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Pine Chemicals Industry
Global Overview and Trends

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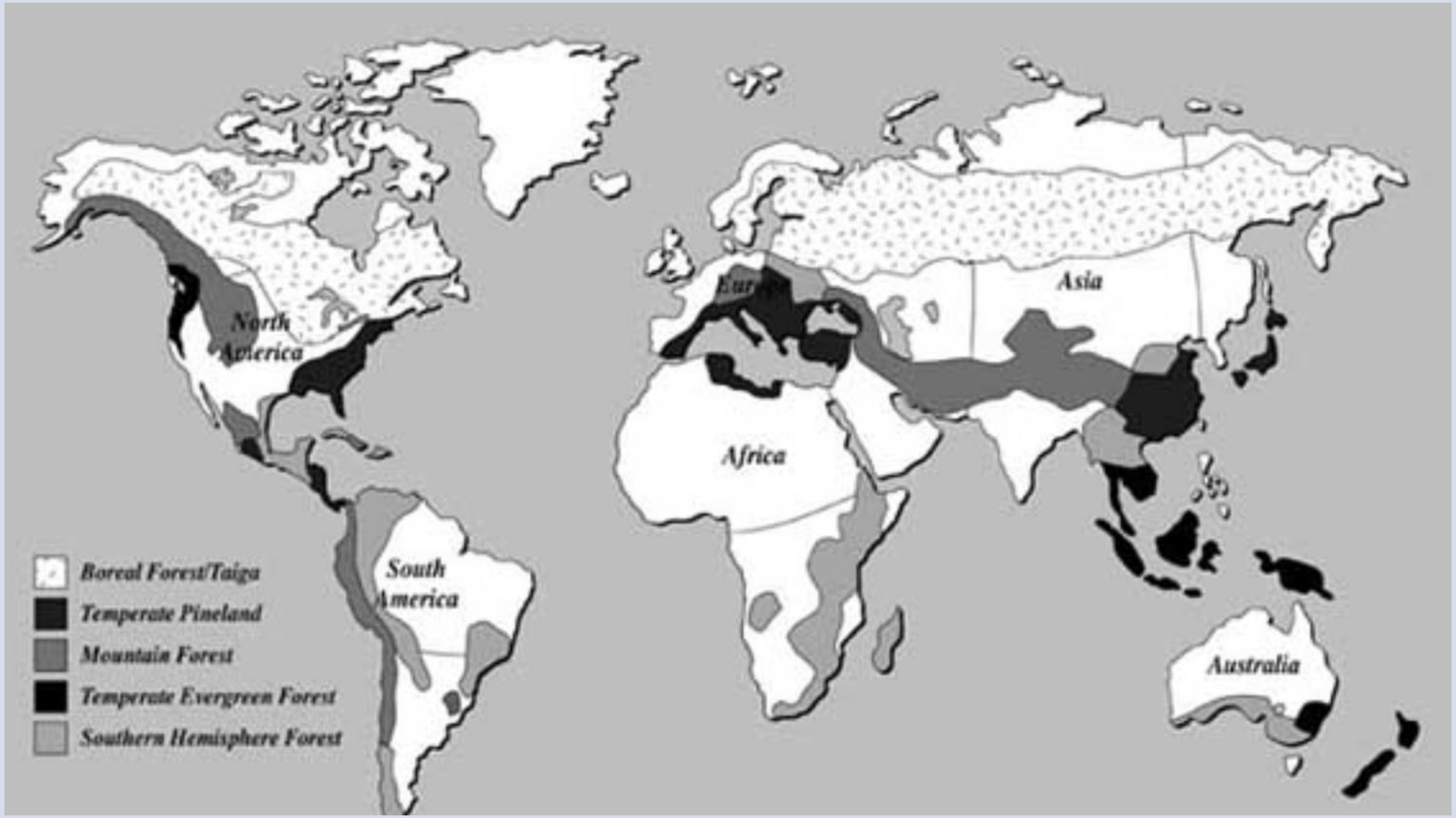
Y2025 : What’s going on ?

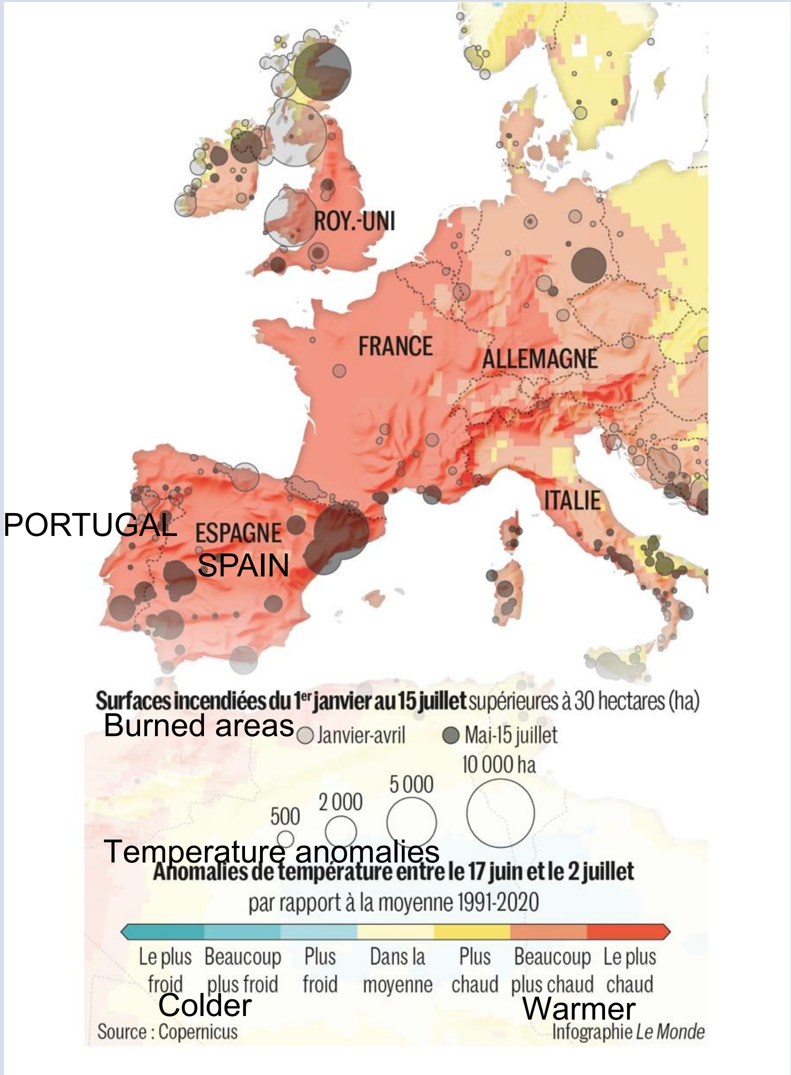
- US Tariffs
- Still low demand for Pulp
- CTO fractionation rates improving … but limited by Rosin demand
- Rosin derivatives : Reprotox classification ?
- Biofuels : Increasing demand for TOFA/CFA
- MDF Turpentine : A new source coming to the market

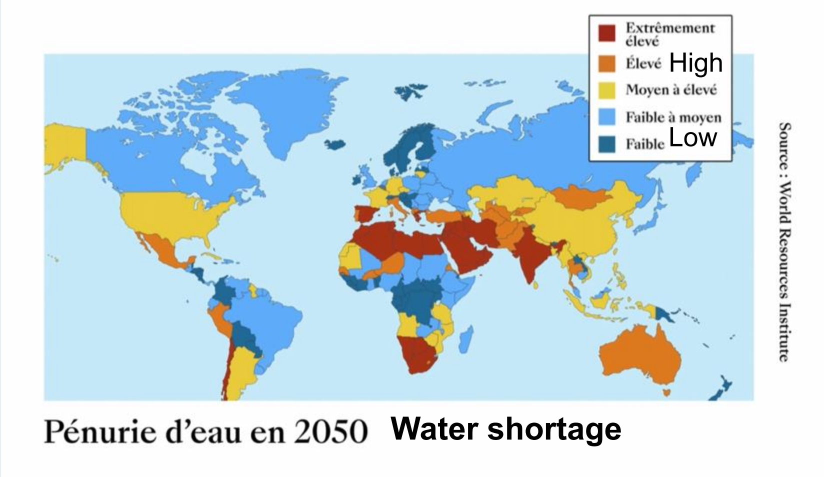
But let’s start with the origin of our industry : The coniferous forests

The World's Coniferous Forests
2 Billions ha
15% of land area / Largest Land Biome



Forests : Facing higher risks
What will be left in Y2050?





Climate Change:
More frequent forest fires
Insect pests and diseases
Higher tree mortality (x2 since 1985)
Slower tree growth
Less carbon capture

Global warming will affect GDP growth:
+1 deg.C = -12% GDP in 6 years
(Source NBER/Les Echos)
…and we might face + 2 or +3 deg.C

Europe:
Tree tapping activity in Spain, Portugal and Greece is affected.
In Portugal already 2.35% of the surface of the whole country burnt this year.
(Source: Publico August 19th)

Pine Chemicals: 4 Different Processes

Tree Tapping:

-Gum Turpentine

-Gum Rosin

Extraction from pine stumps:

-Wood Turpentine

-Wood Rosin

(Disappeared with Pinova plant closure)

Kraft process at Pulpmills:

-Crude Sulfate Turpentine

-Crude Talloil (CTO) :

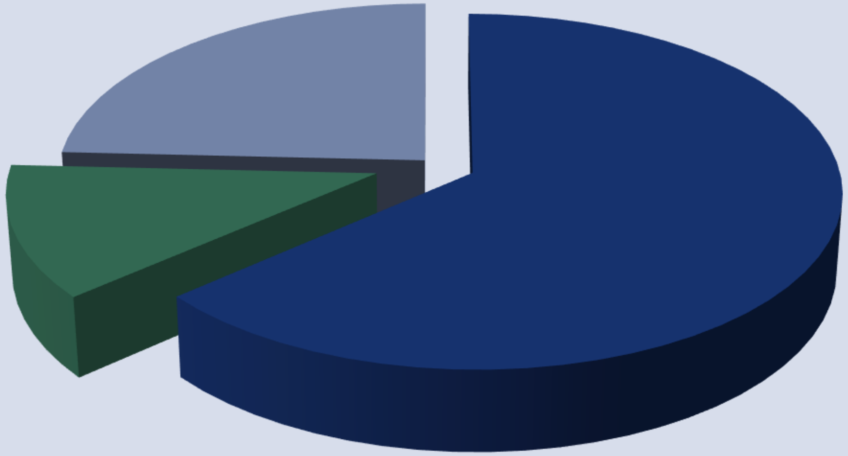
Talloil Rosin / Fatty acids

Pitch / Sterols

Medium density fiberboards:

- MDF Turpentine

Pulp Production



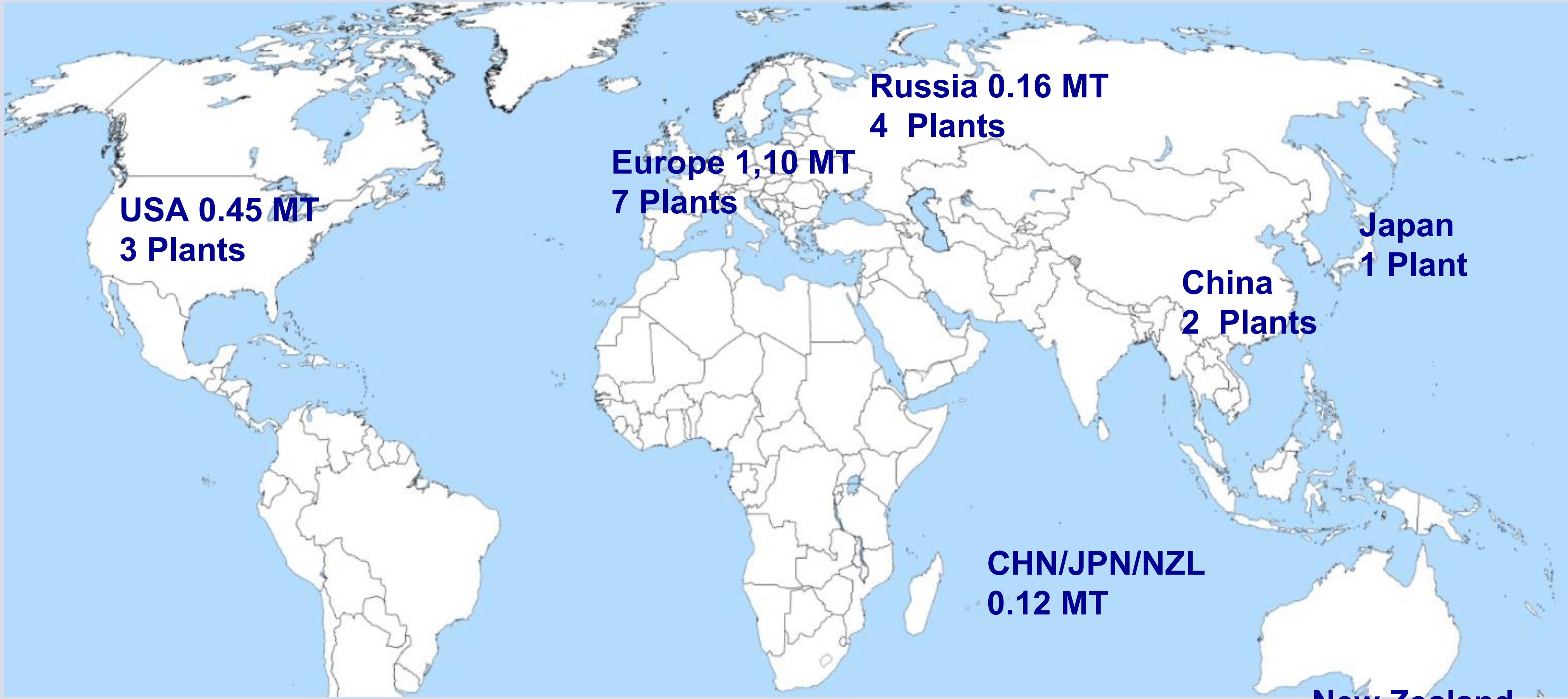
Global Pulp Production from virgin + recovered fibers: 350 Million T
Global Virgin Wood Pulp Production: 170 Million T
140 Million T Chemical process
30 Million T Mechanical process
Kraft process 90% of Chemical process

- Softwood Kraft pulp from coniferous trees : 43 Million T mainly concentrated (90%) in North America and Europe/Russia.

- Crude Tall Oil is mainly obtained from softwood kraft pulp.
- 40-50 Kg CTO /T softwood kraft pulp.

- Global Crude Talloil production : 1.90 Million T

Y2025 World CTO fractionation capacity 1.83 Million T (Capacity in use: 1.40 Million T ??)



New Zealand
1 Plant

1 MT = 1 Million Metric T

Y2025: 18 Plants
Y1990: More than 30 Plants !

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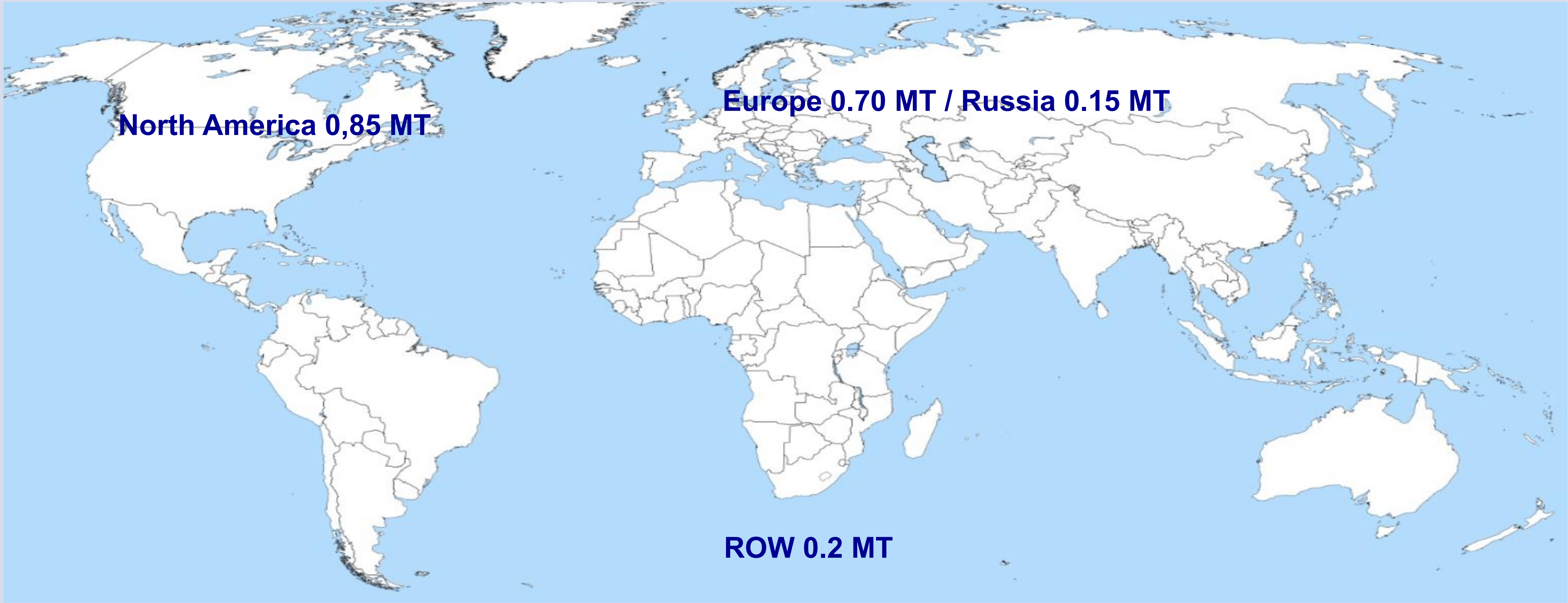
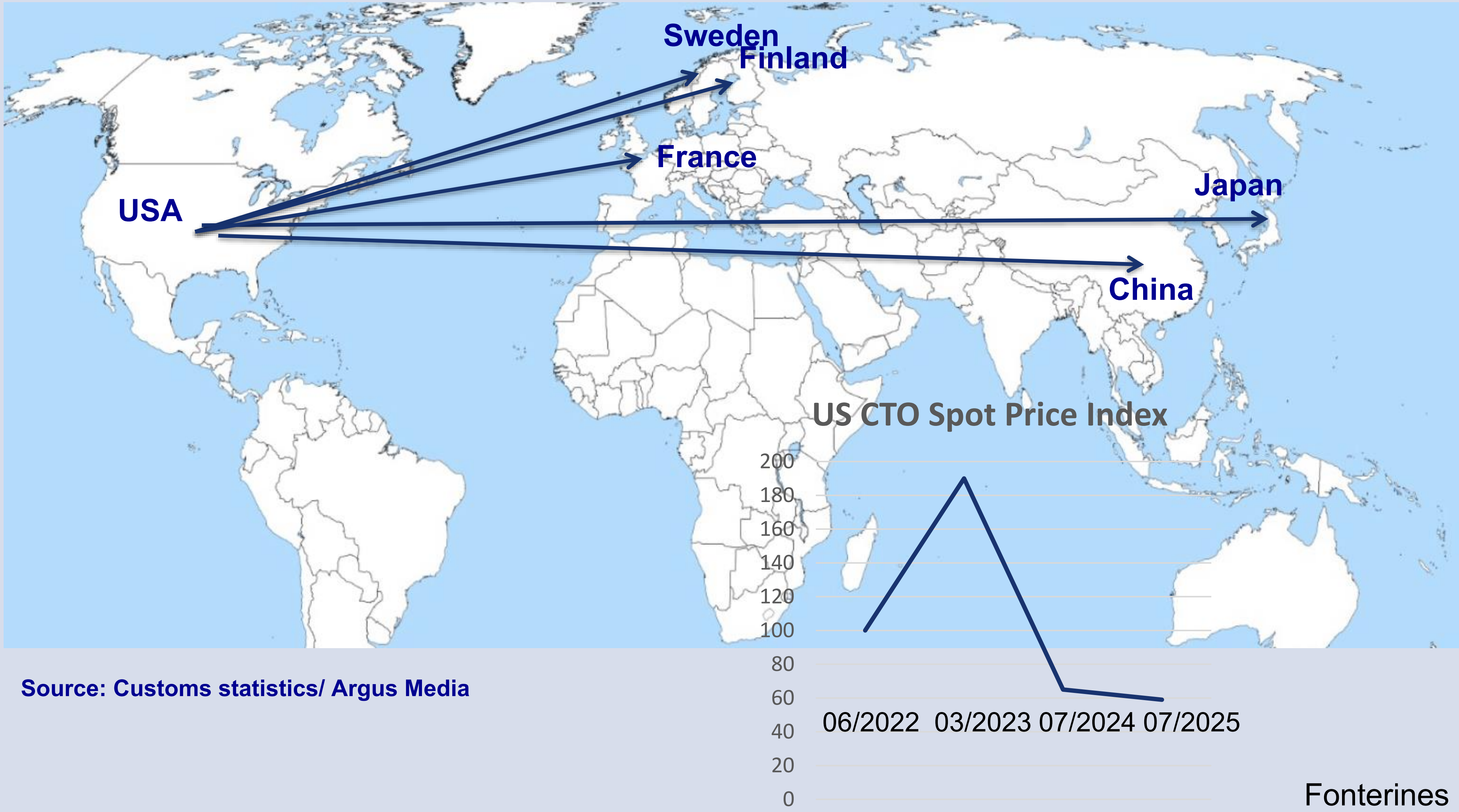
Y2025 CTO production :
1,90 Million T (Y2021: 2.05 Million T)



1 MT= 1 Million Metric T

CTO Main Exports from USA
Y2025 Jan-May 150 000 T

Most of the volume to Sweden and Finland



Source: Customs statistics/ Argus Media

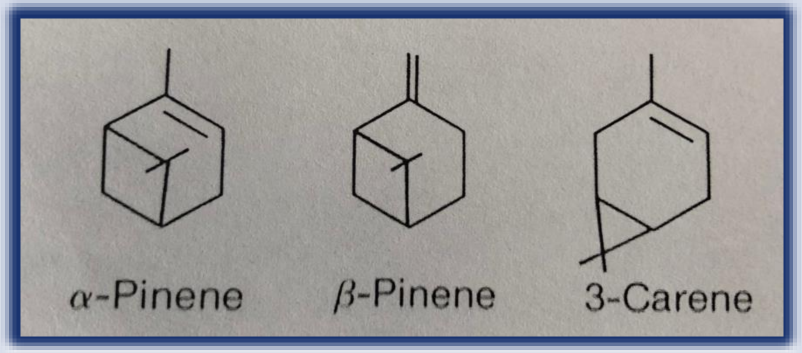
Pulp and CTO News

- 50 000 T Russian CTO no longer available for exports to Europe due to Russia/Ukraine war
- Lower yields due to climate change
- Still low demand for Pulp
- Lots of pulp mills closures in recent years . Downtimes , layoffs and further closures to be expected this year.
- 150 000 T CTO have disappeared !
- CTO prices stabilizing after sharp decrease.
  In Europe some Pulp mills are considering burning CTO in case of further price decline.

. CTO exports from USA reaching record high levels

Turpentine

- Volatile fraction of the oleoresin in the conifererous trees
- Largest volume essential oil in nature
- Chemical composition depending on the species and age of the tree and geographical location.
- Main components are C10H16 bicyclic , unsaturated monoterpene hydrocarbons such as:



- Chemical structure: Terpenes can be considered as polymers of isoprene (C5H8)n but isoprene is not involved in the biosynthesis
- Alpha and Beta pinene are considered as the most valuable fractions for Flavors and Fragrances and Terpene Resins… but Delta 3 Carene is a valuable fraction for Solvents and Resins

Turpentine Main Components Average Composition (%)

	Alpha Pinene	Beta Pinene	Delta 3 Carene
China / P.Massoniana	80	7	
China / P.Elliottii	52	36	
China / P.Yunanensis	60	25	
Brazil/P.Elliottii	40	45	
Brazil /P.Tropical	80	5	
Indonesia /P.Merkusii	80	2	12
Portugal	75	17	
India	25	3	60
USA (South East)	62	25	
USA (NW)/Canada	30	10	20
Finland/Sweden/Russia	55	4	25
Austria	60	13	15

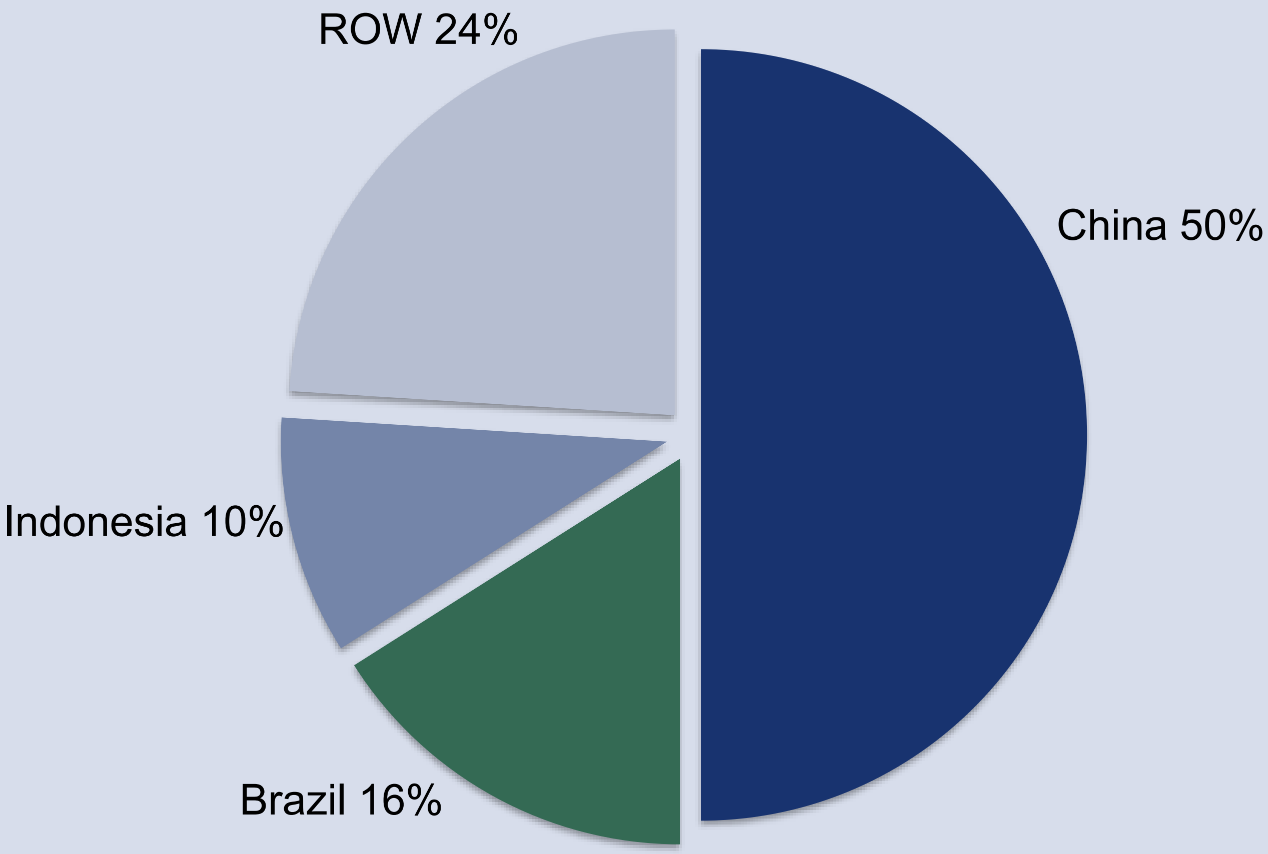
CST: Sulfur compounds 1 – 5 %

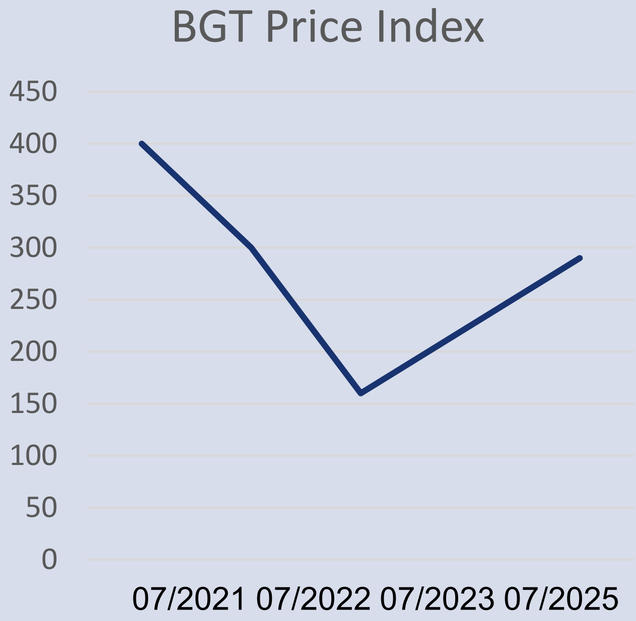
Y2025 Gum Turpentine Production: 145 000 T

Y2023:
Low demand from Flavors and Fragrances.
High inventories in Brazil.
Prices down.

Y2024:
Improving demand.
Higher price level.

Y2025:
High price level.
Demand slowing down





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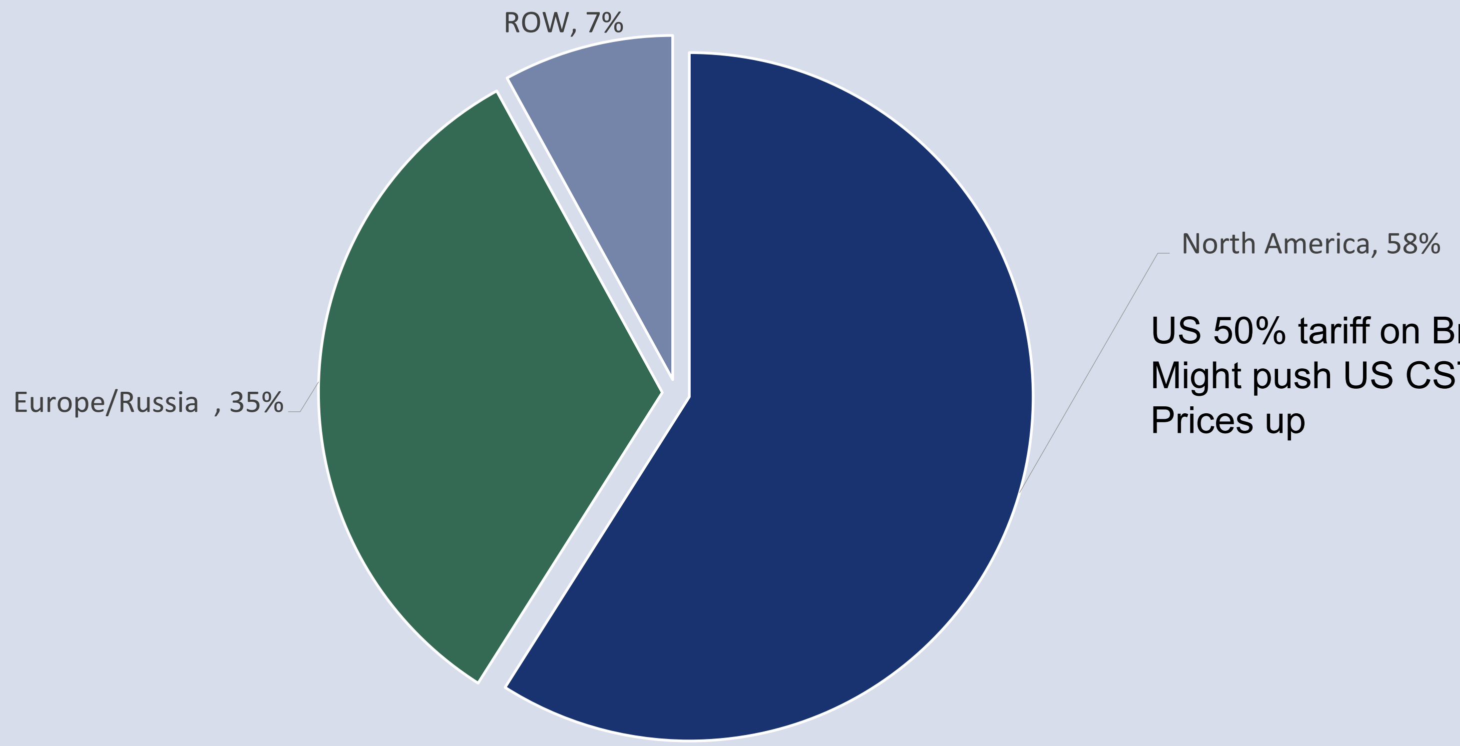
Y2025 CST Production: 180 000 T* (Y2021:210 000T)

3-5 Kg / T Softwood Kraft Pulp



US 50% tariff on Brazil
Might push US CST
Prices up

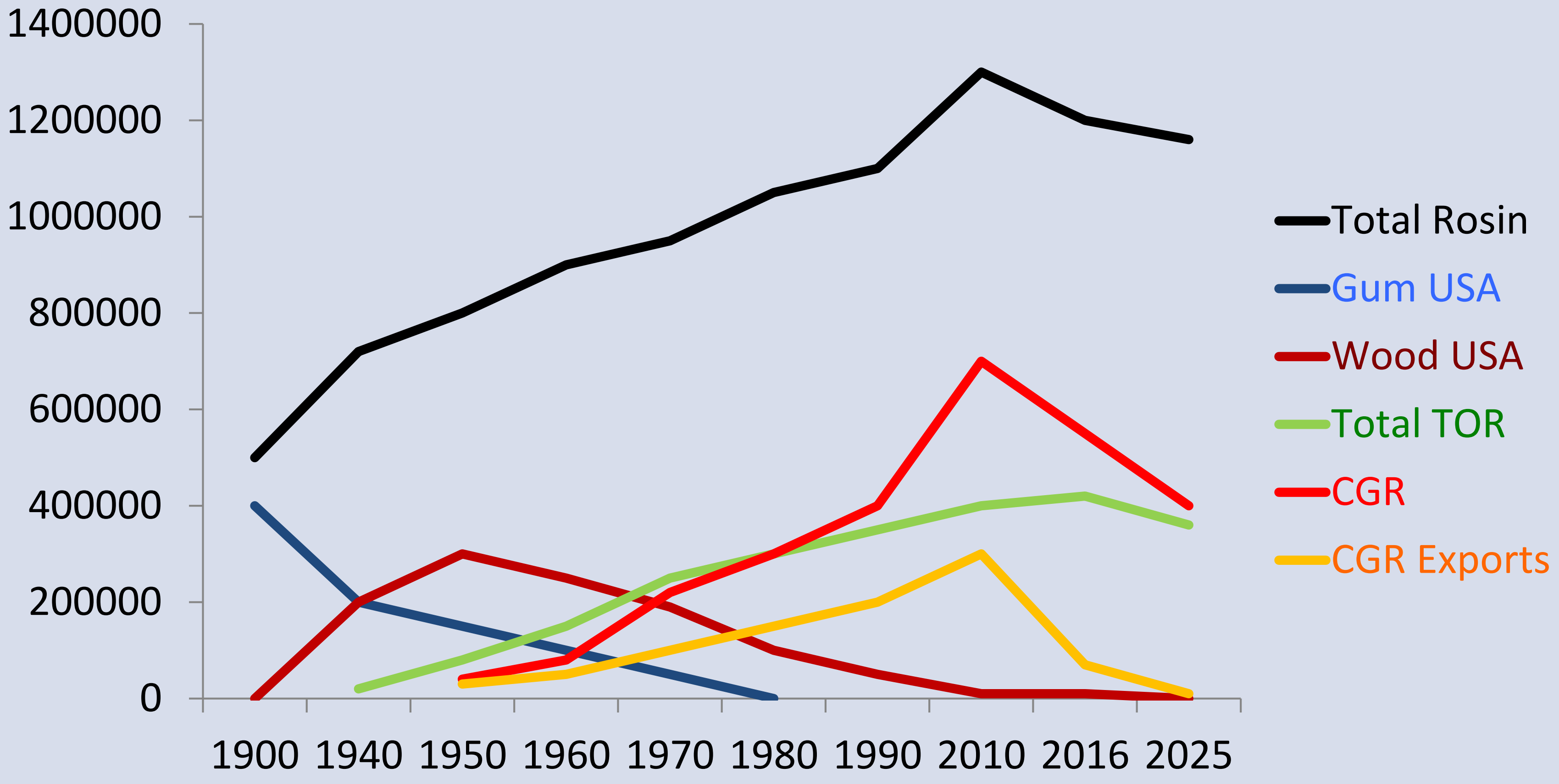
*Including 15 000 T CST from CTO

MDF Turpentine : A new source coming soon !

- **Full details in Prof. Bernd Bungert presentation**
- Raw material for MDF : Mainly softwood from coniferous trees
- Solve environmental issues at MBF plants
- Yield and compostion depending on origin and tree species
- Worldwide potential volume exceeding **120 KT / year**
- **No sulphur content as gum turpentine**

Rosin production

Y2025: Total Rosin production: 1 180 000 MT



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Rosin quality

- Significant differences in composition
- Fast growing Pinus Elliotii with lower PAN content

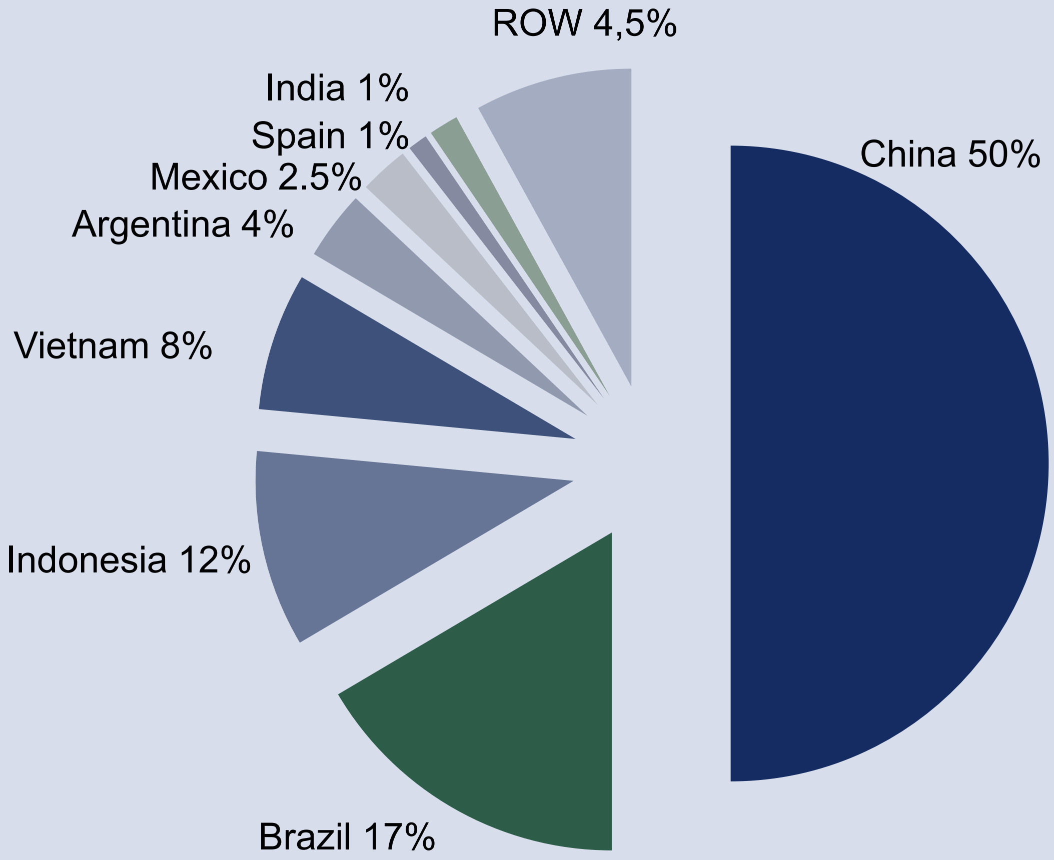
	P. Massoniama	P. Elliottii	SCAN TOR	P. Merkusii
Pimaric acid	8%	4%	2%	0.5%
Sandaraco pimaric acid	1.5%	1.5%	1%	9%
Isopimaric acid	1%	14%	7%	17%
Dehydroabietic acid	3%	3%	19%	4%
Palustric acid	16%	20%	13%	22%
Abietic acid	49%	20%	43%	20%
Neoabietic acid	14%	16%	4%	11%
Others (RA,Unsaps)	7.5%	21.5%	11%	16,5% (10% Merkusic)

Y2025 Global Gum Rosin production: 800 000 T

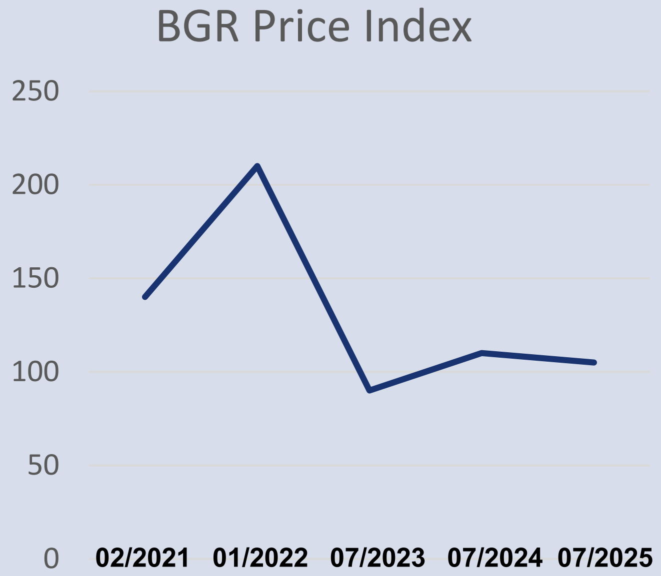
Rosin demand in China : 530 KT.

Wen 2how Chung Hao Trade company investing in tree tapping activity in Spain.

Brazil:
Increased costs for Pine oleoresin are impacting Rosin prices



ROW:
Portugal (1)
Africa (2)
Greece
Madagascar
Fiji
Russia
USA …



(1) Portugal 6 KT

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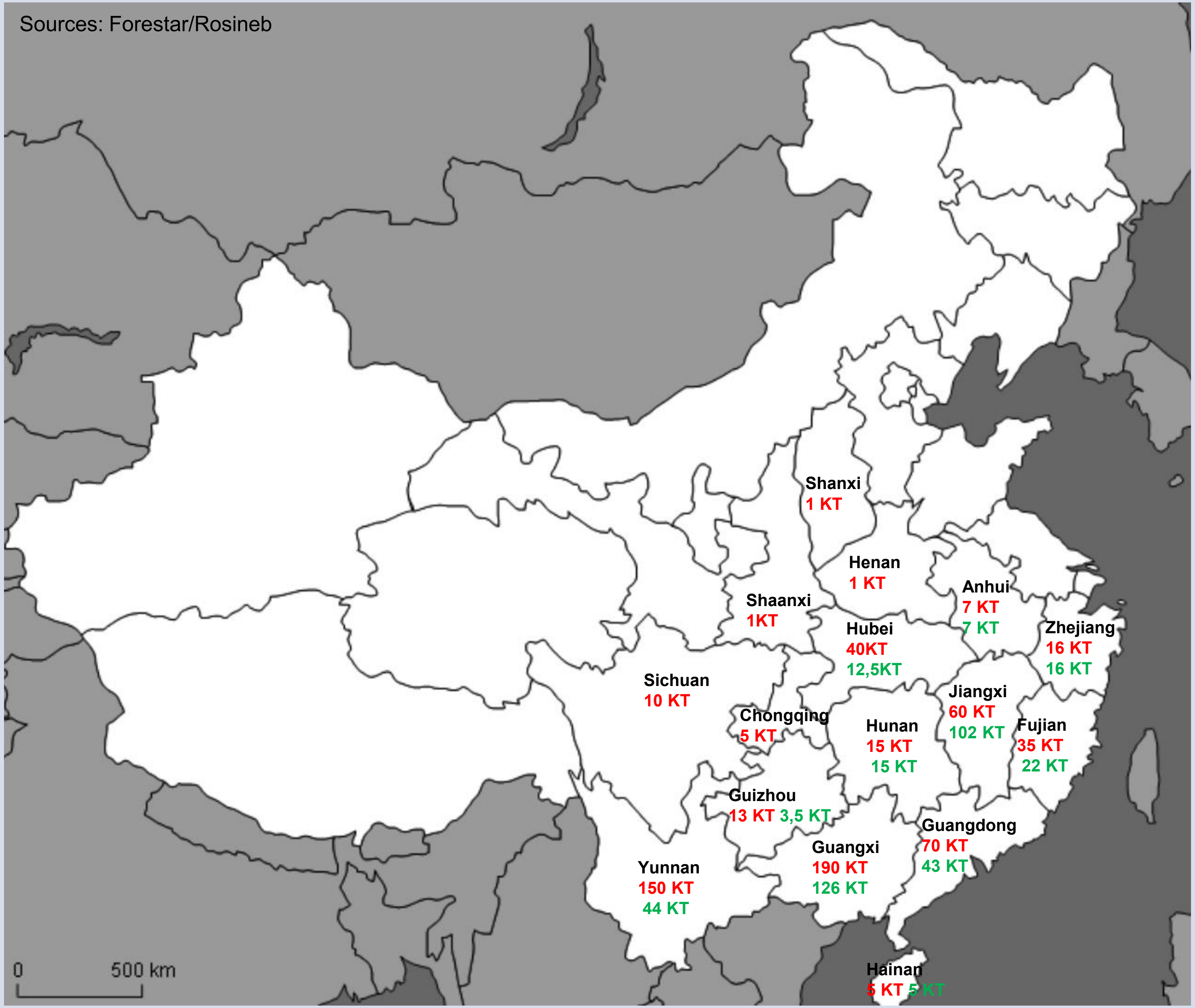
Chinese Gum Rosin Production



Y2011 : 619 KT
(65% Massoniana / 20% Elliottii)

Y2024 : 396 KT
(21% Massoniana / 68% Elliottii)

20 years ago, CGR production +/- 700 KT/Y

Continuous decline due to :
Increasing labor cost
Difficulty to tap natural forests
Industry development and building construction
Local regulations to 'protect' the environment (Yunnan had the potential to produce 500 KT !)

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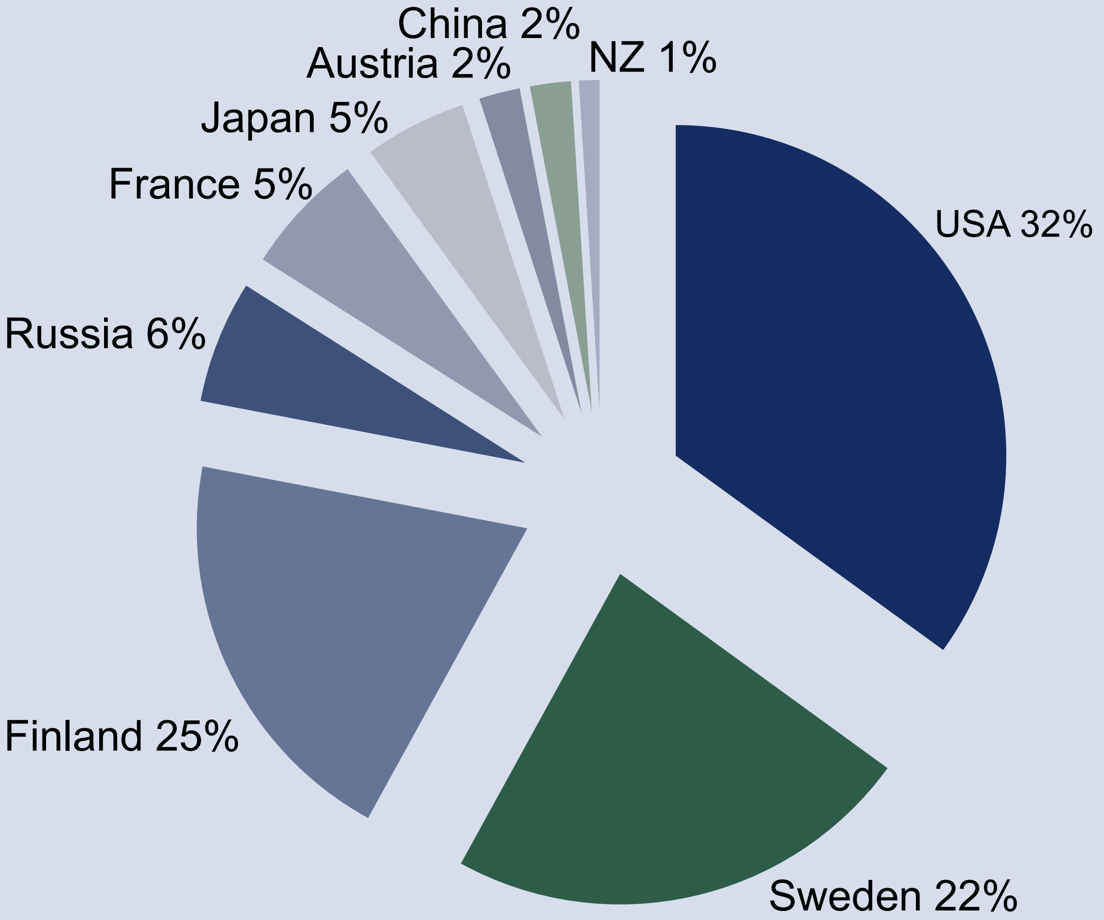
Y2025 Global Talloil Rosin (TOR) Production 380 000 T

(Y2021: 450 000 T, Y2024: 350 000 T))

Fractionation rates have imroved but still limited by Rosin demand



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Ink resins market: sharp decline

Adhesive market : Demand for natural resins picking up very slowly

Competition from HR

Possible Reprotox classification of some Rosin derivatives? PCA and Harrpa working on this issue …but 'Standard' Rosin esters are NOT included in the proposed classification.

Rosin consumption / Market segment

	2017	2025
Adhesives , Road marking	40%	55%
Ink resins	30%	15%
Paper sizing	10%	10%
Emulsifier for rubber	10%	10%
Beverages, CG Cosmetics , Others	10%	10%

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Y2025 TOFA/CFA Production : 420 000 T

Y2024:
Lower production in USA supporting high prices
Increasing exports of European Tofa to USA
Price erosion in Europe due to weaker demand

Y2025:
Higher production volume due to improving CTO fractionation rates.
In Europe still weak demand from coatings.
In USA stable to slightly lower demand.
Higher prices in USA compared to Europe promoting European Tofa imports.
Despite US Tariffs American buyers should continue buying European Tofa.
Improving CFA demand for HVO in Europe.

GDP growth will be affected by new US Tariffs

Average import taxes have been increasing from 2 to 18% since January

- World entering in a new commercial era

- GDP growth will be affected

- Tariffs not really correlated to US Trade balance

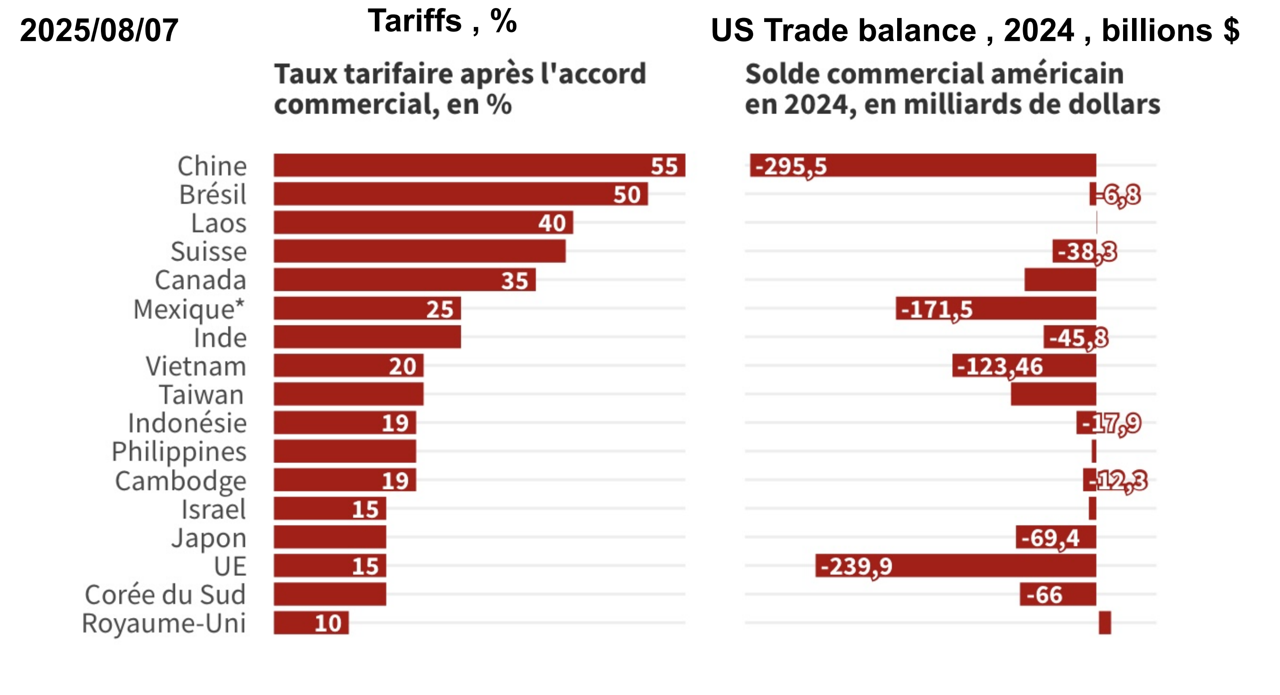
- Potential effect on Pine Chemicals industry:

  . 50% on US imports from Brazil could push US CST producers to increase prices?

  . Brazilian rosin esters producers might be more aggressive on the European market ?

  . European rosin esters producers might increase exports to USA?

  . At this stage no reciprocal Tariffs from EU which could have affected CTO imports from USA



Outlook for the Pine Chemicals industry

- CTO fractionation rates improving …but limited by Rosin demand
- Weak demand for all rosin derivatives
- In Europe improving CFA demand for HVO
- In the USA TOFA demand for oilfields might be affected by sharp oil price decrease (from nowadays USD 65 / barrel towards USD 50/40 / barrel ??
- Sulphur free MDF Turpentine : New source for Flavor and Fragrances and Terpene resins
- Trend around natural resins and biobased and sustainable materials remains high but , as already said last year, not resulting in demand.
- Markets does't like incertitudes .
  Once tariffs fixed (with hopefully longer term stability?) , markets will adapt to the new commercial era.

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