marciapiedi determinati da impiegati saranno necessari per risolvere i problemi.

Una volta impiantati, è di un'esperienza pubblica, fa

Linee guida AlberItalia

Un accesso equo al verde

La scelta del sito di impianto non può essere fatta solo sulla base delle caratteristiche della stazione, ma anche in relazione a dove è ubicato il verde già esistente.

Chi si prenderà cura delle piante?

Prima di seminare il primo seme o piantare la prima piantina, è necessario porsi una domanda: "che guarda al futuro". Chi si prenderà cura di questo albero o di questa foresta? Quali saranno i passi necessari per assicurarsi che resti in buona salute e cosa bisognerà fare al termine del suo ciclo vitale? Quanto tempo e risorse è necessario mettere in campo per prendersene cura in modo responsabile "dalla culla alla tomba"?

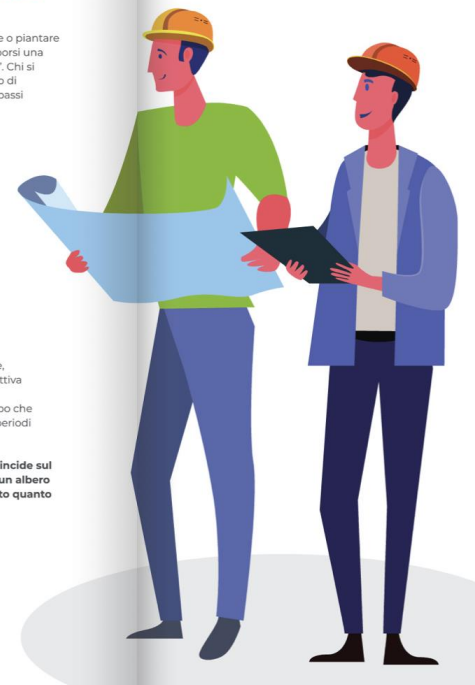
Non tutti hanno la stessa preparazione e la stessa quantità di tempo da dedicare alla realizzazione e alla cura di piantagioni arboree. Per questo, prima di progettare un elemento di infrastruttura verde, è importante accertarsi dell'effettiva competenza di chi se ne dovrà occupare, della quantità di tempo che potrà dedicare agli alberi e dei periodi dell'anno in cui potrà farlo.

Tenere conto di questi aspetti incide sul successo della piantagione di un albero o di una "Foresta Urbana", tanto quanto

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correttezza di analisi del sito, preparazione del terreno, scelta delle specie e stesura di un piano di coltura e conservazione.

Ciò rende più probabile che i nostri figli e i nostri nipoti, godendo dei benefici di una foresta urbana ormai matura, ringrazino chi ha lavorato per crearla così bella e sana.



<https://www.alberitalia.it/filevari/Alberitalia.it-vademecum/alberitalia.it-vademecum.html>

COMMENT · 02 APRIL 2019

Restoring natural forests is the best way to remove atmospheric carbon

Plans to triple the area of plantations will not meet 1.5 °C climate goals. New natural forests can, argue Simon L. Lewis, Charlotte E. Wheeler and colleagues.

Simon L. Lewis , Charlotte E. Wheeler , Edward T. A. Mitchard & Alexander Koch

WHICH STRATEGY?

The amount of carbon stored by 2100 depends on which type of forest restoration the 43 Bonn Challenge countries in the analysis decide to adopt, across a total area of 350 million hectares (Mha).

■ = 1 petagram of carbon

All land becomes forest naturally



This is the most effective way to retain carbon.

42 petagrams of carbon stored in 350 Mha

Current plans are maintained

With protection of natural forest



No protection of natural forest



(assuming naturally regenerated forests are converted to biofuel plantations in 2050)

All land becomes plantations



©nature

Source: S. L. Lewis *et al.*

 **frontiers**
in Forests and Global Change

PERSPECTIVE
published: 11 June 2019
doi: 10.3389/ffgc.2019.00027

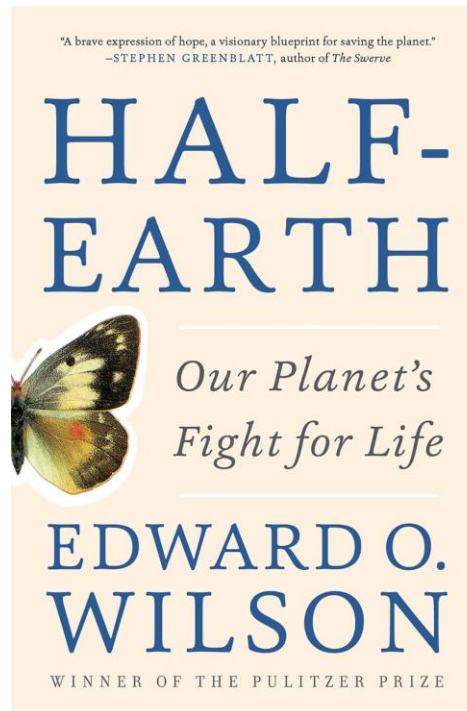


Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good

William R. Moomaw^{1*}, Susan A. Masino^{2,3} and Edward K. Faison⁴

The exceptional value of intact forest ecosystems

James E. M. Watson ^{1,2,15*}, Tom Evans^{2,15}, Oscar Venter³, Brooke Williams^{1,2}, Ayesha Tulloch ^{1,2}, Claire Stewart¹, Ian Thompson⁴, Justina C. Ray⁵, Kris Murray⁶, Alvaro Salazar¹, Clive McAlpine¹, Peter Potapov⁷, Joe Walston², John G. Robinson², Michael Painter², David Wilkie², Christopher Filardi⁸, William F. Laurance⁹, Richard A. Houghton ¹⁰, Sean Maxwell¹, Hedley Grantham^{1,2}, Cristián Samper², Stephanie Wang², Lars Laestadius¹¹, Rebecca K. Runting¹, Gustavo A. Silva-Chávez¹², Jamison Ervin¹³ and David Lindenmayer ¹⁴



The New York Times

A CONVERSATION WITH

In 'Half Earth,' E.O. Wilson Calls for a Grand Retreat



"To save biodiversity, we need to set aside about half the earth's surface as a natural reserve." — Edward O. Wilson Kayana Szymczak for The New York Times

Coordinating Lead Authors:

Gert Jan Nabuurs (The Netherlands), Omar Masera (Mexico)

Lead Authors:

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IPCC: Forestry can make a very significant contribution to a low-cost global mitigation portfolio that provides synergies with adaptation and sustainable development. However, this opportunity is being lost in the current institutional context and lack of political will to implement and has resulted in only a small portion of this potential being realized at present (high agreement, much evidence).

Contents lists available at ScienceDirect

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser




What is Climate-Smart Forestry? A definition from a multinational collaborative process focused on mountain regions of Europe

Euan Bowditch^a, Giovanni Santopuoli^{b,c,*}, Franz Binder^d, Miren del Río^{e,f}, Nicola La Porta^{g,h}, Tatiana Kluvankovaⁱ, Jerzy Lesinski^j, Renzo Motta^k, Maciej Pach^l, Pietro Panzacchi^{c,m}, Hans Pretzschⁿ, Christian Temperli^o, Giustino Tonon^m, Melanie Smith^a, Violeta Velikova^p, Andrew Weatherall^q, Roberto Tognetti^{b,c,h}



Article

By 2050 the Mitigation Effects of EU Forests Could Nearly Double through Climate Smart Forestry

Gert-Jan Nabuurs^{1,*}, Philippe Delacote², David Ellison³, Marc Hanewinkel⁴, Lauri Hetemäki⁵, Marcus Lindner⁵

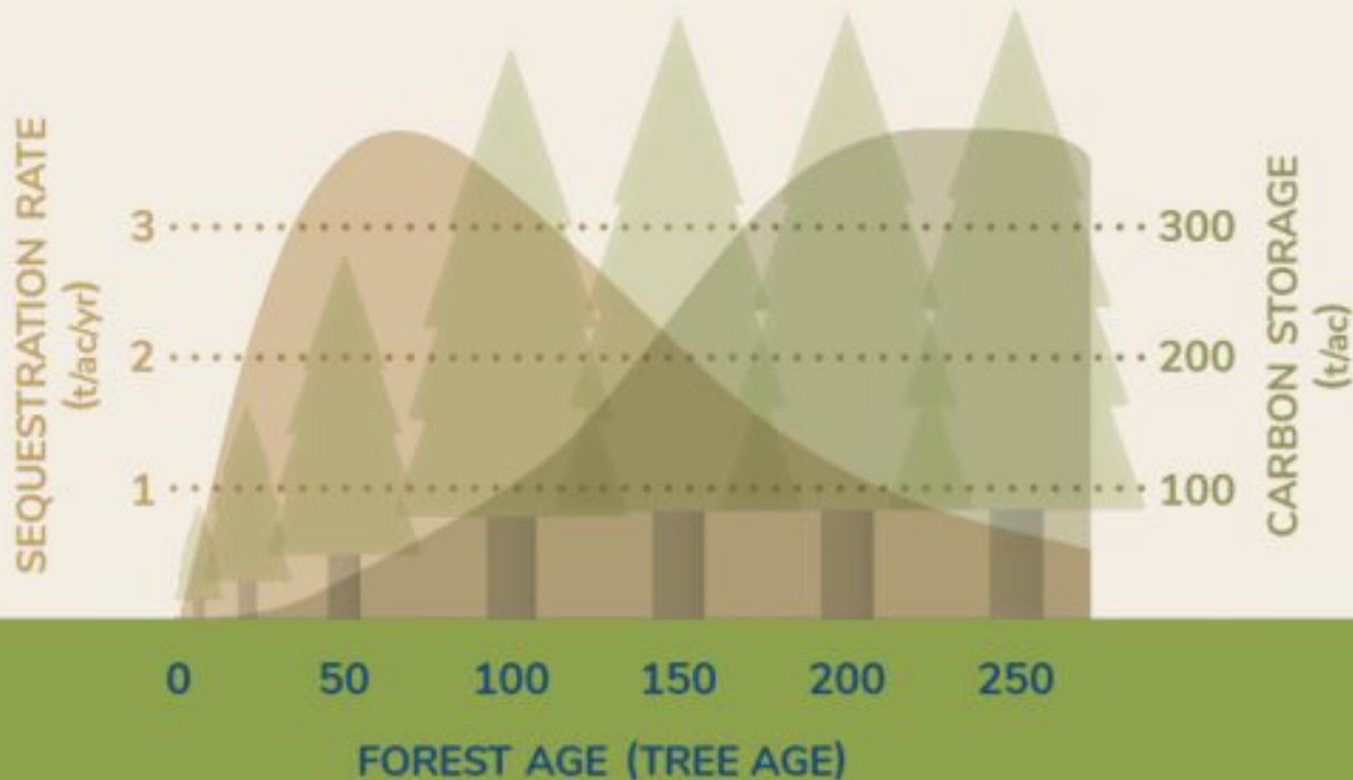
Table 1. Summation of the Climate Smart Forestry mitigation effect. All numbers are approximations.

Climate-Smart Forestry is sustainable adaptive forest management and governance to protect and enhance the potential of forests to adapt to, and mitigate climate change. The aim is to sustain ecosystem integrity and functions and to ensure the continuous delivery of ecosystem goods and services, while minimising the impact of climate-induced changes on mountain forests on well-being and nature's contribution to people.

In summary, **Climate-Smart Forestry** should enable both forests and society to transform, adapt to and mitigate climate-induced changes.

Main Category of Forest Management Measure	Sub Measure	Mitigation Effect (Mt CO ₂ a ⁻¹)
1. Improved forest management	1a. fullgrown coppice	56
	1b. enhanced productivity & improved management	38
	1c. reduced disturbances, deforestation, drainage	35
	1d. material substitution wood products	43
2. Forest area expansion		64
3. Energy substitution		141
4. Establish forest reserves		64
Total		441

SEQUESTRATION RATE AND CARBON STORAGE OVER AGE*



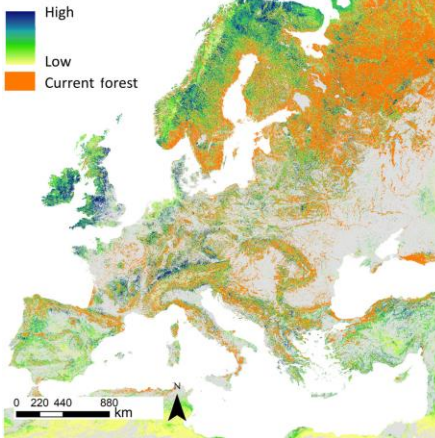
Young forests are very efficient at removing carbon from the atmosphere, and that efficiency declines steadily with age.

*NUMBERS ARE ORDER OF MAGNITUDE ONLY.

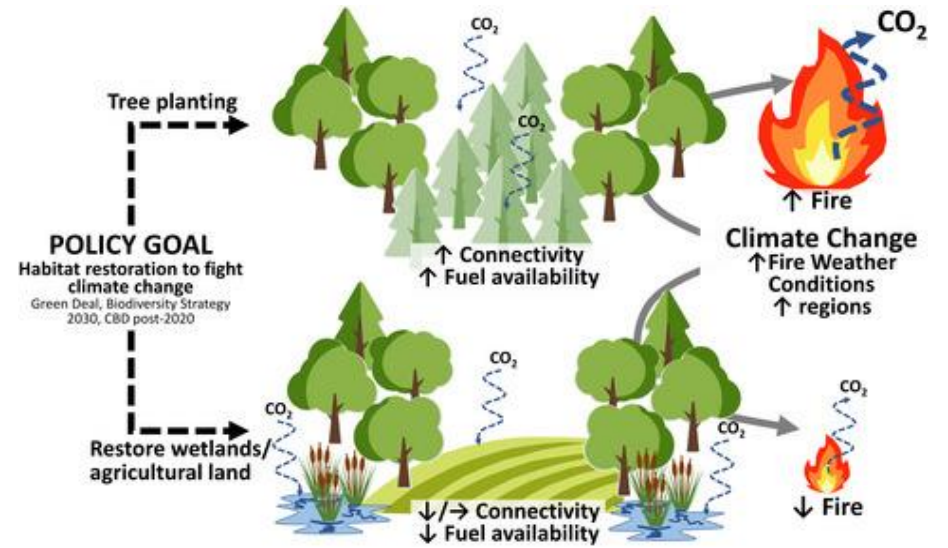
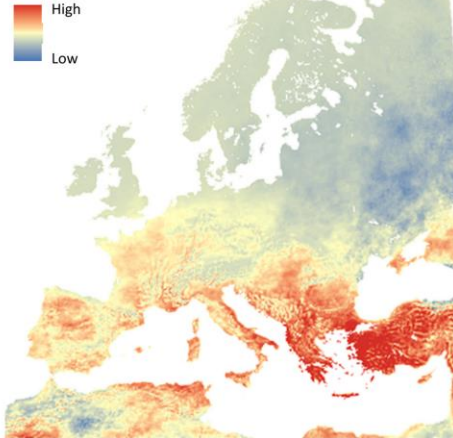
Boschi giovani sono molto efficienti nell'assorbire carbonio, foreste mature e vetuste hanno assorbimenti più bassi ma stock più elevati

Tree planting: A double-edged sword to fight climate change in an era of megafires

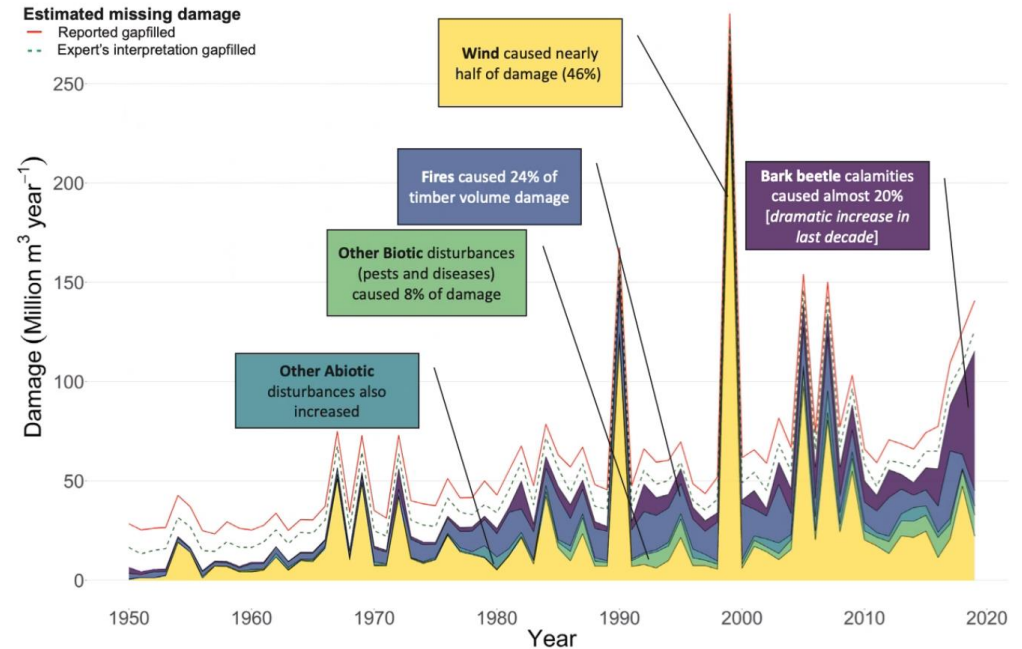
Forest restoration potential



Change fire weather index (2021–2050)



Patacca et al. (*Global Change Biol.* 2022)



First signs of carbon sink saturation in European forest biomass

Gert-Jan Nabuurs^{1*}, Marcus Lindner², Pieter J. Verkerk², Katja Gunia³, Paola Deda⁴, Roman Michalak⁴ and Giacomo Grassi⁵

SCIENCE ADVANCES | RESEARCH ARTICLE

ENVIRONMENTAL STUDIES

How close are we to the temperature tipping point of the terrestrial biosphere?

Katharyn A. Duffy^{1,2*}, Christopher R. Schwalm^{2,3}, Vickery L. Arcus⁴, George W. Koch², Liyin L. Liang^{4,5}, Louis A. Schipper⁴



OPEN

Pronounced loss of Amazon rainforest resilience since the early 2000s

Chris A. Boulton¹, Timothy M. Lenton¹ and Niklas Boers^{1,2,3}

Are we able to forecast the future capacity of the forests to absorb carbon dioxide?

ARTICLE

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OPEN

Limited capacity of tree growth to mitigate the global greenhouse effect under predicted warming

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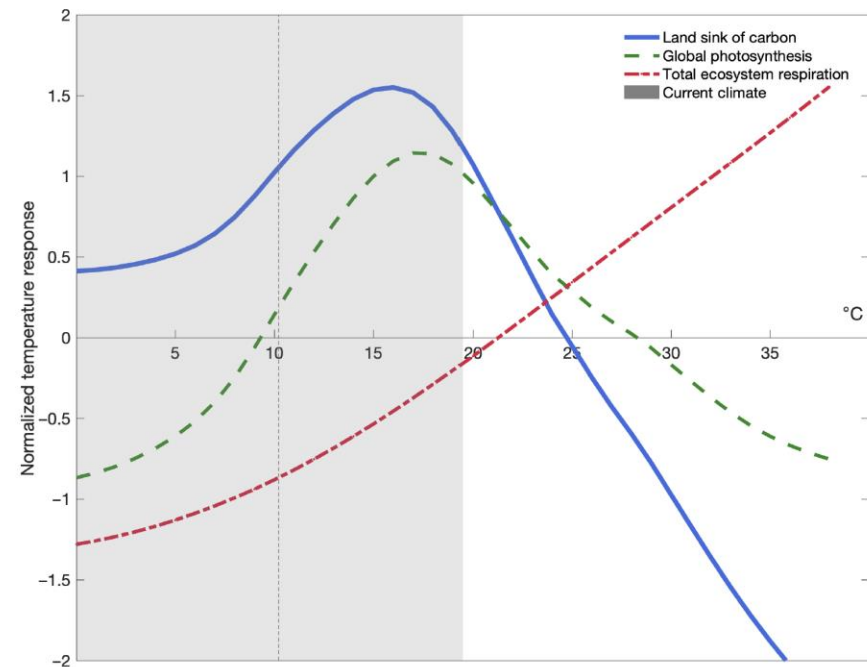


Fig. 2. Temperature dependence of the terrestrial carbon sink. Integrated global temperature response curves for normalized photosynthesis (green dashed line), respiration (red dashed dotted line), and a mass balance estimate of the land sink (blue solid line) in relation to current climate (gray bar), where the mean across each curve sums to zero. Photosynthesis represents the integration of C_3 and C_4 curves (Fig. 1) weighted by global fraction of C_3/C_4 photosynthesis (37). The gray shaded bar represents observed mean annual temperature range from 1991 to 2015 (9, 22), and vertical dashed line indicates current annual mean temperature at FLUXNET tower sites.

Renewable energy from forest biomass?

Biomass for energy (bioenergy) is the main source of renewable energy in the EU, with a share of almost 60%

Wood represents about the 50% of biomass for energy

2020 - 20% of renewables

2030 - 32% of renewables

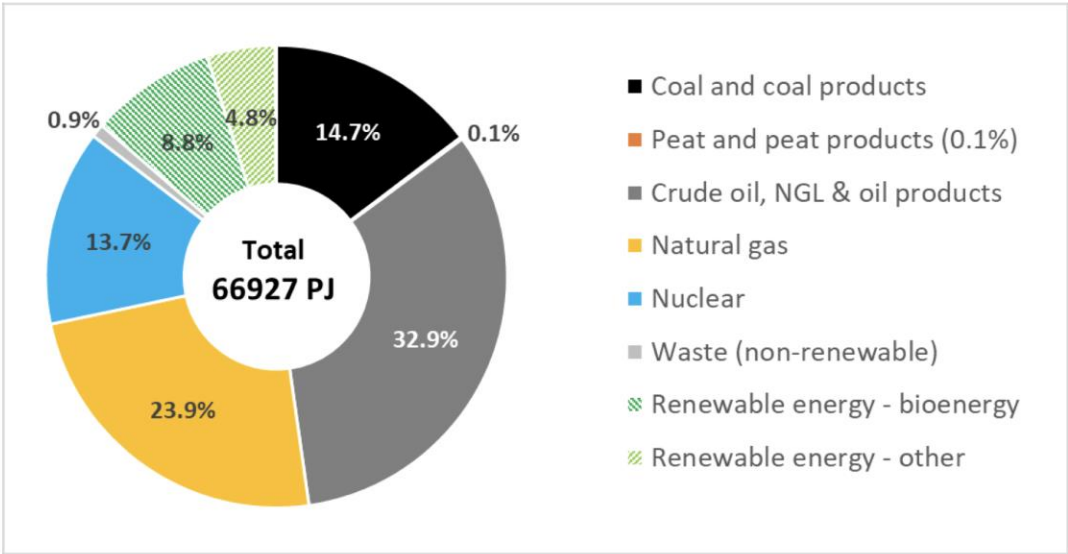


Figure 1: Total primary energy supply⁵ in the EU in 2016 (Source: World Energy Balances © OECD/IEA 2018)

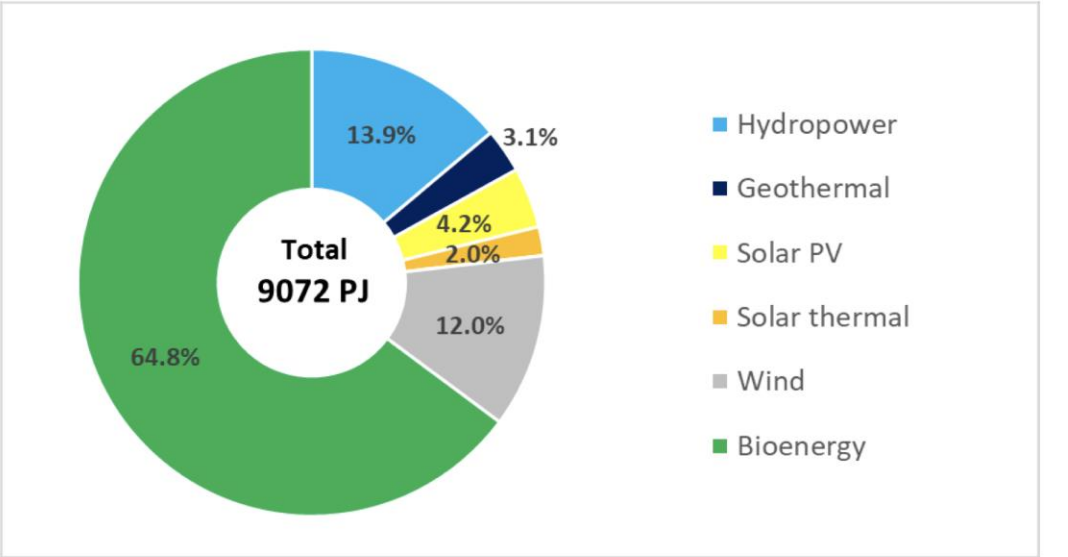


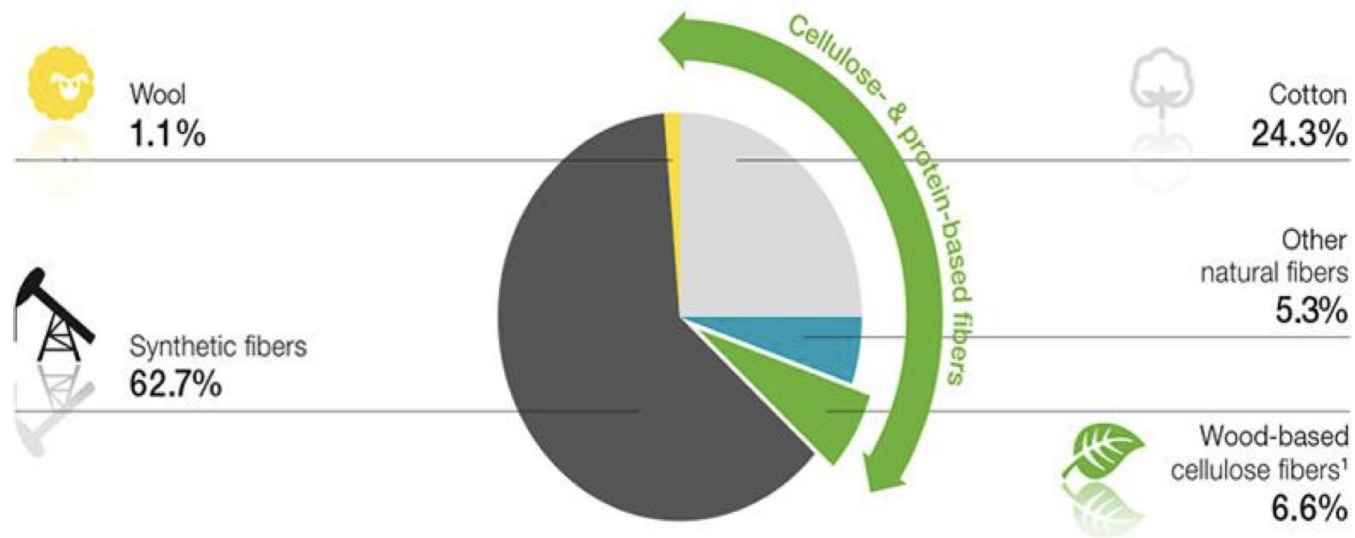
Figure 2: Total primary energy supply of Renewable Energy Sources in the EU in 2016 (Source: World Energy Balances © OECD/IEA 2018)



Wood-based fibres for a sustainable textile industry

- Global production of textile fibres:
 - 93 Mt (2016)
 - 250 Mt (2050)

- Carbon footprint from wood-based textile fibres can be significantly lower than synthetic ones



CARBON LEAKAGE

Carbon leakage

"Carbon leakage is defined as the increase in CO₂ emissions outside the countries taking domestic mitigation action divided by the reduction in the emissions of these countries. It is expressed as a percentage, and can be greater or less than 100%.

Soybean crop paradox

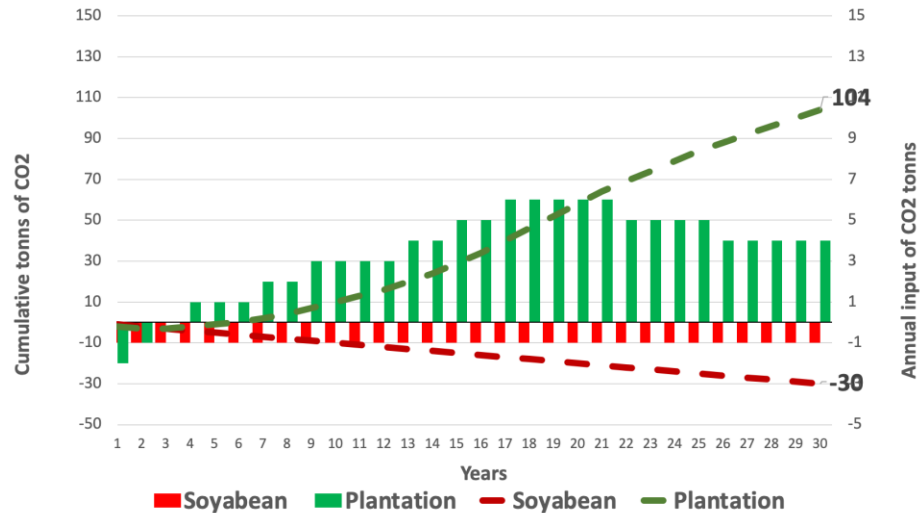


1 ha



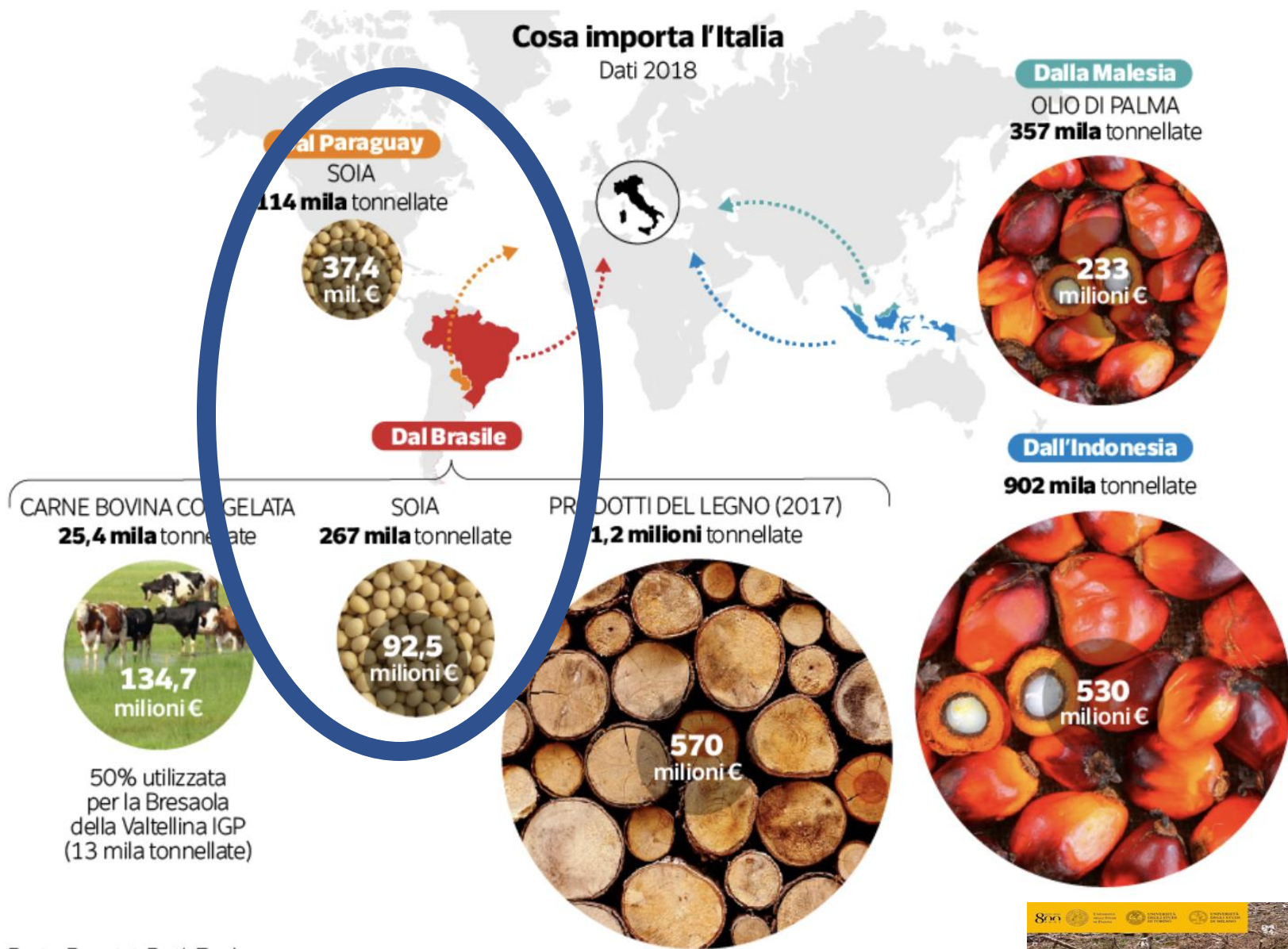
+ 74 tonn CO₂ (30 years)

Tree plantation instead of soybean crop



Cosa importa l'Italia

Dati 2018



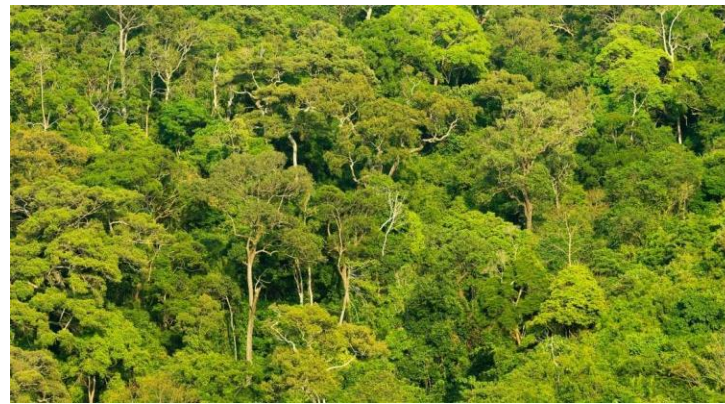
Fonte: Eurostat, Earth Trade

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Ministero delle Politiche Agricole, Alimentari e Rurali
Ministero delle Politiche Regionali
Ministero delle Politiche Economiche e del Lavoro

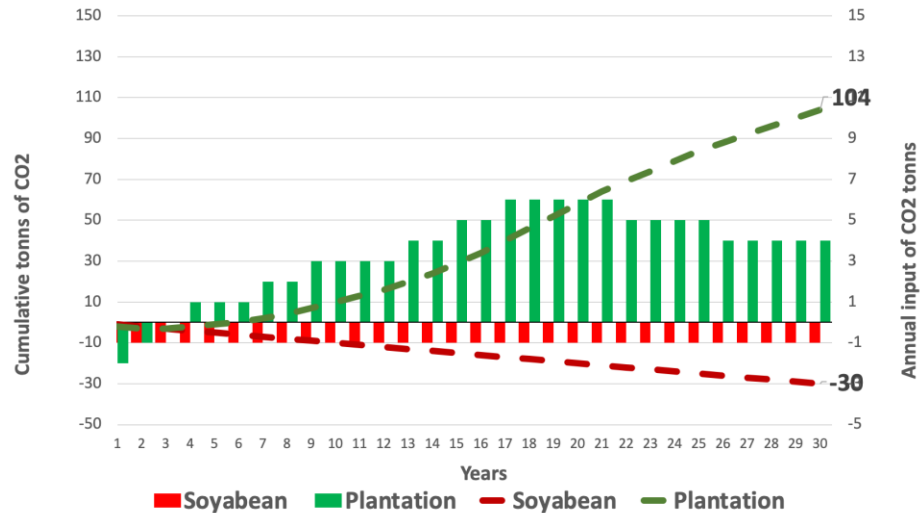
DEFORESTATION MADE IN ITALY

Padova, 10 dicembre 2019 ore 14:00

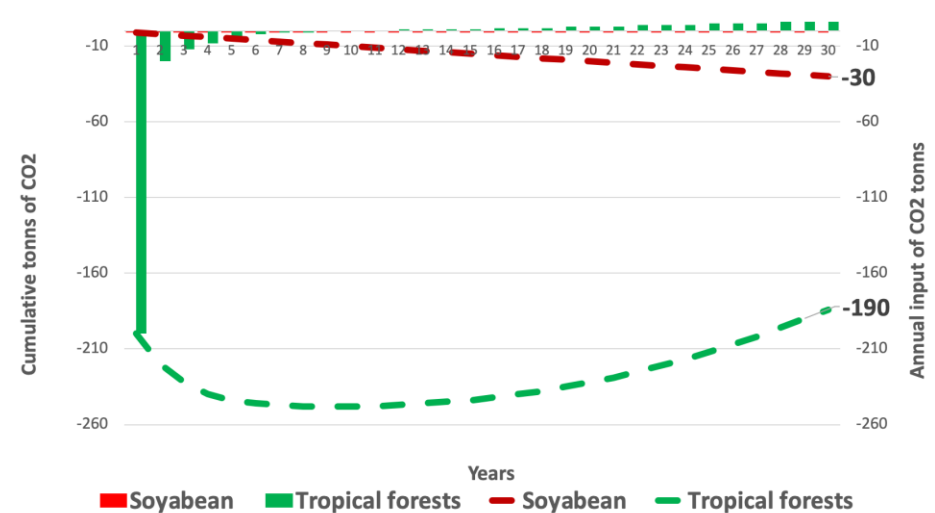
Soybean crop paradox



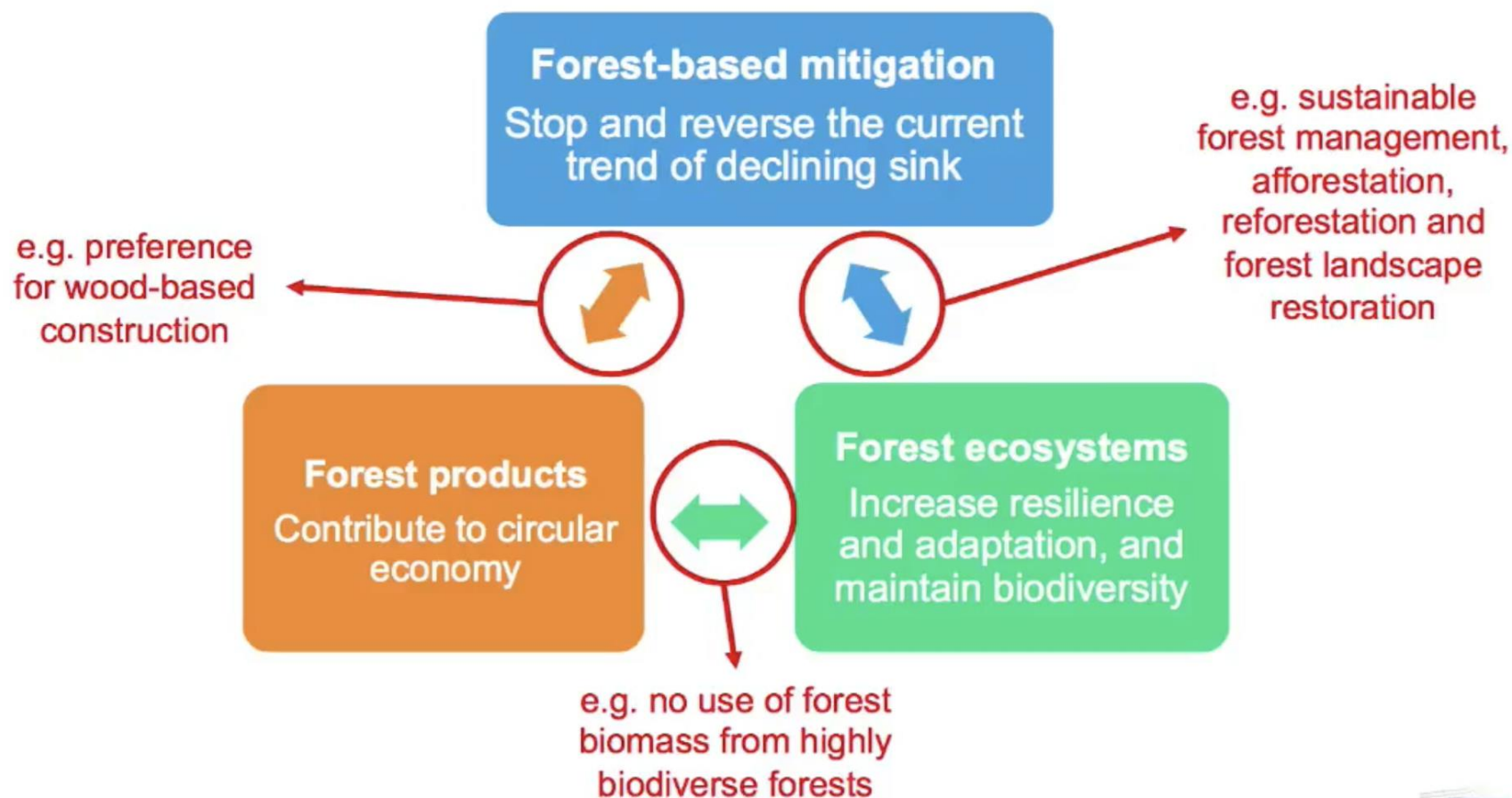
Tree plantation instead of soybean crop



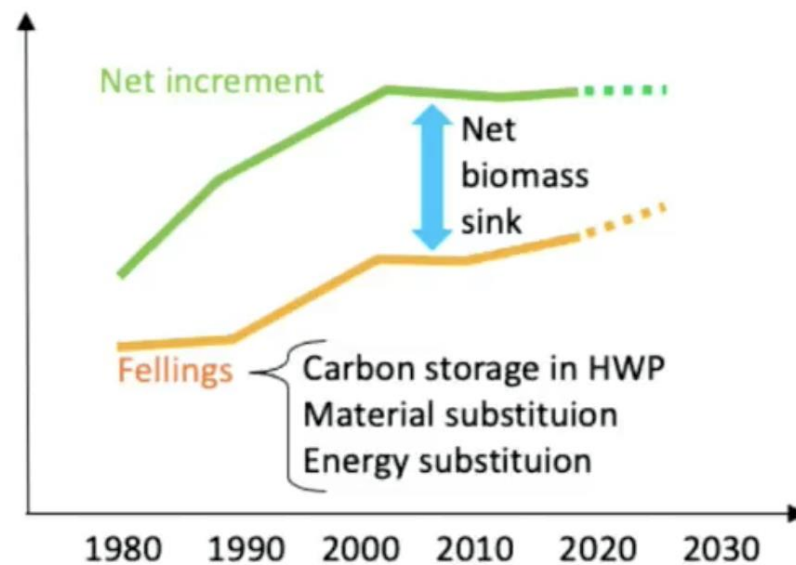
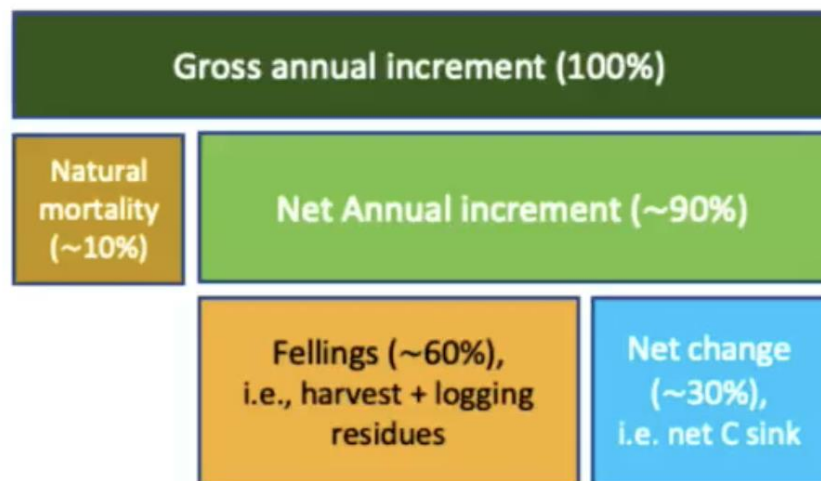
Soybean crop instead tropical forests



Sinergia tra le politiche



Components of the net forest carbon sink and their dynamics



The **net forest C sink** (living biomass) can increase if the **gross annual increment** increases, the **natural mortality** decreases, or **fellingings** (harvest + residues) are reduced.

Trade-offs exist, e.g.:

- ↑ harvest: ↑ wood in HWP and substitution effects, but ↓ net sink in the short-medium term
- ↓ harvest: ↑ net sink in the short-medium term, but ↓ HWP and substitution effects

La capacità di assorbimento delle foreste UE sta diminuendo:

- Invecchiamento
- Disturbi (aumento biomassa + età)
- Vulnerabilità ai cambiamenti climatici (aumento magnitudo)



think
GLOBALLY,
act
LOCALLY