

2023 Encontro Brasileiro de Pine Chemicals
Nov 30 – Dec 1 , Sao paulo

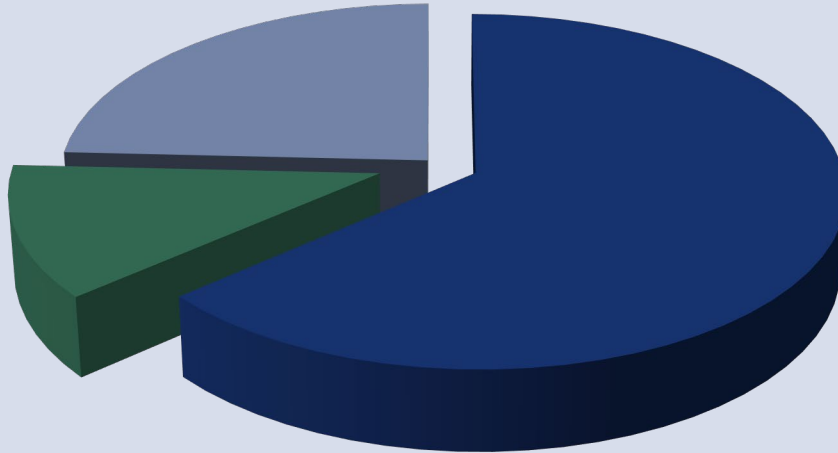
CTO , CST and TOR

Global overview and Trends

Michel Baumassy , SAS Fonterines Consulting



Pulp Production



- Other pulp
- SW Sulphate Kraft Pulp
- HW Sulphate Kraft Pulp

**Global Pulp Production from virgin + recovered fibers:
330 Million T**

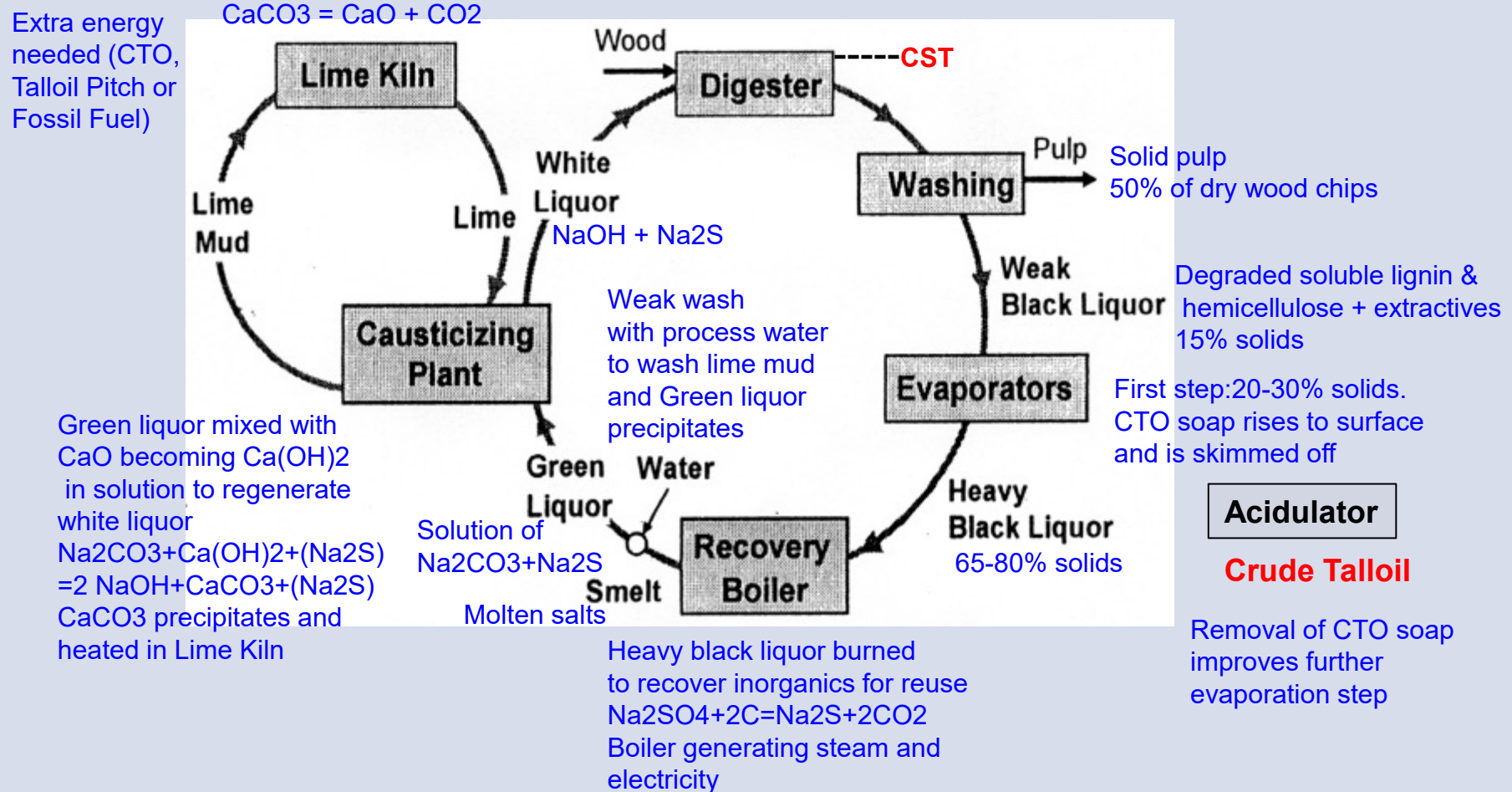
Global Virgin Wood Pulp Production: 160 Million T
130 Million T Chemical process
30 Million T Mechanical process
Kraft process 90% of Chemical process

- 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 : 1.95 Million T

KRAFT Process

- Invented in Danzig/Prussia in 1879 by Carl Dahl
- Superior strength of the resulting paper (Kraft = Strength in German)
- Invention of the recovery boiler in 1930 enabling the recovery and reuse of the inorganic pulping chemicals
- Raw Talloil soap which rises to the surface of the intermediate black liquor tank is skimmed off and acidified with sulfuric acid to produce Crude Talloil
- Dissolved organic compounds in heavy Black Liquor are burned to produce steam and power.
- **Black liquor can be considered as the most important renewable bio-fuel**

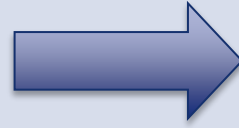
KRAFT Process



Ca, Na and S: closed cycle

CTO History

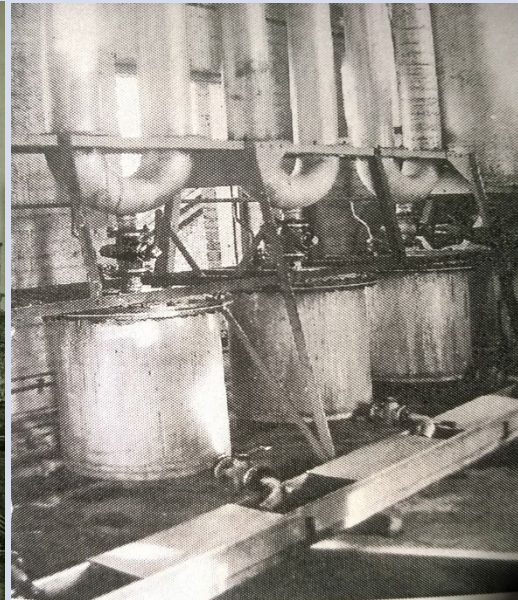
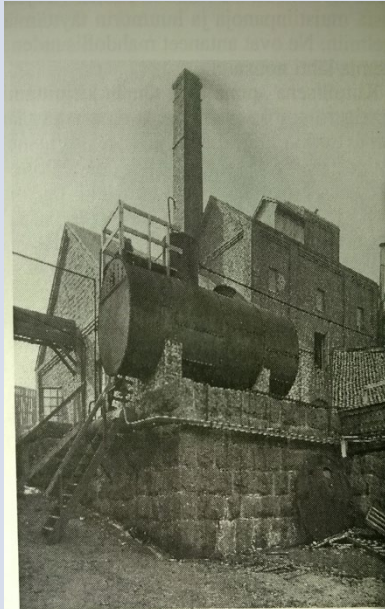
Late 19th century:
Discovery that black
liquors contain fatty
acid and rosin acid
soaps



1899: Production of
Crude Talloil starts at
Skutskär/Sweden



1911: Patents in
Finland, Sweden by
Hellström and
Bergström

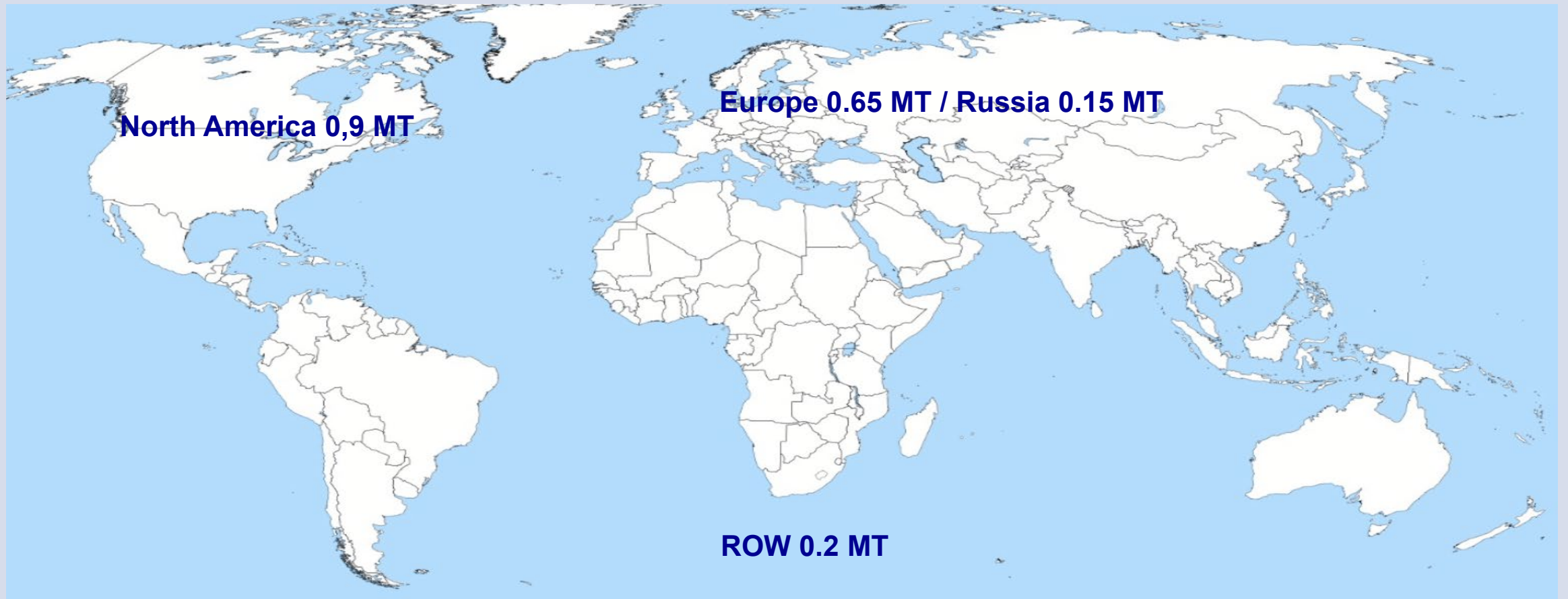


1913 : First CTO Vacuum
Distillation Plant in Kotka/Finland



2022 Newest CTO fractionation plant

Y2023 CTO production : 1,90 Million T (Y2021: 2.05 Million T)

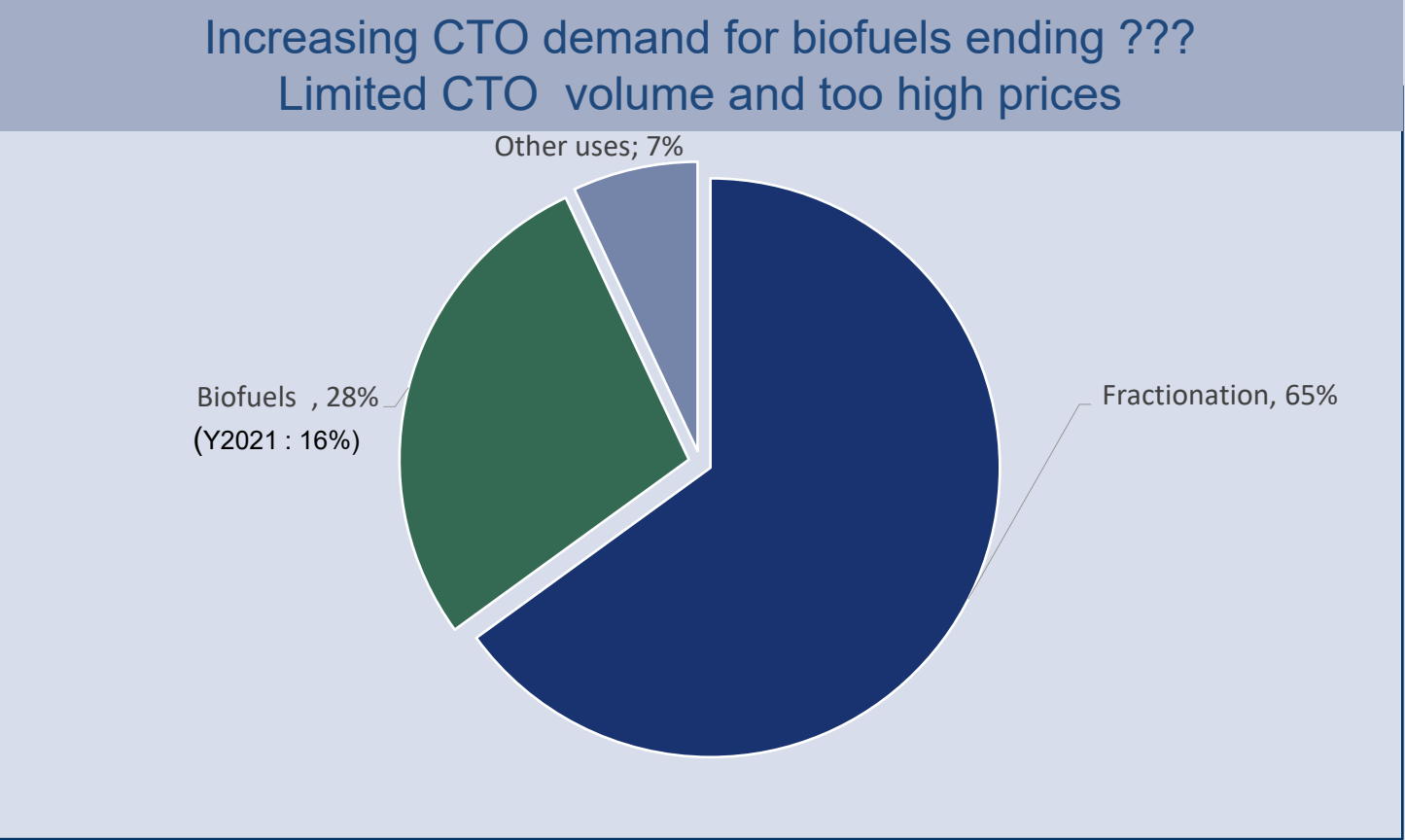


1 MT= 1 Million Metric T

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
- Lower demand for pulp
- Pulp mills closures : Latest announcements : Canton mill NC , Sunila mill Fi , Tacoma WA , Espanola Ontario , Foley Fla , Orange TX , Riegelwood NC , Pensacola Fla
- 150 000 T CTO have disappeared !
- Nevertheless CTO prices are declining with softening demand (high prices no longer affordable, lower fractionation rates ...)
- Ingevity DeRidder CTO fractionation plant will be closed by June 2024
- New Metsä/Kemi mill will replace the older one (Net CTO gain +40KT)

Y2023 CTO Demand / Market Segment



Minstream Pine Products project on hold

Biofuels : Ambitious goals (1)

Sustainable Aviation Fuels (SAF)

- Air transport : 3% of Greenhouse gas emissions in 2023
- July 13 , 2023 : 137 225 flights according to Flightradar 24. Twice more by 2030 ?
- EU rules for SAF : 2% in 2025 , 6% in 2030 , 20% in 2035 , 70% in 2050 !!
- EU needs in 2050 : 400 Millions T SAF (235 KT in 2022)
- SAF can be produced by Oleochemical biomass (UCO, animal fat, ...) , lignocellulosic biomass (wood and forest residues...) , E-Fuels (H2 produced by electrolysis with 'green electricity' + CO2)
- SAF from Biomasses can represent only 10 to 20% in 2050
- E-Fuels might be a solution but need huge capital investments and huge amount of electricity (37 MWh / 1T SAF)
- In 2050 25% of European sustainable electricity would be needed to produce SAF !!!
- SAF 2 to 6 times more expensive than kerosene (Will improve ... but will anyway result in higher priced flight tickets)
- Airlines are signing contracts based on plants to be built without time frame
- Are the goals realistic or way too ambitious ?

- **2 Million tons CTO volume is negligible compared to biofuels huge needs and cannot bring any sustainable long term solution**

Biofuels : Ambitious goals (2)

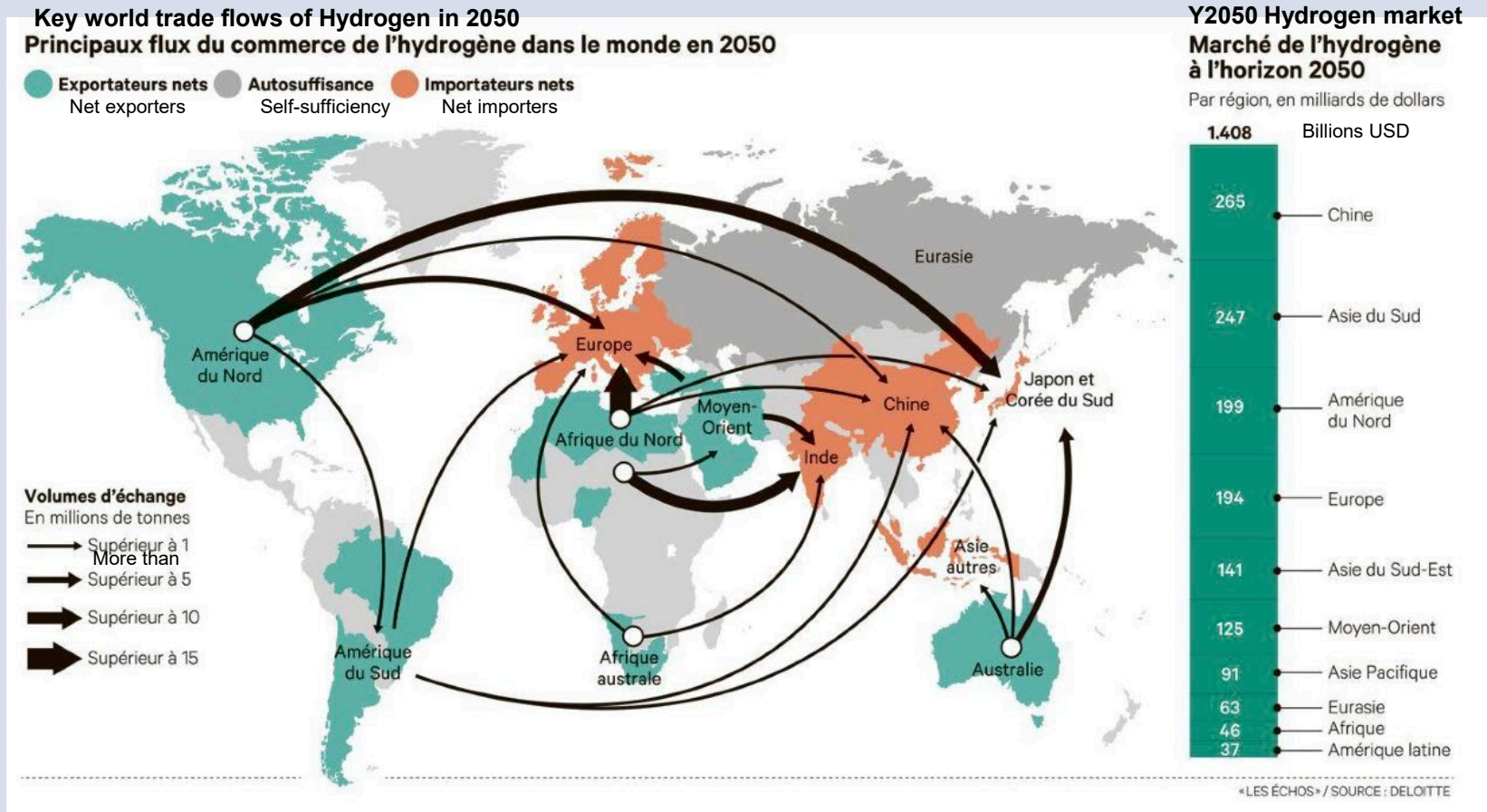
Ocean freight

- Ocean freight : 3% of Greenhouse gas emissions in 2023
- Transporting 80% of world consumed products
- Ocean freight might triple by 2050
- UNO goals (July 2023 London meeting) : 20-30 % lower emissions by 2030 , 70-80 % by 2040 , carbon neutrality in 2050 ?
- Ships with additional sails : Saving 20% of fuel
- Reduce speed of the ship and better control of the flows (nowadays ships are rushing across the oceans and then wait in line days or weeks to enter into the harbours
- LNG (transition fuel) , biofuels (H₂ , CH₄ , Methanol , NH₃ ...) ...but volume won't be enough for everyone
- E-Fuels : Huge amount of electricity needed
- Only for the french fleet 40% of the nuclear electricity produced in France would be needed !
- 150 000 wind turbines needed for the world fleet
- 300 Billions USD / year between 2030 and 2050 to decarbonize the ocean freight ... but would represent only 1% price increase of all consumed goods.

- **Once again : 2 Million tons CTO volume is negligible compared to biofuels huge needs and cannot bring any sustainable long term solution .**

Hydrogen Market Y2050 (Source Les Echos/Deloitte)

'Green' Hydrogen produced from renewable energies might represent 85% of volume by 2050 . Today it represents less than 1%.
 Heavy investments required ...but equivalent to those of oil and gas sector today



Turpentine Main Components Average Composition (%)

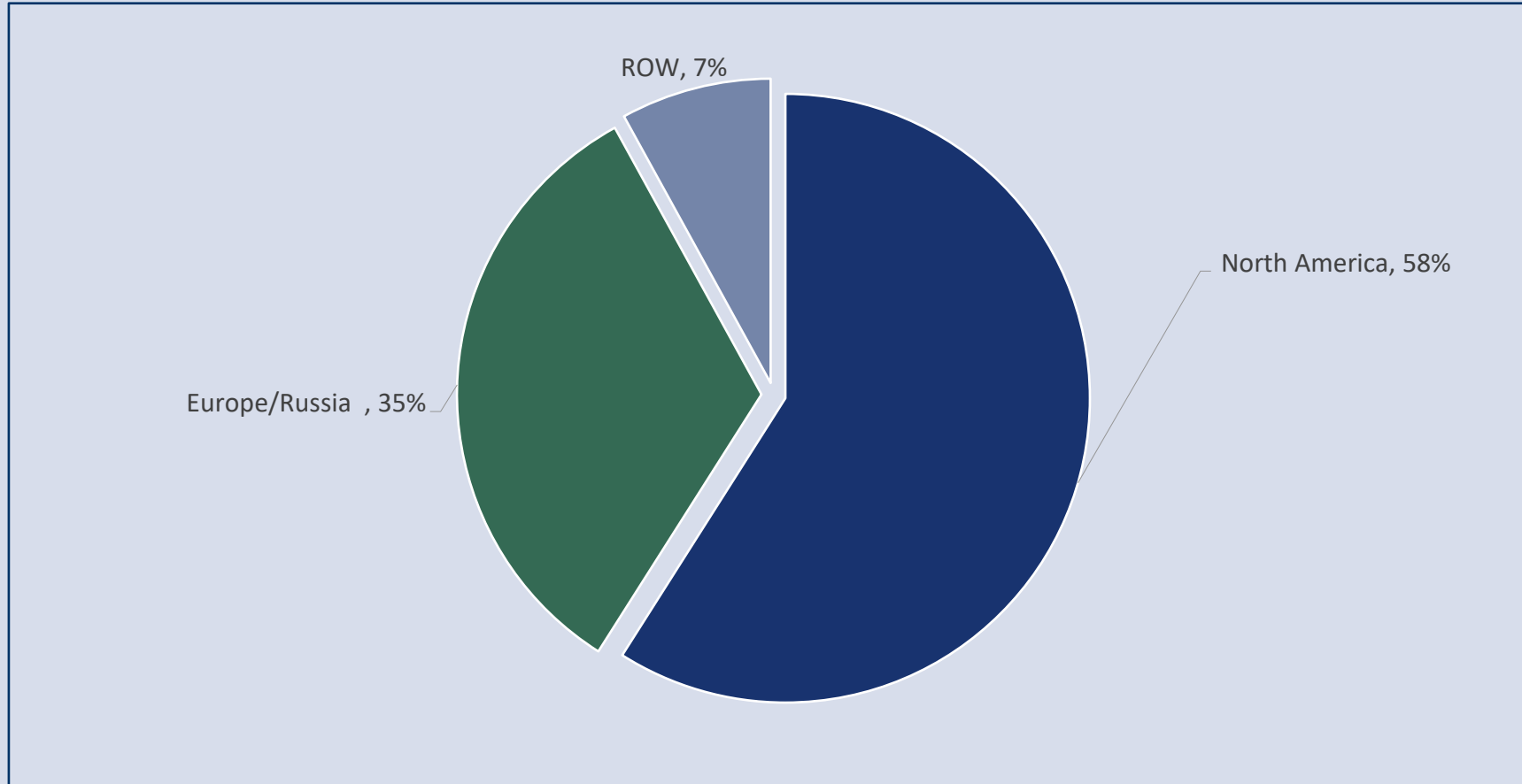
	Alpha Pinene	Beta Pinene	Delta 3 Carene
China / P.Massoniana	80	7	
China / P.Elliottii	52	36	
China / P.Yunanensis	60	25	
Brazil/P.Elliottii	40	45	
Brazil /P.Tropical	80	5	
Indonesia /P.Merkusii	80	2	12
Portugal	75	17	
India	25	3	60
USA (South East)	62	25	
USA (NW)/Canada	30	10	20
Finland/Sweden/Russia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

CST: Sulfur compounds 1 – 5 %

Y2023 CST Production: 190 000 T*

(Y2021:210 000T)

3-5 Kg / T Softwood Kraft Pulp



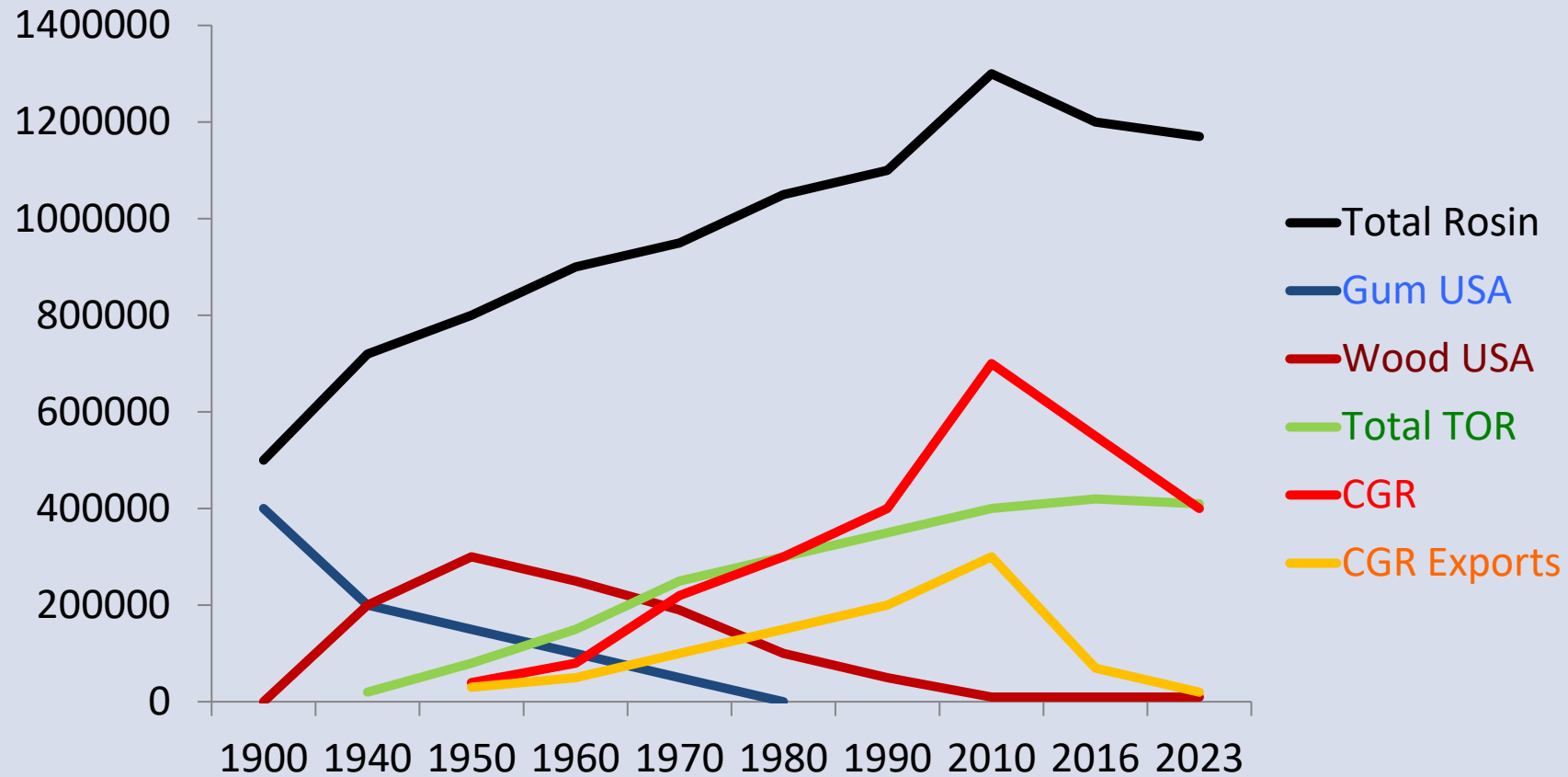
Volume down:
Pulp mills closures
Lower fractionation rates

Pinova plant closure affecting CST demand and Terpene resins production

Limonene production down (Consequence of EL Nino in Brazil and hurricane Ian in Florida)

*Including 20 000 T CST from CTO

Rosin production



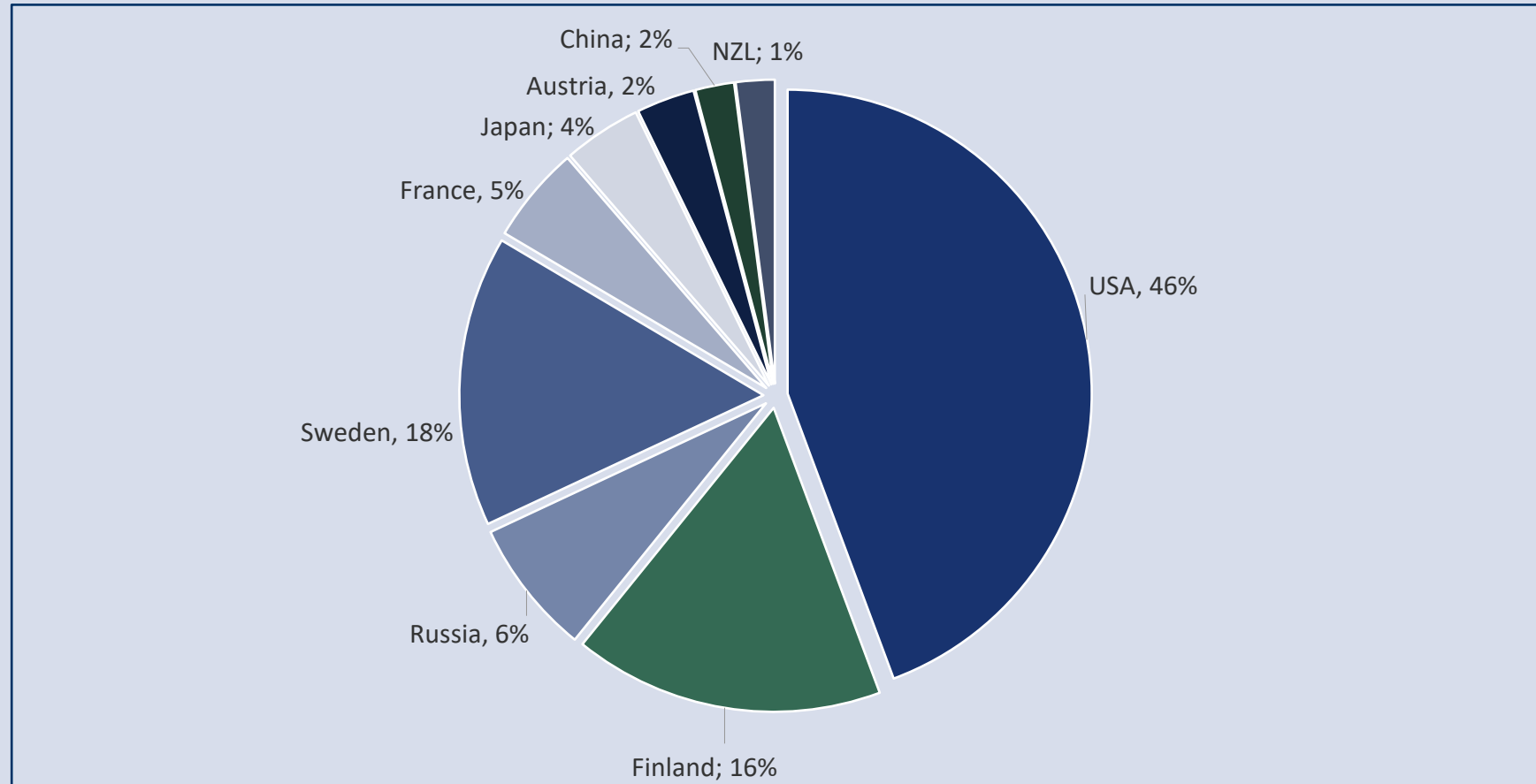
Y2023 Global Talloil Rosin (TOR) Production 400 000 T (Y2021: 450 000 T)

Low demand from
Inks and Adhesives
industries

Competition from
lower priced Gum
rosin derivatives and
Hydrocarbon resins

Lower fractionation
rates

One fractionation
plant moved away
from CTO feed



World Trade : The big traffic jam is over

Overcapacities

Lower demand for ocean freight

Freight rates 'melt like snow in the sun'

Back to Y2019 volume

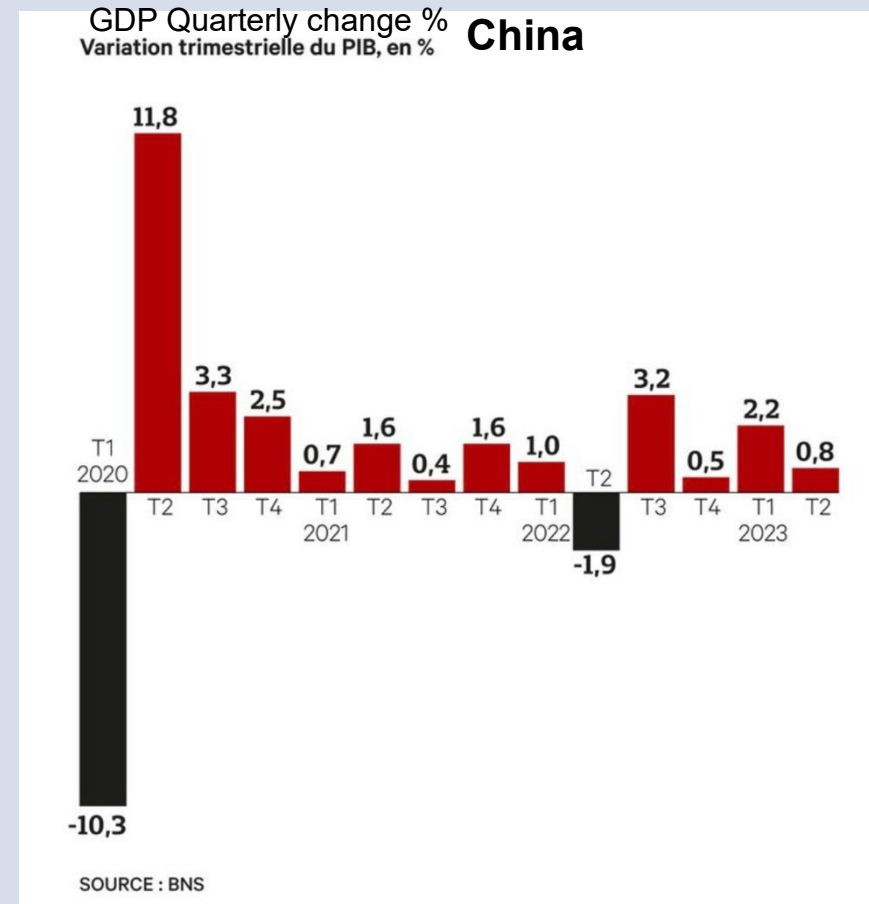
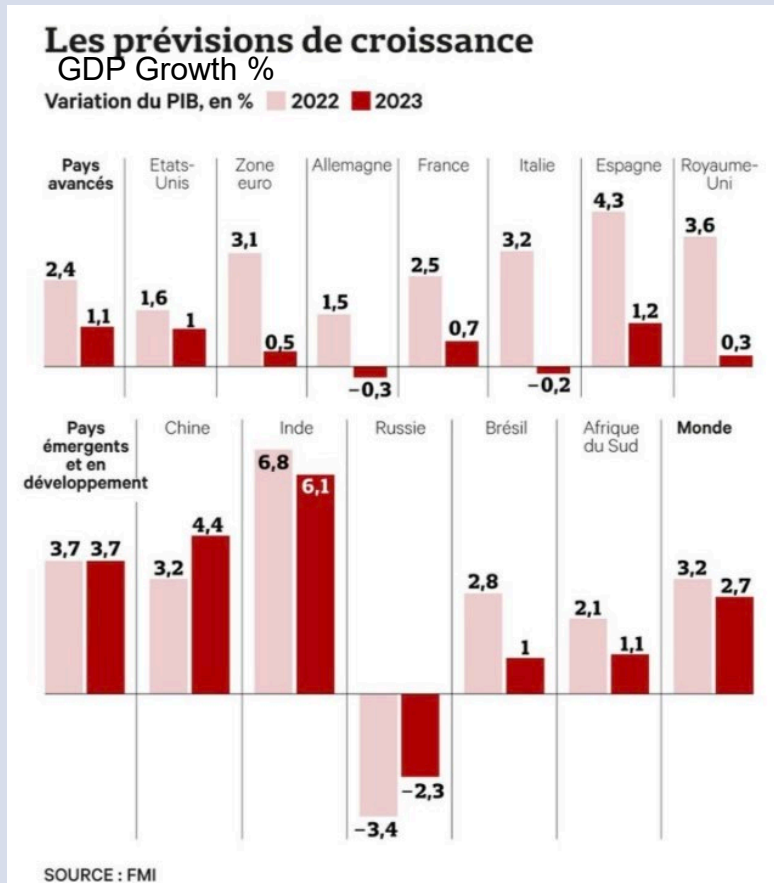


- Billions of profits during Covid period
 - Almost 900 new container ships have been ordered to arrive 2023-2025 representing 28% of the existing fleet (expressed as the number of containers)
 - Positive effects:
 - Early withdrawal of old ships
 - Reduced speed of the ships (Will lower CO2 emissions)
- ... till the next upward cycle as ocean freight might triple by 2050 !

GDP Growth 2022/2023 (Source IMF/BNS/Les Echos)

Price Inflation , Higher interest rates , Economic slowdown

China: Disappointed hopes of the after Covid



Outlook for the Pine Chemicals industry

- Y2023: 150 000 T less CTO volume ...but softening demand
- Excess of fractionation capacity might lead in the future to consolidations and plant closures ??
- Weak demand for all rosin and terpene derivatives
- Threats on the global economy due to Russia/Ukraine war , high energy prices , inflation still at high level, risk of financial crisis
- China: GDP growth not reaching the after Covid expectations . Low domestic demand, youth unemployment , decrease in real estate prices decourage investors, willingness to make Western economies less dependent on China ...
- Y2024 : Fast recovery ?? , demand for Pine Chemicals improving ??.... But lower volume available (TOR production down to 350 000 T ??)
- Trend around biobased and sustainable materials remains high. CTO is a very good source for biobased materials . Markets will have to clearly position themselves to support CTO derivatives and avoid this source to move away



SAS Fonterines Consulting
fonterines.consulting@gmail.com
Phone: +33 671522640