IWMS26

14.15 APRIL 2025 - FLORENCE

Forest resources in Europe and the role of Italy for a forest-based bioeconomy

Davide Pettenella

ItaliaForestaLegno cluster nazionale

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

1

A key concept for the present: the policrisis

(Edgar Morin,1993)

- Socio-political instability (armed conflicts)
- Environmental crisis
- The energy crisis
- The US neo-protectionism and the closing of markets

... and on all crises:
The crisis of the international governance system

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

2

A recent forecast for the EU forest products consumption according to different scenarios: a different picture

Product	Unit	Pathway	Consumption 1995	Consumption 2020	Consumption 2045	Consumption 2050	Change 1995-2020	Change 2020-2045	Change 2020-2050
Panels	Mm3	historical	32	54					
		ssp2			68	71	71%	27%	31%
		fair			42	43		-21%	-21%
Paper	Mt	historical	52	66					
		ssp2			78	79	27%	18%	21%
		fair			52	52		-21%	-20%
Pulp	Mt	historical	37	38					
		ssp2			47	50	2%	25%	31%
		fair			39	39		3%	4%
Sawnwood	Mm3	historical	67	81					
		ssp2			97	99	22%	19%	22%
		fair			72	73		-11%	-11%
Fuelwood	Mm3	historical	75	119					
		ssp2			162	174	59%	36%	46%
		fair			50	51		-58%	-58%
Industrial Roundwood	Mm3	historical	296	367					
		ssp2			453	471	24%	23%	28%
		fair			370	374		1%	2%
Total Roundwood	Mm3	historical	371	486					
		ssp2			615	645	31%	27%	33%
		fair			420	425		-14%	-13%

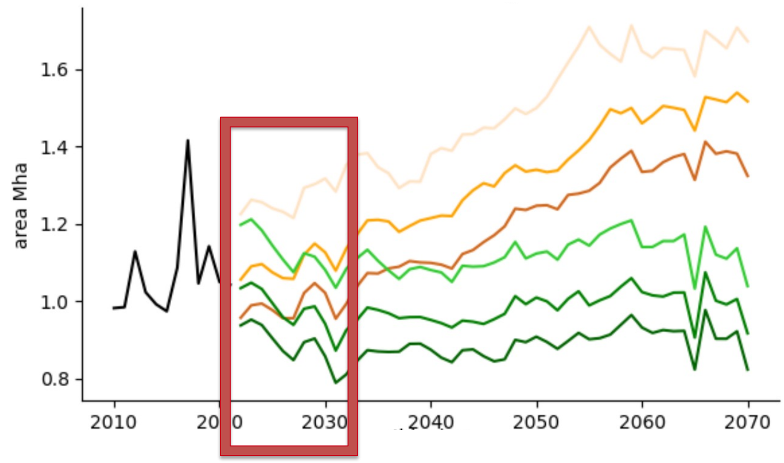
Source: JRC (Rougieux et al., 2024 - doi:10.2760/17191)

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

3

EU harvest areas (final cut and savage) according to different scenarios



Source: JRC (Rougieux et al., 2024 - doi:10.2760/17191)

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

4

Outline

- Demand side drivers
- Supply side drivers
- The role of Italy in the bioeconomy

Slides available:
www.davidepettenella.it

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

5

Outline

- **Demand side drivers**
  The fundamental driver: decarbonization
  - greening of the building sector
  - new products of the bioeconomy
  - new role of bioenergy
- Supply side drivers
- The short terms perspectives and the role of Italy in the bioeconomy

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

6

Not a very recent forecast for the EU market: a moderate increase removal and consumption (million m³ over bark)

	Removals			Consumption			Net trade		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**	**2020**	**2025**	**2030**
Conif. sawlogs	204.1	208.0	212.7	210.1	213.4	217.5	−6.0	−5.4	−4.8
Non-conif. sawlogs	40.7	41.7	42.9	45.2	45.9	46.8	−4.5	−4.2	−3.9
Conif. pulpwood	120.2	122.4	126.9	110.1	110.5	113.3	10.1	11.9	13.7
Non-conif. pulpwood	58.8	62.7	67.4	95.6	98.1	102.1	−36.9	−35.4	−34.7
Total IRW	423.7	434.8	449.9	461.0	467.9	479.6	−37.3	−33.1	−29.7

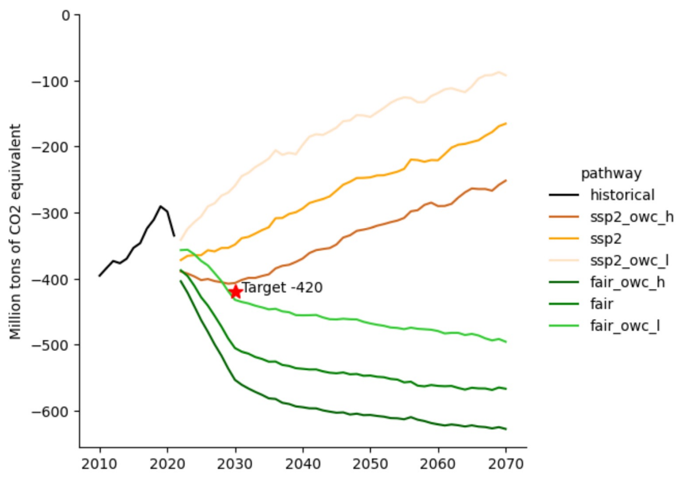
Source: Jonsson et al., 2021 https://doi.org/10.1016/j.techfore.2020.120478

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

7

Total EU carbon sink (negative values represent a carbon sink while positive values represent a carbon source)



Source: JRC (Rougieux et al., 2024 - doi:10.2760/17191)

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

8

The decarbonization commitments

- **EU: C neutrality in 2050**

  (Fin: 2035; A and Irl: 2040; Sw and G: 2045)

  -55% C emission by **2030**

  -90% C emission by **2040**

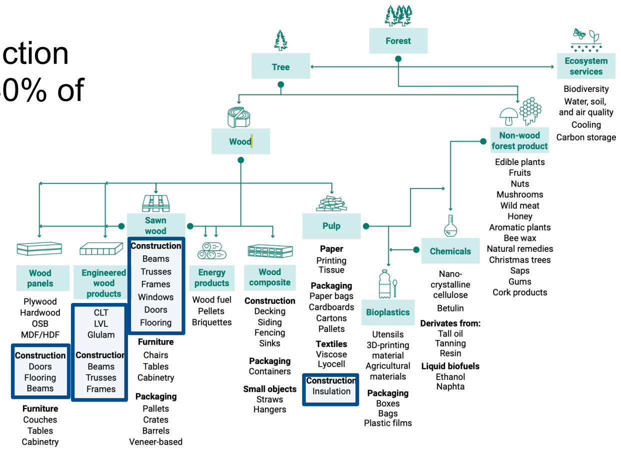
  → the leading institution at global level

- Most of the countries: C neutrality in 2050
- China and Ukraine: 2060
- India: 2070
- Australia: 2050-2100

Check national commitments:
https://www.motive-power.com/npuc-resource/carbon-neutral-goals-by-country/

The forestry sector structure

The construction sector: 36-40% of the global emissions



Notes: CLT, Cross-laminated timber; HDF, High-density fibreboard; LVL, Laminated veneer lumber; MDF, Medium-density fibreboard; OSB, Oriented strand board.

Source: Adapted from Verkerk et al. (2021).

The Construction Material Pyramid

(Global Warming Potential – Kg/CO_2)

Source: https://www.materialepyramiden.dk/

Only wood-based products

Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

11

A strong EU commitment towards the use of wood in the construction sector

12

3 sectors considered in the new EU Regulation *Carbon Removal Certification Framework* (CRCF): in 2026 carbon credits generated by:

PERMANENT STORAGE

E.g. Bioenergy with Carbon Capture and Storage (BECCS), Direct Air Carbon Capture and Storage (DACCS)

CARBON FARMING

E.g. Af-/re-forestation, improved forest management, agroforestry, soil carbon sequestration, peatland restoration

CARBON STORAGE IN PRODUCTS

E.g. Use of wood-based materials in construction, long-lasting Carbon Capture and Utilisation (CCU)

Minimum life: 35 years

Source: European Commission

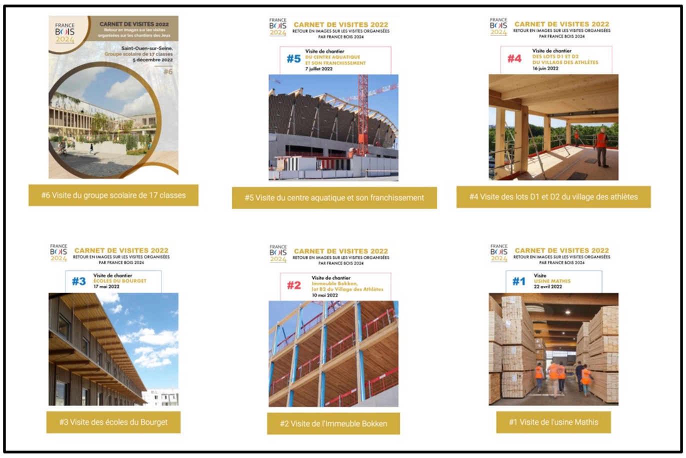
TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

13

France Bois 2024

FRANCE BOIS 2024

Paris Olympics: 40% with the the "*Bois de France*" brand with a 30% emission reduction effect compared to London and Rio



https://www.francebois2024.com/

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

14

Le label BOIS DE FRANCE
Traçabilité garantie

Le label BOIS DE FRANCE est né de la volonté de mettre en valeur le bois français et sa transformation en France.

Il est aujourd'hui le seul label national à garantir la traçabilité du bois français, de la forêt jusqu'à son utilisation dans les produits de consommation et de la construction. Un produit bois vraiment français, c'est un produit BOIS DE FRANCE !

https://bois-de-france.org

Garantir un véritable produit français

Défendre les productions de nos forêts françaises est aussi important que de garantir sa transformation dans notre pays, pour l'économie locale ET pour l'assurance de l'utilisation de bois écoresponsables.

Promouvoir le bois français et la filière professionnelle

Le label s'adresse à tous les professionnels (fournisseurs de bois, transformateurs, négoces) mais aussi aux prescripteurs, aux donneurs d'ordre et au grand public.

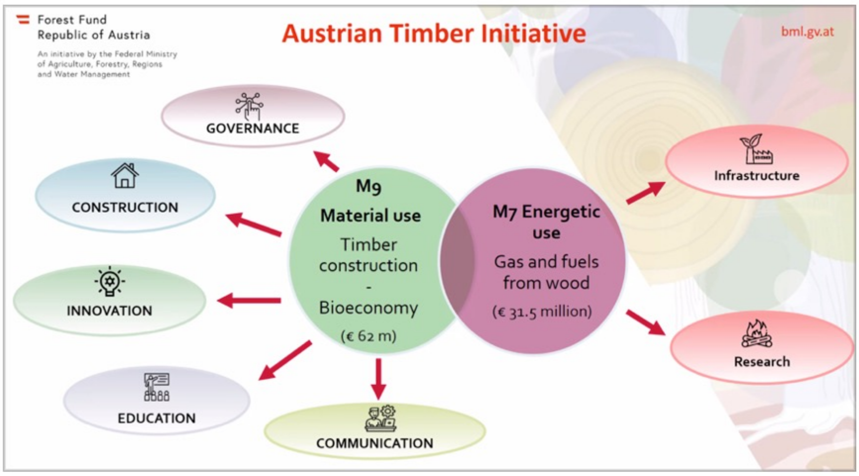
Développer l'unité de l'écosystème du bois français

Se regrouper, se structurer pour mieux se connaître et développer une communication adaptée et commune à tous les acteurs du bois français est une évidence et la garantie d'une future force.

TESAF Dipartimento Territorio e Sistemi Agro-Forestali
Università degli Studi di Padova

15

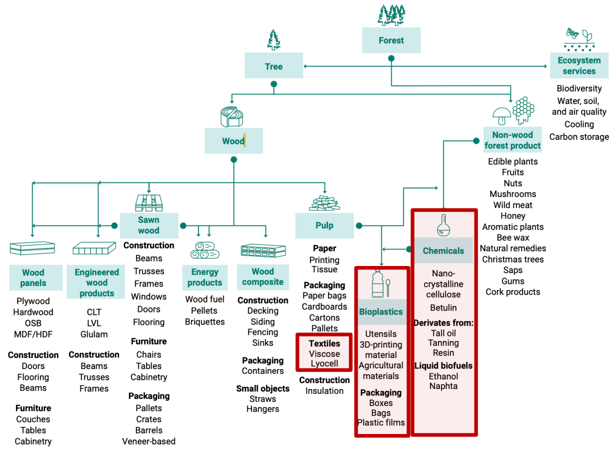
Austrian Wood Initiative in 2022 "Creating a sustainable future with wood": 93.5 M €



TESAF Dipartimento Territorio e Sistemi Agro-Forestali
Università degli Studi di Padova

16

The forestry sector structure



Notes: CLT, Cross-laminated timber; HDF, High-density fibreboard; LVL, Laminated veneer lumber; MDF, Medium-density fibreboard; OSB, Oriented strand board.

Source: Adapted from Verkerk et al. (2021).

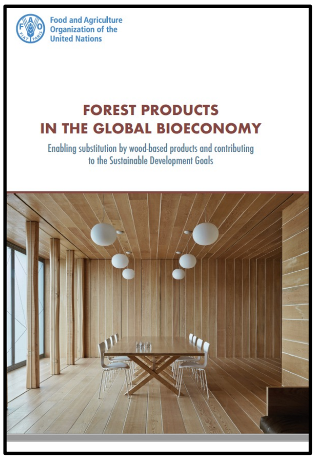
TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

17

The main wood-based products needed for the bioeconomy

5 + 1

Source: FAO, 2022
(https://www.fao.org/3/cb7274en/cb7274en.pdf)



TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

18

Forecasts for industrial consumption of wood products at global level (million cm)

Primary processed wood products basic outlook 2050	Volume 2020 (million m³)	Volume 2050 (million m³)	Percentage change 2020–2050
Sawnwood & engeneered products	929	1 205	3
Veneer/ plywood	267	539	102
Particle/ fibreboard	345	593	72
Wood pulp*	745	786	5
Total	2 286	3 123	37

Source: FAO, GFSO 2050 (2022)

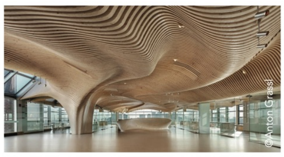
Wood products selected to replace non-renewables	Volume 2050 (million m³; lower and upper estimate)	Volume change on basic outlook (percent)
Sawnwood in mass timber / CLT	41–123	3–10
Not considered		-
-		
Wood pulp for MMCF	57–149	5–12
	98–272	8–23

The new products of the bioeconomy

19

Forest-based bioeconomy: 5 industrial strategic sectors for substitution

- Engineered wood products
  - Cross-Laminated Timber (CLT or X-LAM): +37% annual growth (2014-20)
  - Laminated Veneer Lumber (LVL): +6% annual growth and others



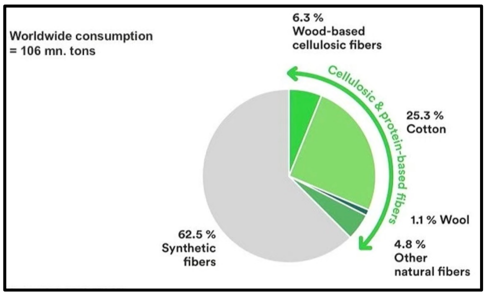

- Bio-textile products


20

The "star" product: biotextiles

UNECE/FAO (2021): in 2040 the demand for the biotextiles alone will cover the 30% (80 M cm) of industrial wood consumption in Europe

Global fiber consumption (2018)



Source: M.Palahì (2023) on ICAC, CIRFS, TFY, FEB data

5 strategic sectors

- Bio-plastics and wood-based composites (e.g., : PWC- *Plastic-Wood Composite)*

- Packaging

- Foams and wood insulation

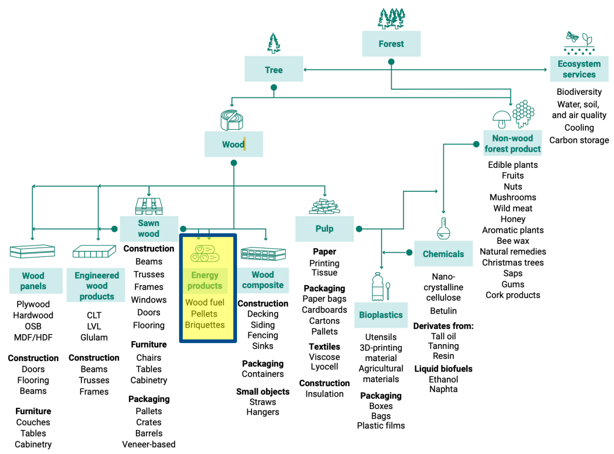
5 strategic sectors

- Engineered wood products
- Foams and wood insulation
- Bio-plastics
- Wood-based composites
- Bio-textile products

From low-quality wood biomass

23

The forestry sector structure



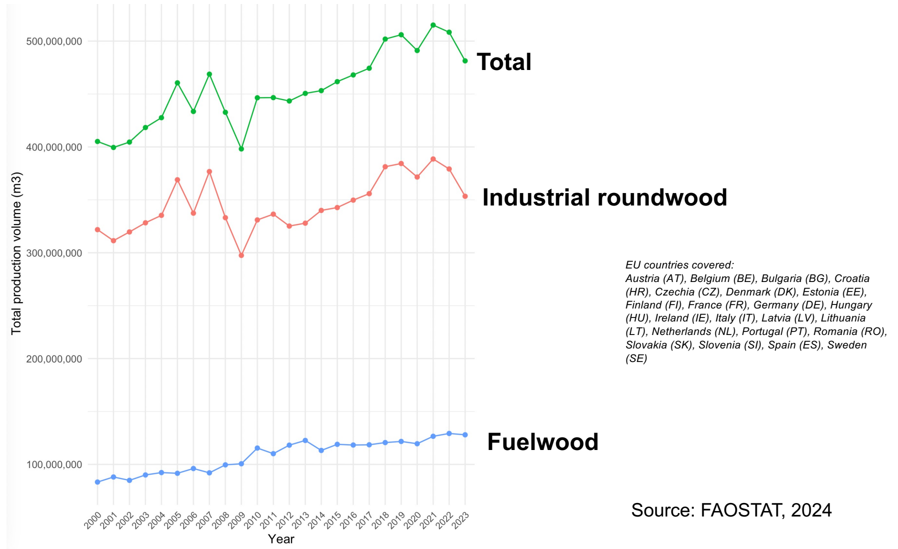
Notes: CLT, Cross-laminated timber; HDF, High-density fibreboard; LVL, Laminated veneer lumber; MDF, Medium-density fibreboard; OSB, Oriented strand board.

Source: Adapted from Verkerk et al. (2021).

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

24

Industrial roundwood and fuelwood harvesting in the EU (2000=100)

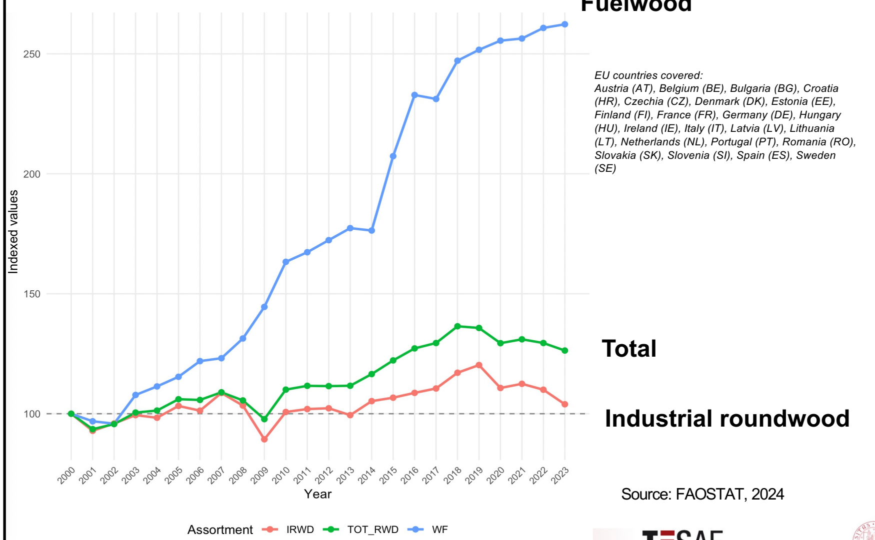


Source: FAOSTAT, 2024

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

25

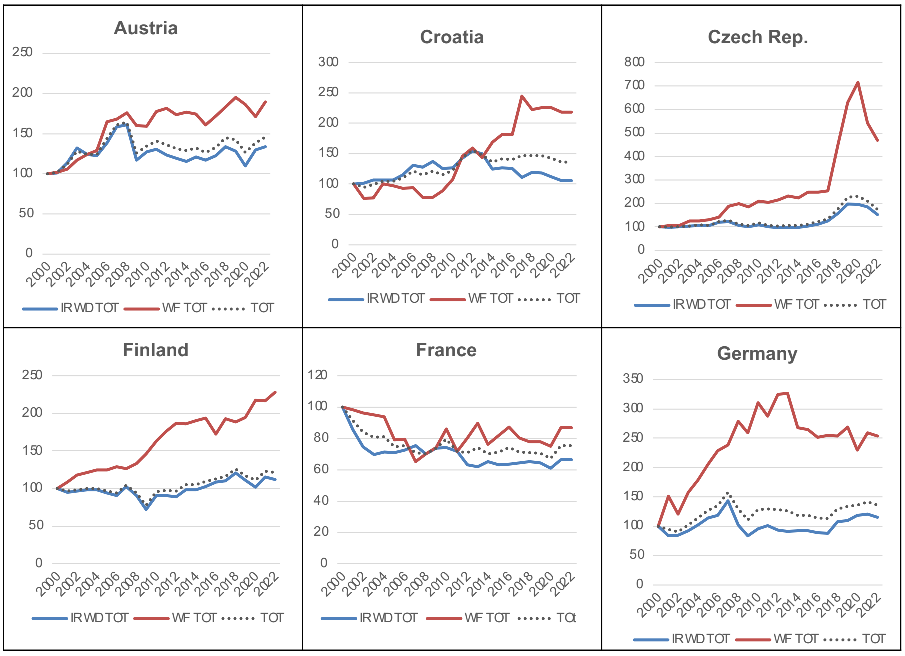
Industrial roundwood and fuelwood harvesting in the EU (2000=100)



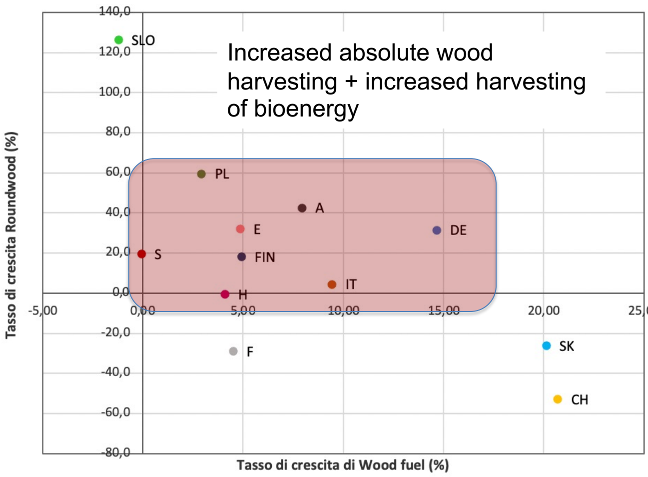
Source: FAOSTAT, 2024

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

26

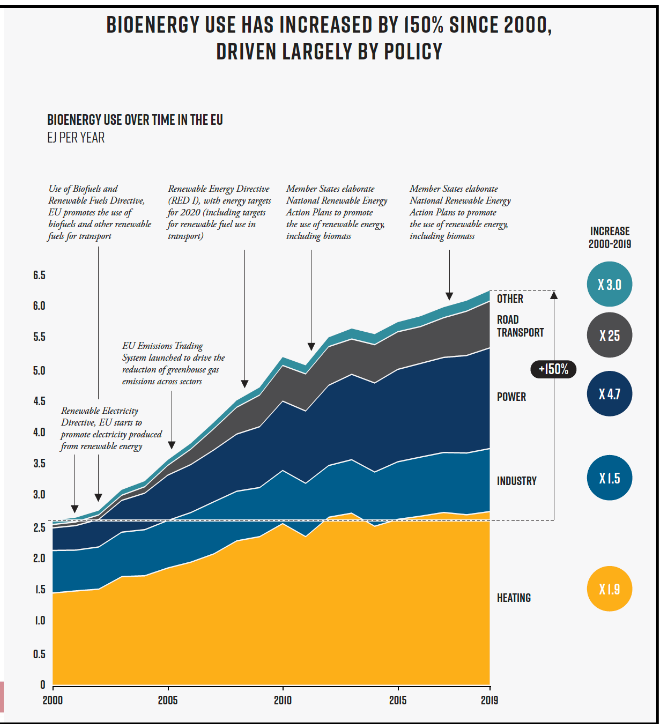


Wood removals patterns in selected European countries (2000-2019)



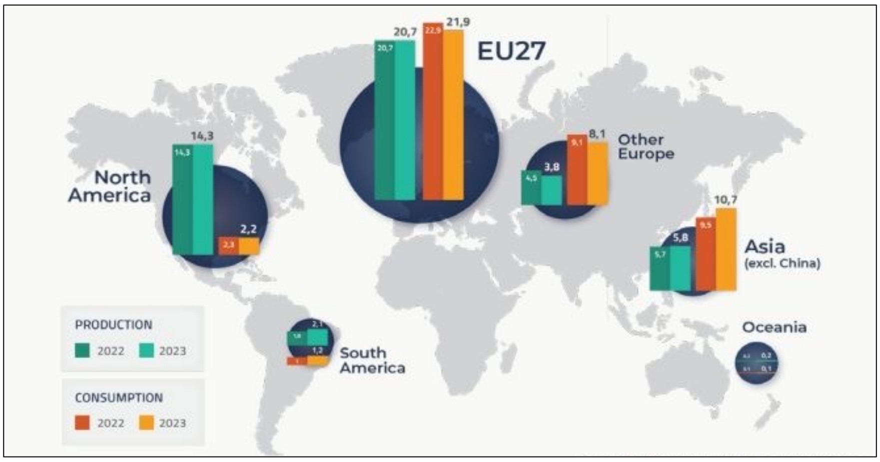
Source: FAOSTAT

Material Economics (2022). EU Biomass Use in a Net-Zero Economy.A course correction for EU biomass



29

World pellet production and consumption in 2022 and 2023 (M tons)



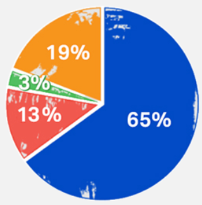
Source: Bioenergy Europe quoting EPC Survey, 2023

TESAF Dipartimento Territorio e Sistemi Agro-Forestali
Università degli Studi di Padova

30

The IATA program towards net zero target by 2050

Achieving net zero by 2050 will require a combination of maximum elimination of emissions at the source, offsetting and carbon capture technologies.



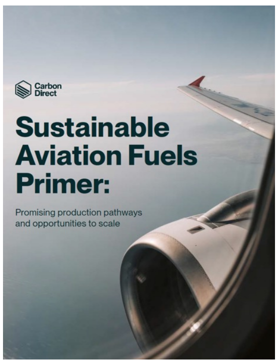
- **65%** Sustainable Aviation Fuel (SAF)
- **13%** New technology, electric and hydrogen
- **3%** Infrastructure and operational efficiencies
- **19%** Offsets and carbon capture

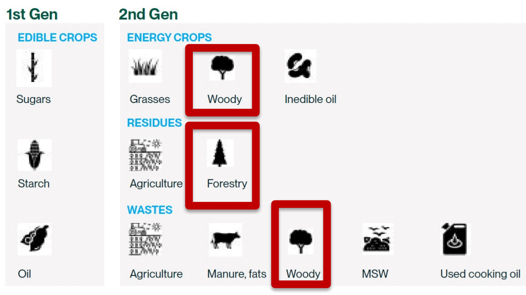
Source: https://www.iata.org/en/iata-repository/pressroom/fact-sheets/fact-sheet---alternative-fuels/

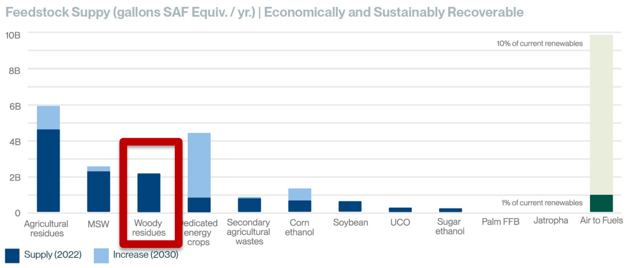
TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

31

Raw materials for SAF







TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

32

Outline

- Demand side drivers
- **Supply side drivers**
- The role of Italy in the bioeconomy

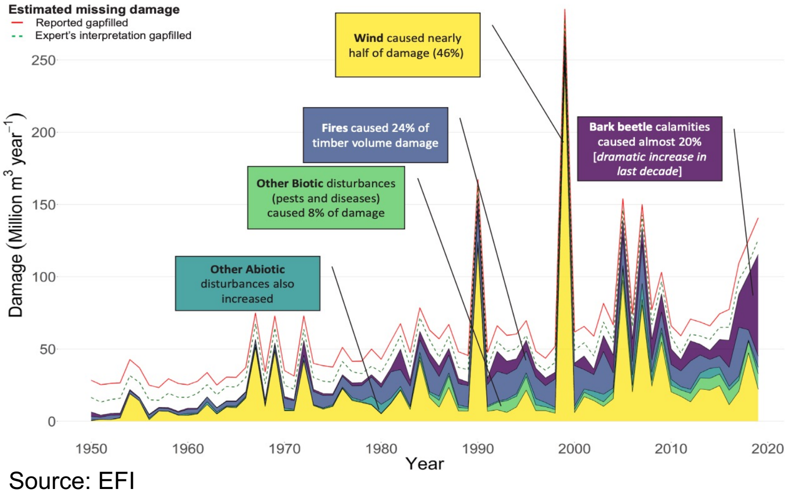
33

The drivers forces behind the supply

- **Negative drivers** for the European supply of wood products:
  - **reduced sink function** of the European forests (**increased instability**) and reduced short-medium term European supply
  - increased demand for **biodiversity protection**
  - **shortage of land** for biomass production in Europe
- **Positive drivers**
  - Increased **wood recovery/recycling**
  - Increased interests of financial investors in **forest investments**

34

Increased frequency and intensity of damages to European forests



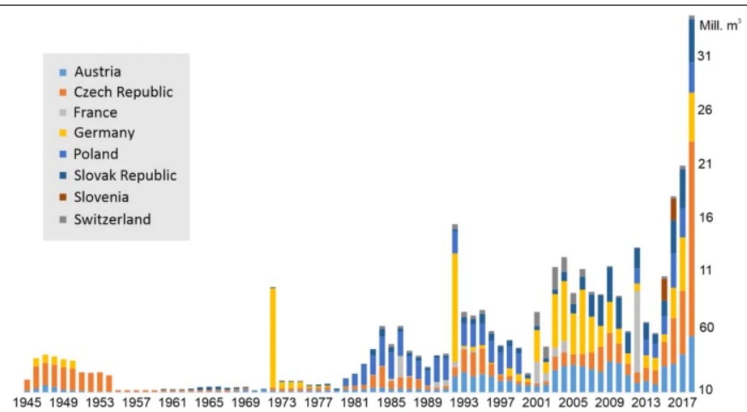
Source: EFI

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

35

Impacts on bark beetle in Central EU



Volume of Norway spruce killed by *Ips typographus* (and other bark beetles) in selected countries in Europe since 1945

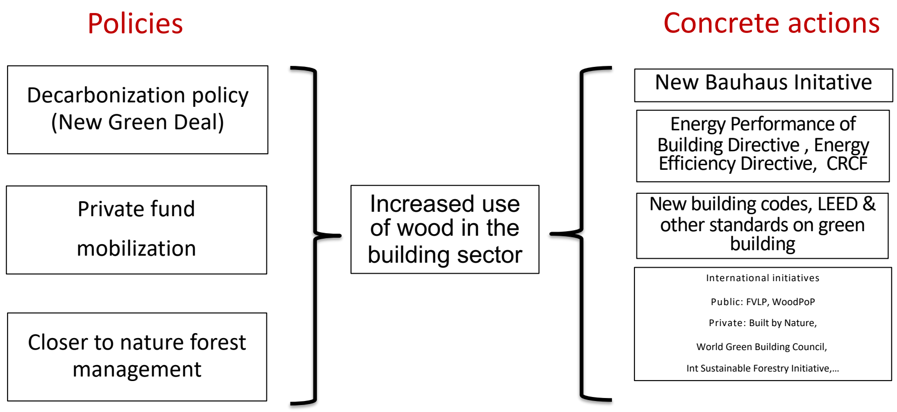
Source: Hlasny et al. (2021)

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

36

Policies and concrete actions for the green building sector

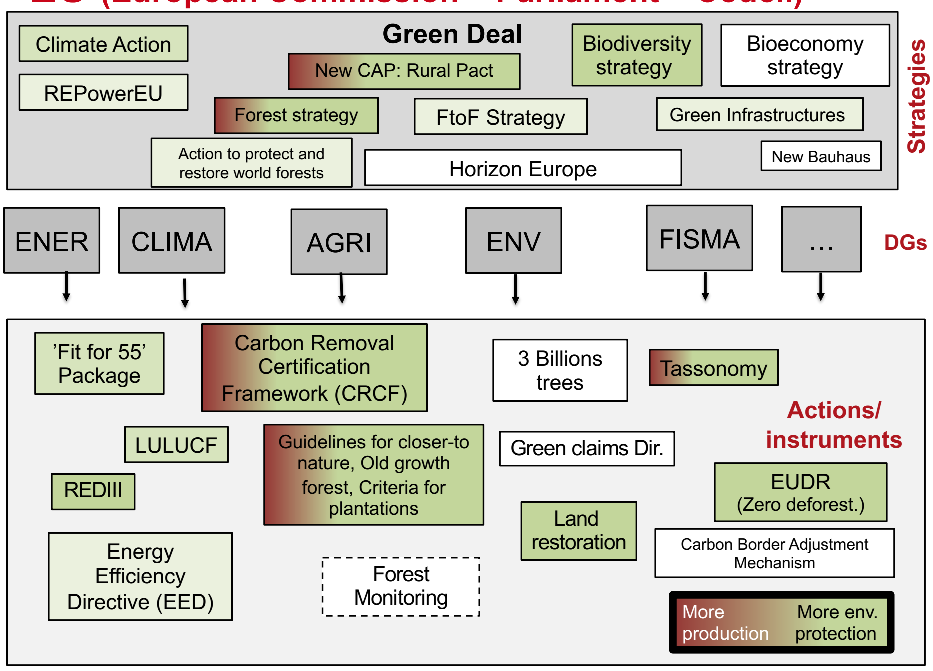


TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

37

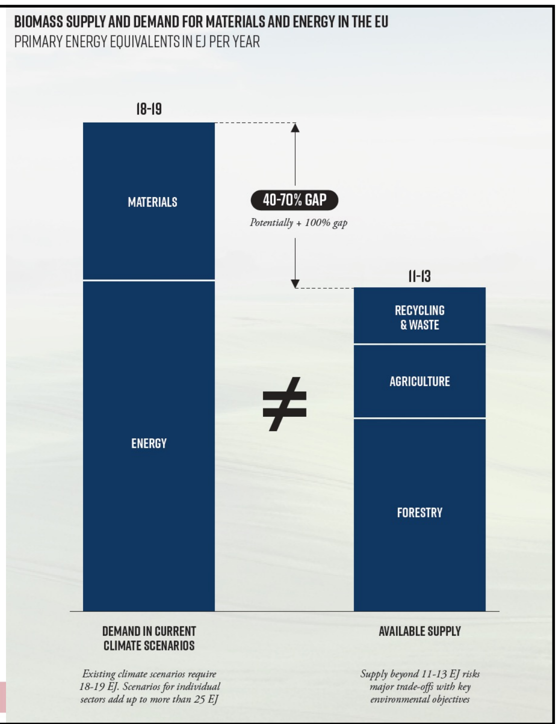
EU (European Commission + Parliament + Coucil)



38

A growing gap between biomass consumption and production in the UE

Source: Material Economics (2022). EU Biomass Use in a Net-Zero Economy.A course correction for EU biomass



39

Importing more biomass to support European bioeconomy development

More than 1/3 of biomass inputs for the EU bioeconomy are **sourced and imported from extra-EU areas**

nature

Explore content | About the journal | Publish with us | Subscribe

nature > comment > article

COMMENT | 26 October 2020 | Correction 12 November 2020 | Correction 21 December 2020 | Correction 03 March 2021

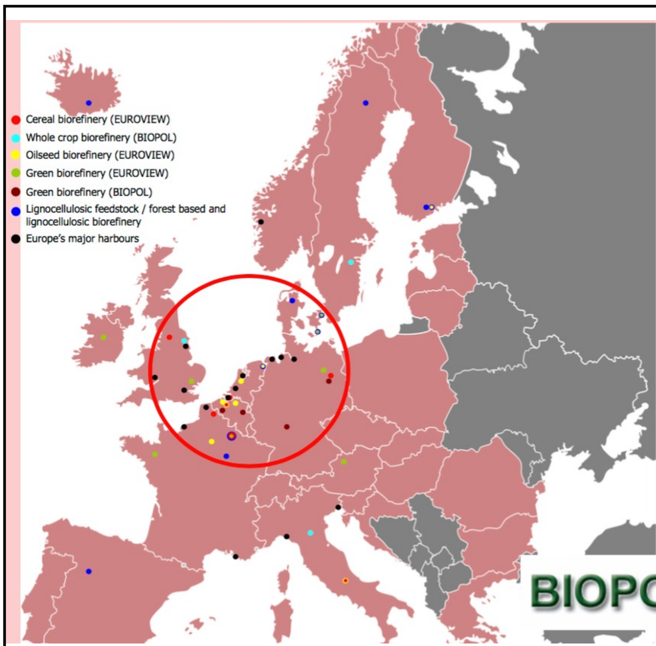
Europe's Green Deal offshores environmental damage to other nations

Importing millions of tonnes of crops and meat each year undercuts farming standards in the European Union and destroys tropical forests.

Richard Fuchs, Calum Brown & Mark Rounsevell

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

40



75% of the biorefinery sites and 70% of the largest sea harbors are located within a circle consisting of France, Germany, Denmark, Belgium, the Netherlands, and the UK

Source: Reith and Steinmetz (2009); Fava (2015)

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

41

Outline

- Demand side drivers
- Supply side drivers
- **The role of Italy in the bioeconomy**

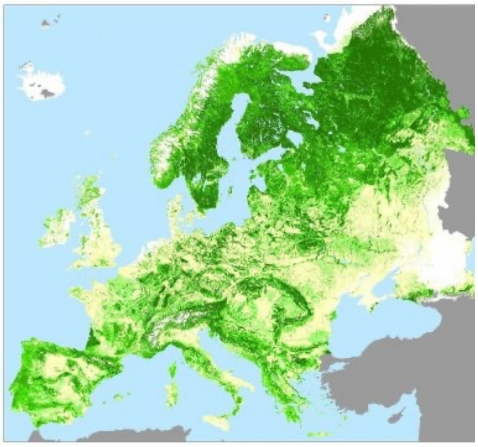
TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

42

	France	Germany	UK	Italy	*EU*
Forest cover	32%	33%	13%	**38%**	*33%*

Source: Forest Europe. State of Eur. Forests 2015

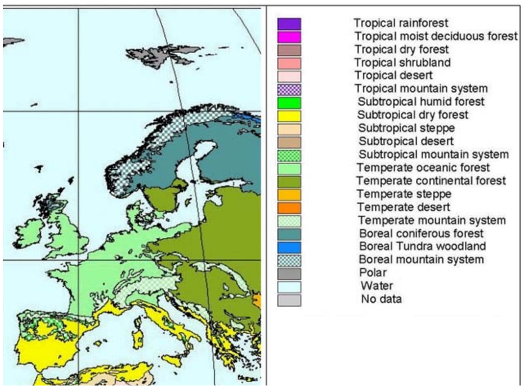
Forests



With more than 12 M hectares of forests, Italy has almost the same forest cover of Germany

43

Biodiversity



Italian flora:

over 5,800 species

5,300 herbaceous

and 500 woody

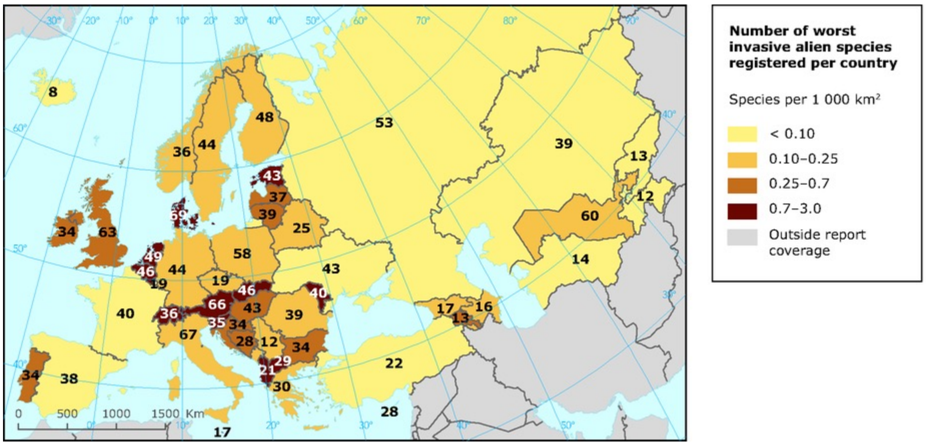
The richest country in Europe[1]

(Europe: 7,500 species)

1. Sandro Pignatti S. (ed.), Ecologia vegetale UTET, 2000.
   Blasi C., Boitani L., La Posta S., Manes F., Marchetti M. Stato della biodiversità in Italia Contributo alla strategia nazionale per la biodiversità. Palombi ed., 2005.

44

… but also invasive species



Source: https://biodiversity.europa.eu/topics/invasive-species

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

45

Mountains = Forests

95% of the forests in hilly and mountain regions:

= less developed areas

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

46

Expansion of forest cover

2-3 million hectares under natural conversion to forests (mainly in mountain areas)

1950 = 5.5 M hectares

2017 = 11.8 M hectares

2023 = more than 12 M hectares

47

	France	Germany	UK	Italy	*EU*
Forest cover	32%	33%	13%	38%	*33%*
Annual fellings/NAI	47%	80%	51%	**39%**	*66%*

Source: Forest Europe. State of Eur. Forests 2015

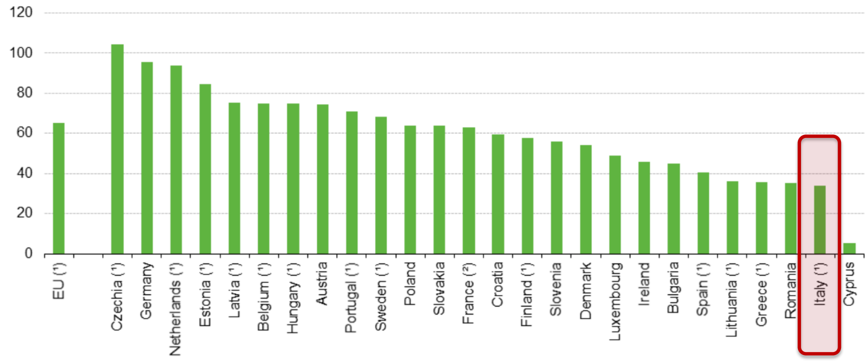
Annual fellings = 15.8 M cubic metres (2/3 fuelwood)

NAI = 38 Million cubic metres

Annual fellings/NAI = the lowest in Europe (after Cyprus – source: EUROSTAT)

48

Share of wood removals to net increment in EU forests, 2020 (%)



(¹) Data are estimates.
(²) Data refer to metropolitan France and only forest available for wood supply.
Note: Increment refers to the volume of wood grown less average annual mortality. Removals are measured overbark.
Malta: not available.

eurostat

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

49

How to make the woodworking industry competitive with a poor domestic wood supply?

4 possible solutions:

- Raw material imports
- Poplar plantations
- Circular economy
- Labour-intensive wood industry: furniture sector, high-quality paper products, floorings, …

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

50

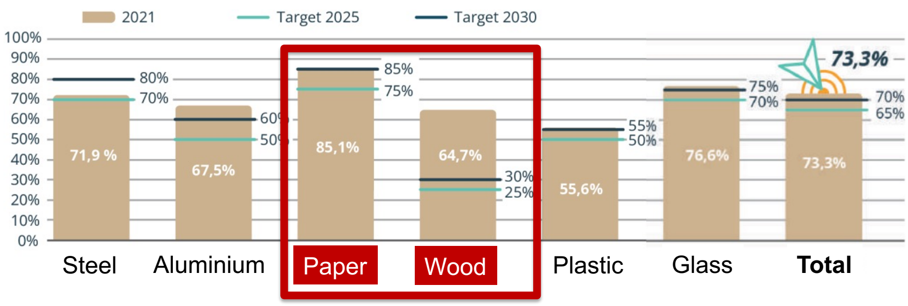
Fast growing plantations

Poplar plantations in the Po valley:

- Rotation period: 10 yr
- NAI: 15-20 cm/ha/yr
- only 70,000 ha but…
- = 60-70% of Italian removals of industrial timber
- **IRR = 5-7%**

51

Recycling rate of end-of-life products in Italy in relation to the EU targets set for Italy for 2025 and 2030



Source: https://www.fondazionesvilupposostenibile.org/wp-content/uploads/dlm_uploads/Sintesi-Il-Riciclo-in-Italia-2022.pdf

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

Università degli Studi di Padova

52

THE **ITALIAN FURNITURE INDUSTRY** GENERATES AS MUCH **ADDED VALUE** AS **FRANCE, SPAIN AND SWEDEN COMBINED**.

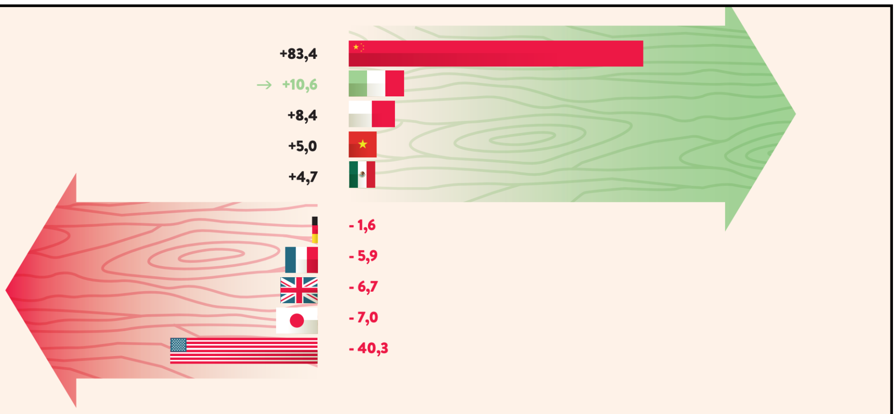
i di

ro)

In spite of its structural shortage of raw materials, Italy's skilled furniture manufacturers are able to generate massive added value (€4.9 billion), ahead of many other timber-rich countries such as France (€2.3 billion), Spain (€1.8 billion) and Sweden (€900 million).

FONTE / SOURCE | Fondazione Edison su dati/on data EUROSTAT

53



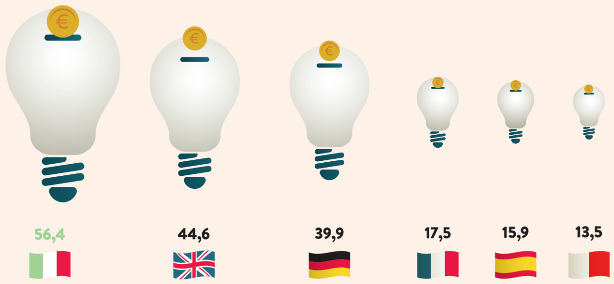
ITALIAN WOOD AND FURNITURE INDUSTRY HAS THE **WORLD'S SECOND HIGHEST TRADE SURPLUS**.

US$)

With a trade surplus of 10 billion, the trade balance of the Italian wood and furniture industry is second only to China (83.4 billion), and considerably ahead of Poland (8.4 billion), Vietnam (5 billion), Mexico (4.7 billion) and Germany (-1.6 billion).

FONTE / SOURCE | Fondazione Edison su dati/on data ITC e/and UN COMTRADE

54

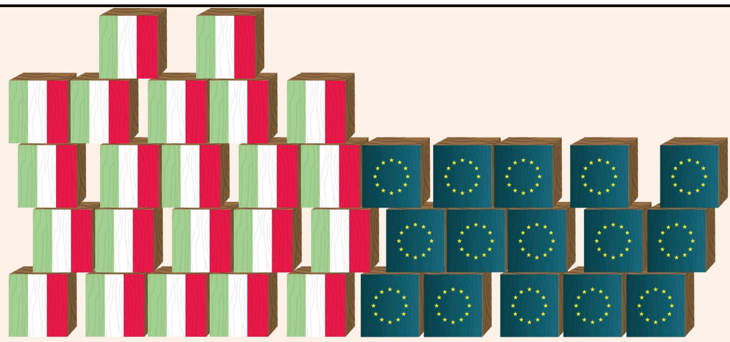


THE ITALIAN FURNITURE INDUSTRY'S **R&D** INVESTMENT IS THE **HIGHEST IN EUROPE**.

Italian furniture manufacturers are Europe's highest investors in R&D, spending €56.4 million on beating the competition in innovation and design.
Ahead of the UK (€44.6), Germany (€39.9) and France (€17.5).

FONTE / SOURCE | Fondazione Edison su dati/on data EUROSTAT

55



ITALY LEADS THE EU IN **60% OF WOOD AND FURNITURE PRODUCTS**.

Italy leads the EU-28 trade balance for 22 out of the 37 products internationally surveyed for the wood and furniture sector, including furniture, doors, windows and lighting products (Fortis-Corradini Index, Edison Foundation) .

FONTE / SOURCE | ISTAT, EUROSTAT e/ and UN COMTRADE

56

Furniture import by USA (M $)

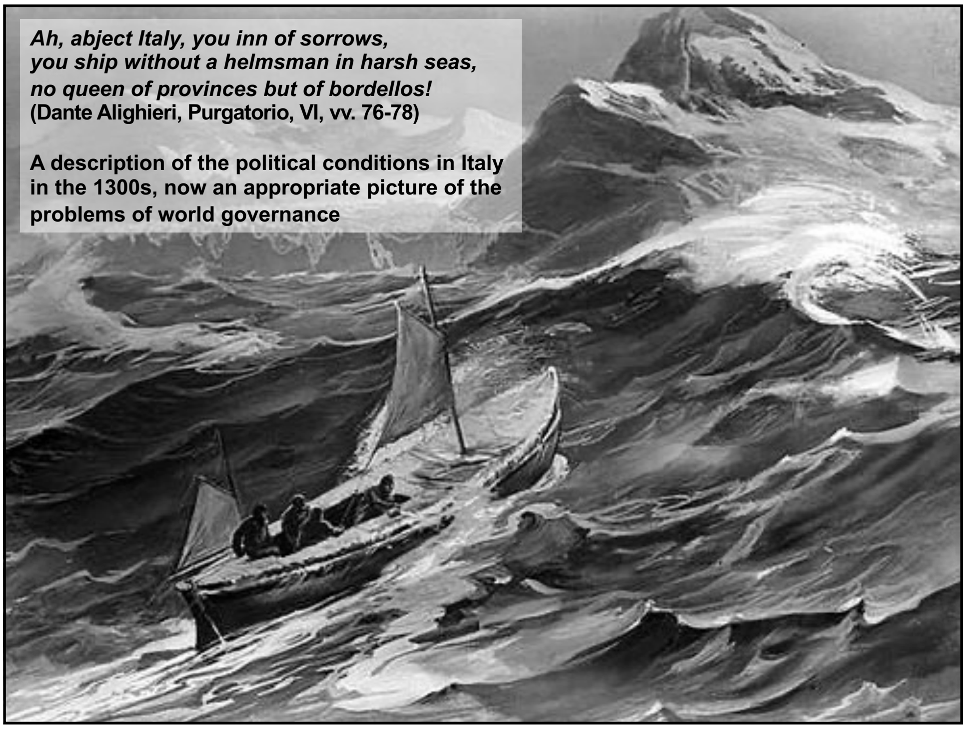
	2022	2023	2024	
World	**36 139**	**27 143**	**28 963**	**100.0%**
Viet Nam	9 758	6 817	8 295	28.6%
China	9 315	6 403	6 599	22.8%
Canada	2 998	3 038	2 942	10.2%
Mexico	2 648	2 466	2 263	7.8%
Malaysia	2 001	1 171	1 333	4.6%
Italy	1 465	1 248	1 283	4.4%
Taipei	1 071	821	831	2.9%
Indonesia	1 186	727	725	2.5%
India	898	685	684	2.4%

Source: ITC calculations based on US Census Bureau statistics

Hot topics:
- Strategic **trade diversification**: trade restrictions on China and Canada may divert Chinese and Canadian exports to the EU, affecting key EU industries.
- But the **high tax differentials** (China: 125-145%; EU: 20%) could reduce the impact on EU exports to USA
- Strengthening **partnerships** with alternative **import partners** (Arabic countries, Latin America, …)

TESAF Dipartimento Territorio e Sistemi Agro-Forestali — Università degli Studi di Padova

57



58