



2019 PCA International Conference / September 22-24 Vancouver



Pine Chemicals Industry Global overview and Trends

Michel Baumassy , Forchem Oy



A bit of Rosin history in Canada: The Birch Bark Canoe



Principal mean of water transportation for Aboriginal people.

Used extensively in the fur trade from the early 17th to the mid-19th centuries.

Seams waterproofed with hot **Pine Resin** applied with a stick.

Pine Chemicals: 3 Different Processes

Tree Tapping:

- Gum Turpentine
- Gum Rosin



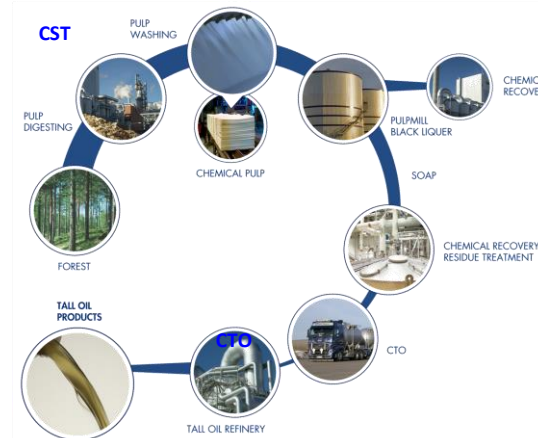
Extraction from pine stumps:

- Wood Turpentine
- Wood Rosin



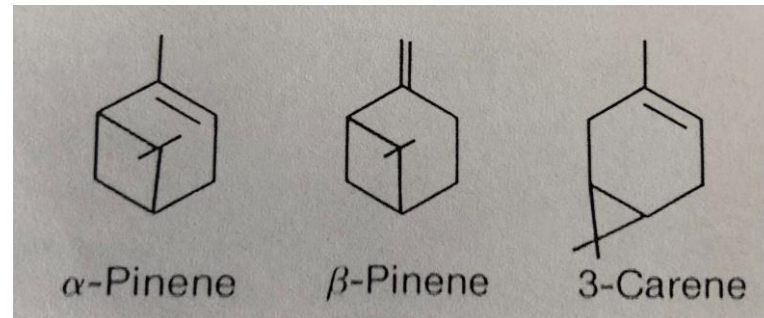
Kraft process at Pulpmills:

- Crude Sulfate Turpentine
- Crude Talloil (CTO) :
 - Talloil Rosin
 - Talloil Fatty acids
 - Talloil Pitch
 - Sterols



Turpentine

- Volatile fraction of the oleoresin in the coniferous 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:



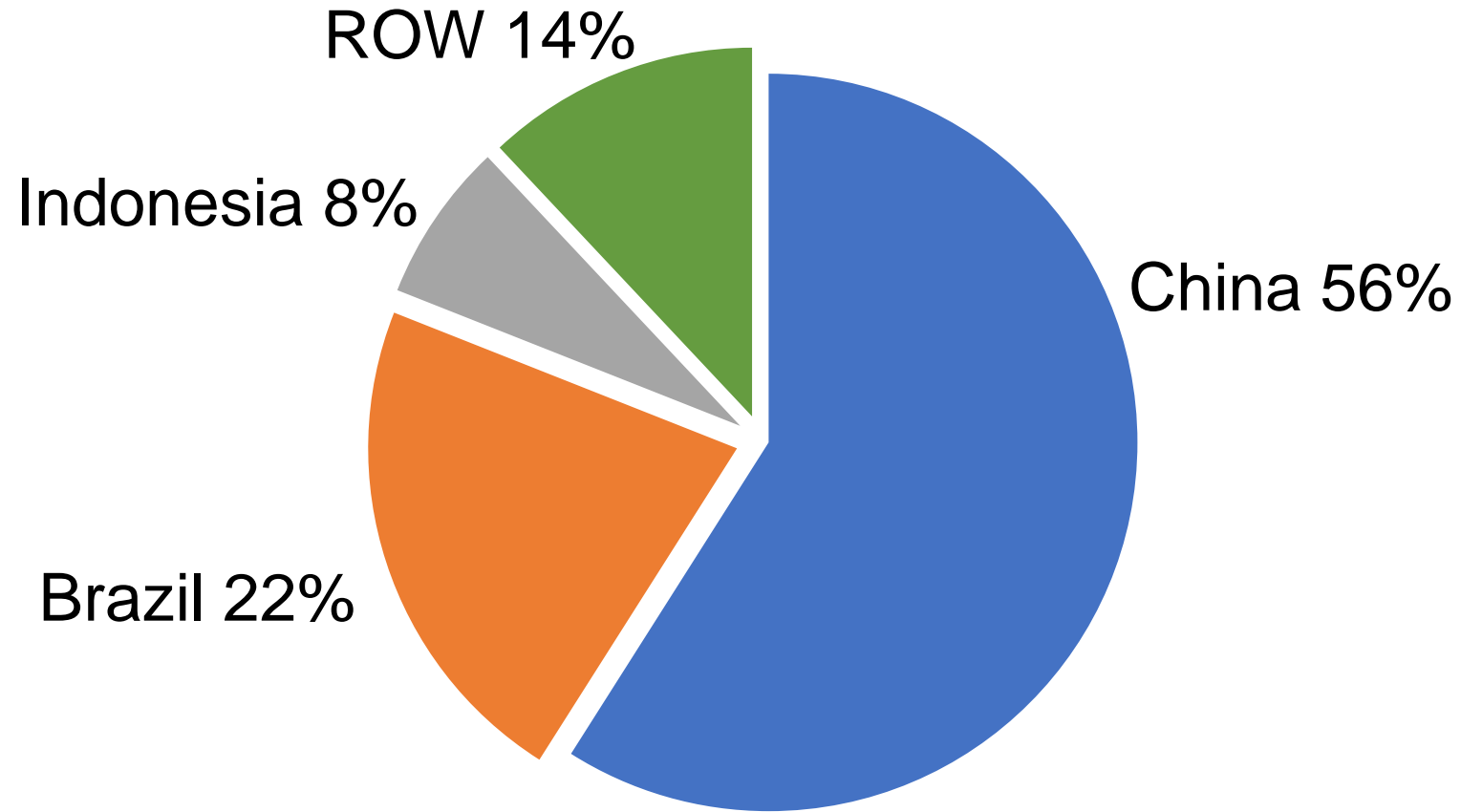
- Chemical structure: Terpenes can be considered as polymers of isoprene (C₅H₈)_n but isoprene is not involved in the biosynthesis

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

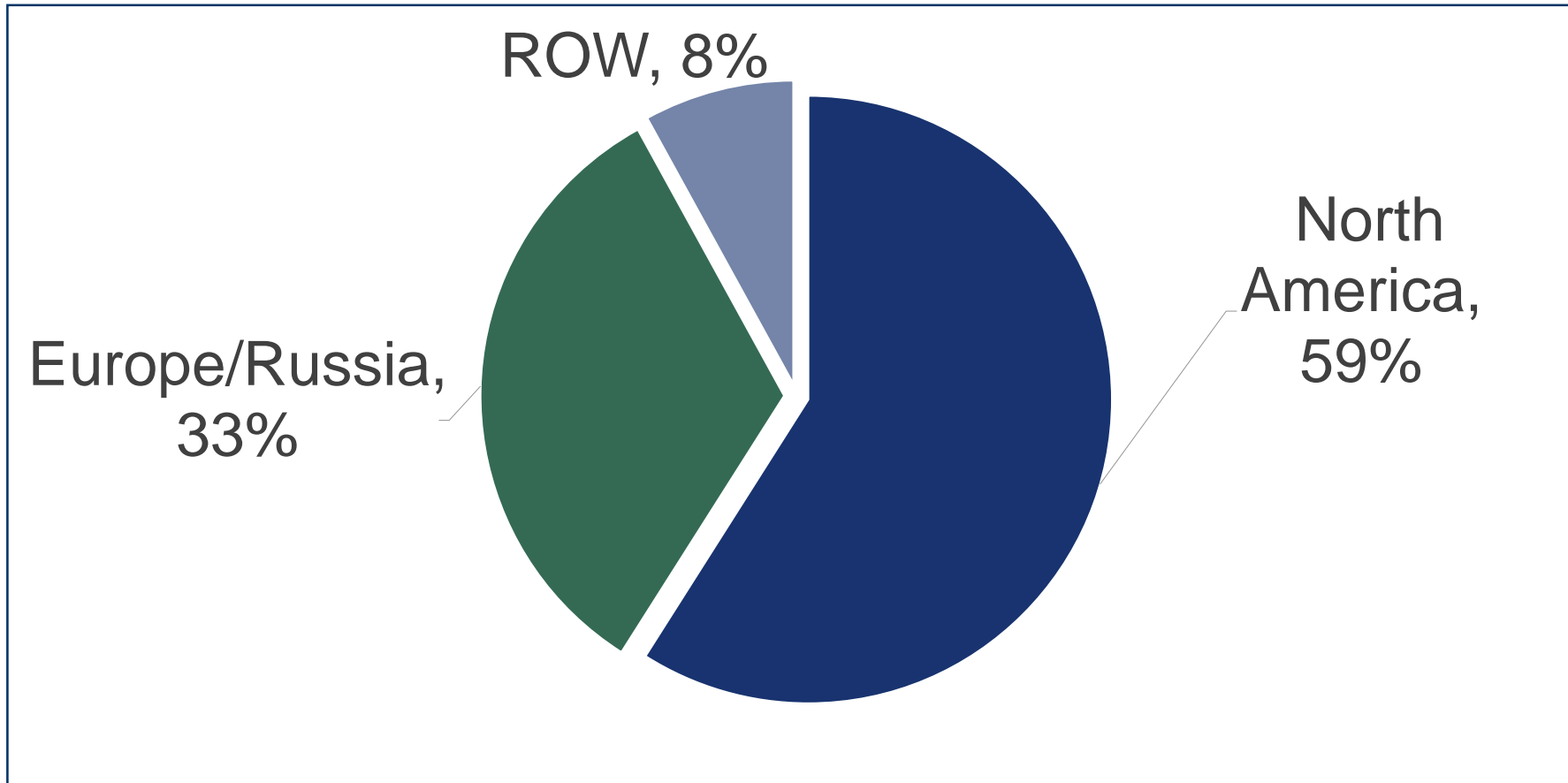
CST: Sulfur compounds 1 – 5 %

Y2019 Gum Turpentine Production: 140 000T



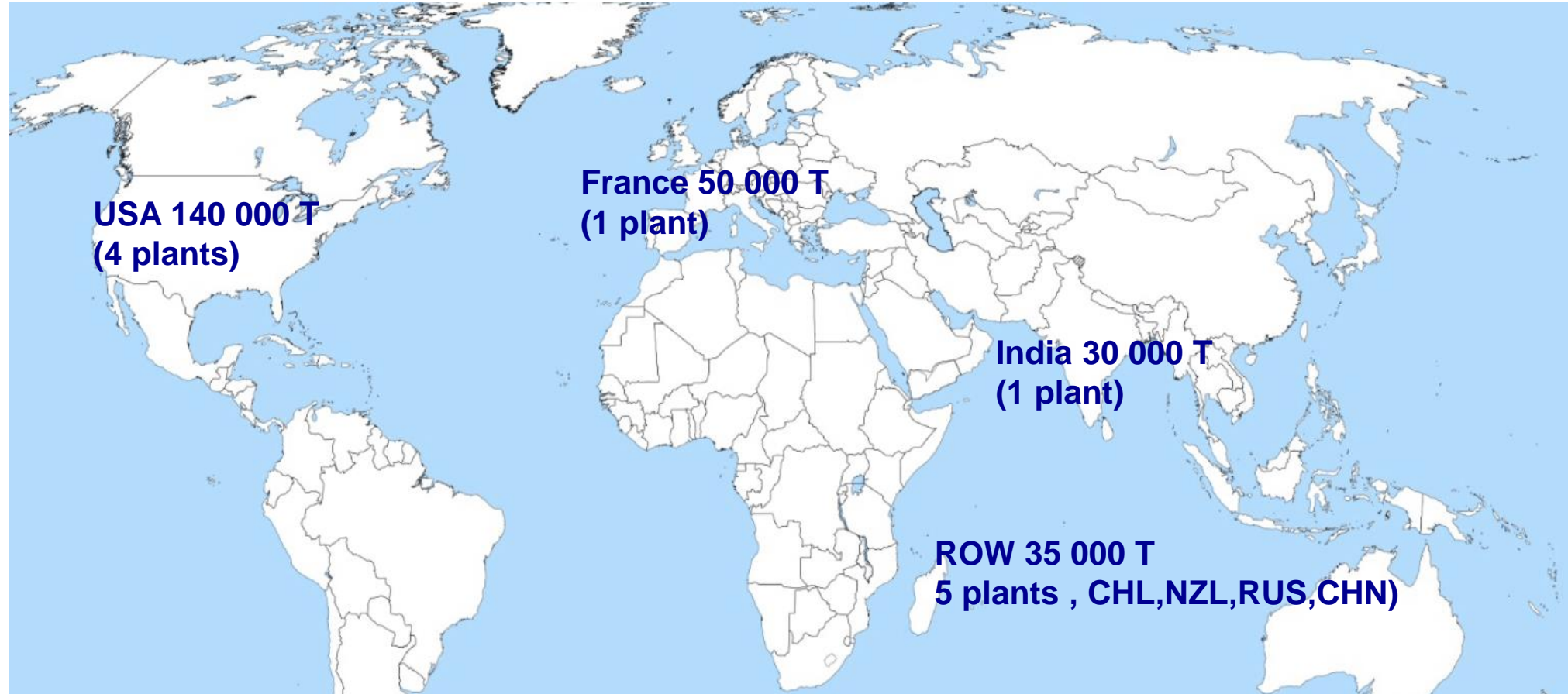
Y2019 CST Production: 205 000 T*

3-5 Kg / T Softwood Kraft Pulp

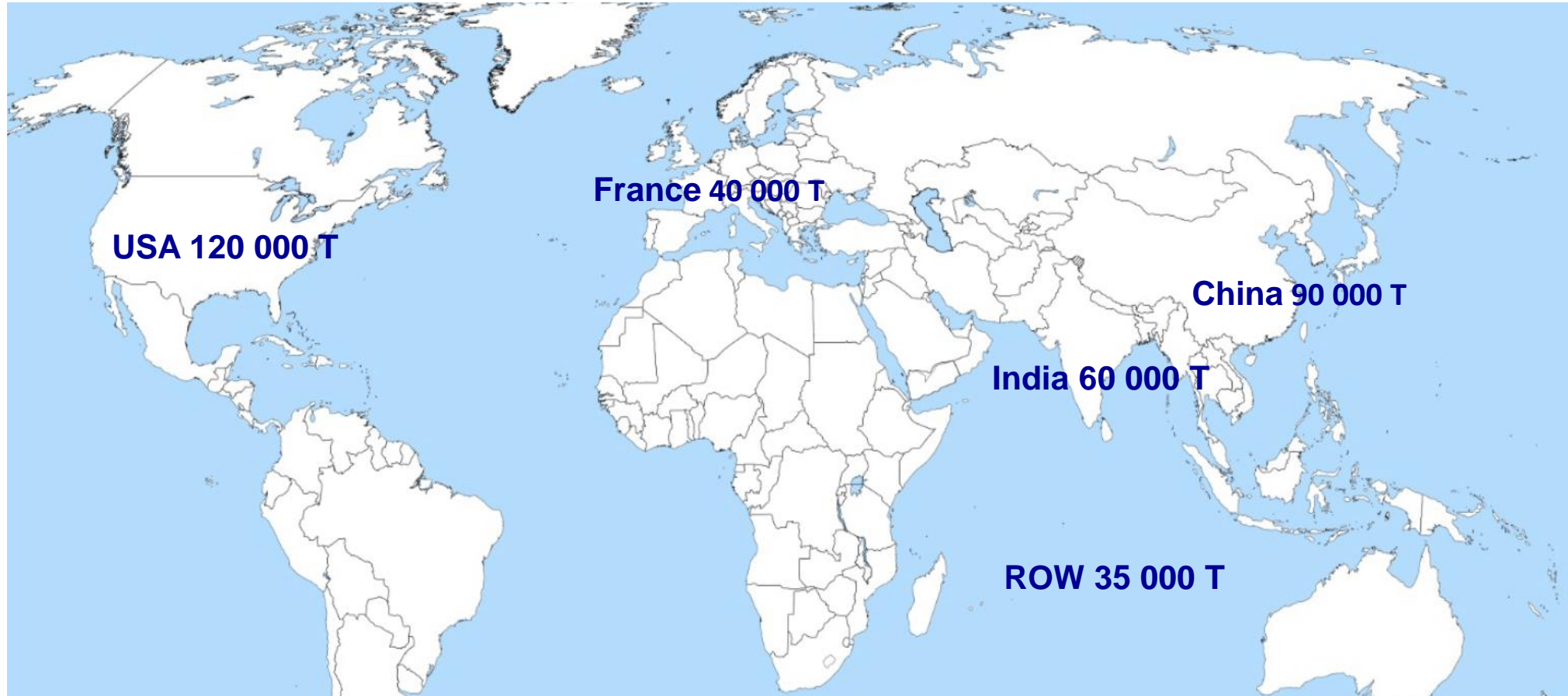


*Including 20 000 T ? CST from CTO

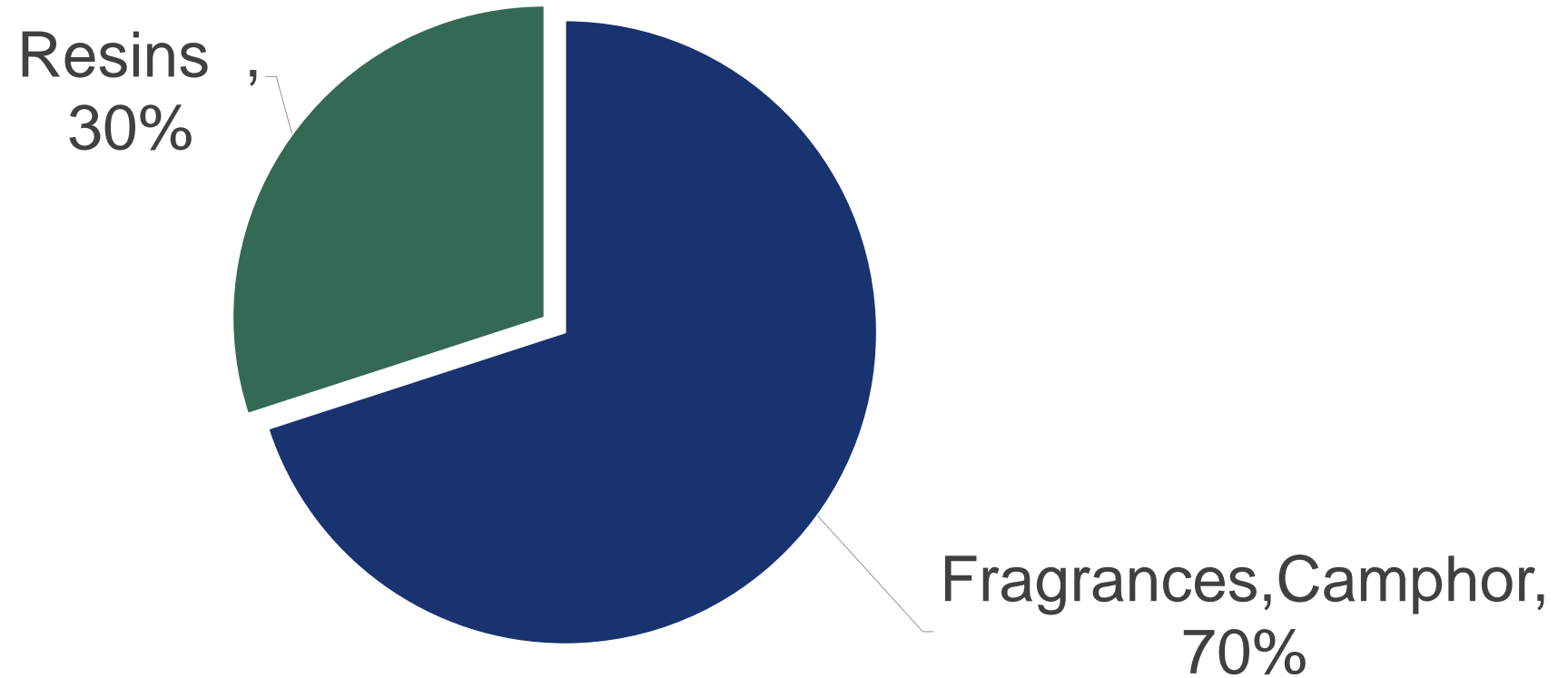
Y2019 World CST fractionation capacity 255 000 T (Capacity in use: 205 000T)



Y2019 Turpentine Demand (Total Turpentine Production 345 000 T)

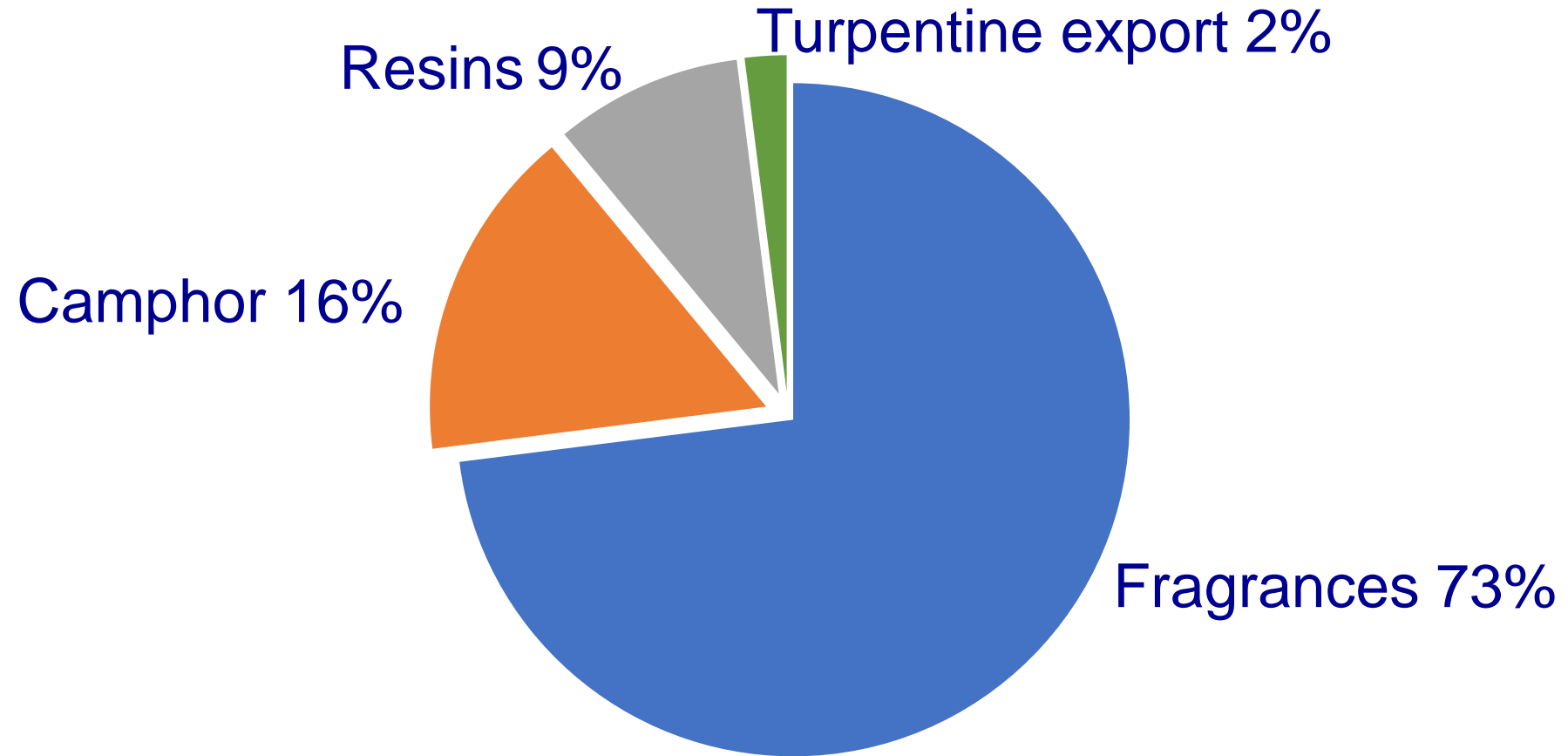


Turpentine demand / Market segment



Turpentine demand in China : 90 000T

(80% for exports of Terpene Derivatives)



Source: Nanning Songtao Business & Services Co

A few Terpene derivatives

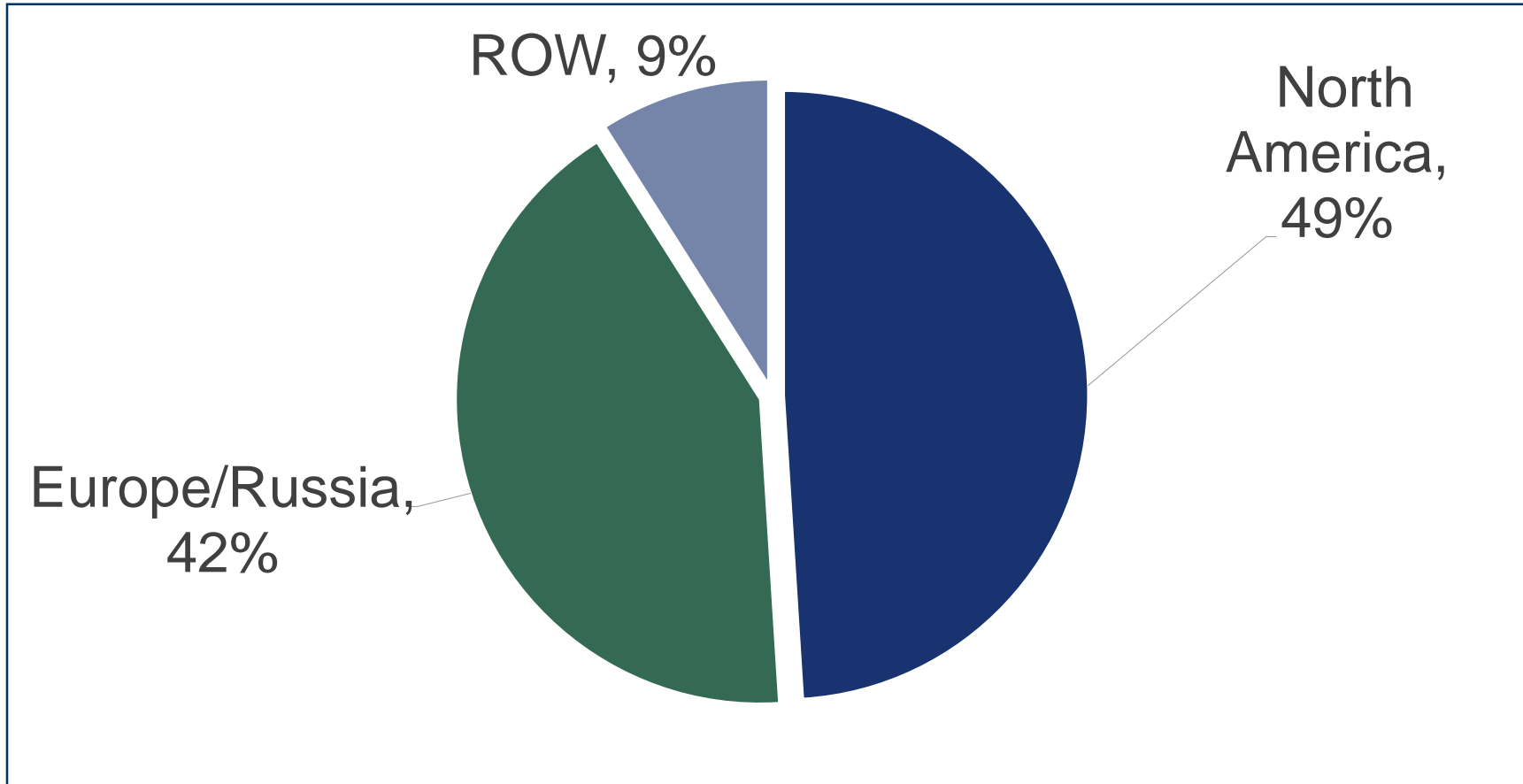
- Alpha pinene
 - Terpineol (Pine oils)
 - Terpenyl acetate
 - Dihydromyrcenol
 - Camphene
 - Borneol , Isoborneol , Isobornyl acetate
 - Camphor
 - Terpene resins
- . Beta Pinene
 - Myrcene
 - Menthol
 - Nopol,Nopyl acetate
 - Geraniol , Nerol
 - Terpene resins
- . Delta 3 carene
 - Terpene Phenolic resins
 - Carvone
 - Delta 2 Carene , Menthol
 - Insecticides (old process)

Turpentine Developments

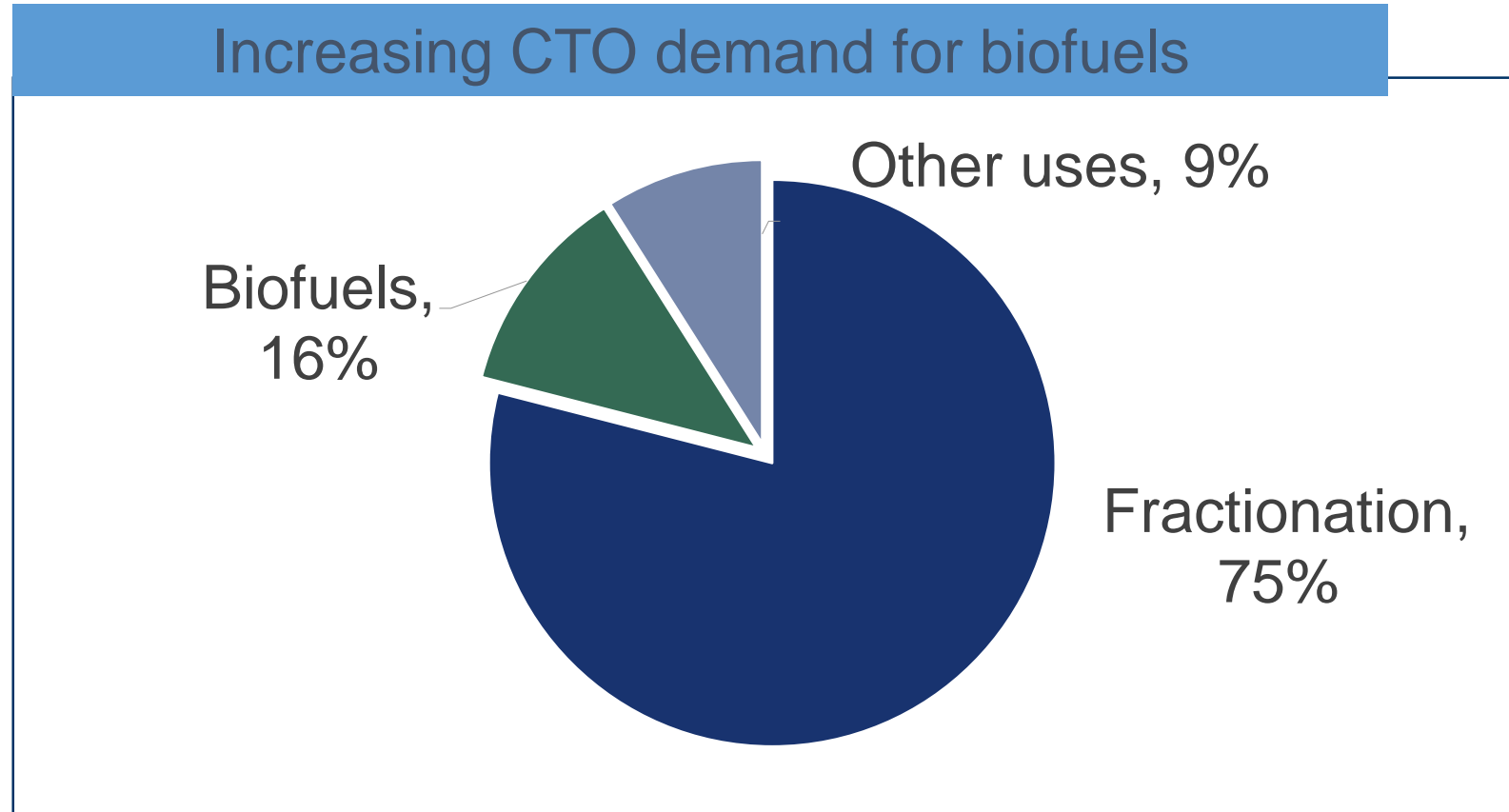
- High demand from fragrance and resin industries
- October 2017: Fire at a Basf plant created additional demand for terpene derivatives from natural origin.
- 2018: Fires at two Terpene derivatives plants in India
- Plant closures in China for environmental reasons
- Mid. 2018 : Chinese Turpentine price reached a peak at USD 5000/T ex factory
- 2019 : Situation getting back to normal

Y2019 CTO Production : 2 Million T

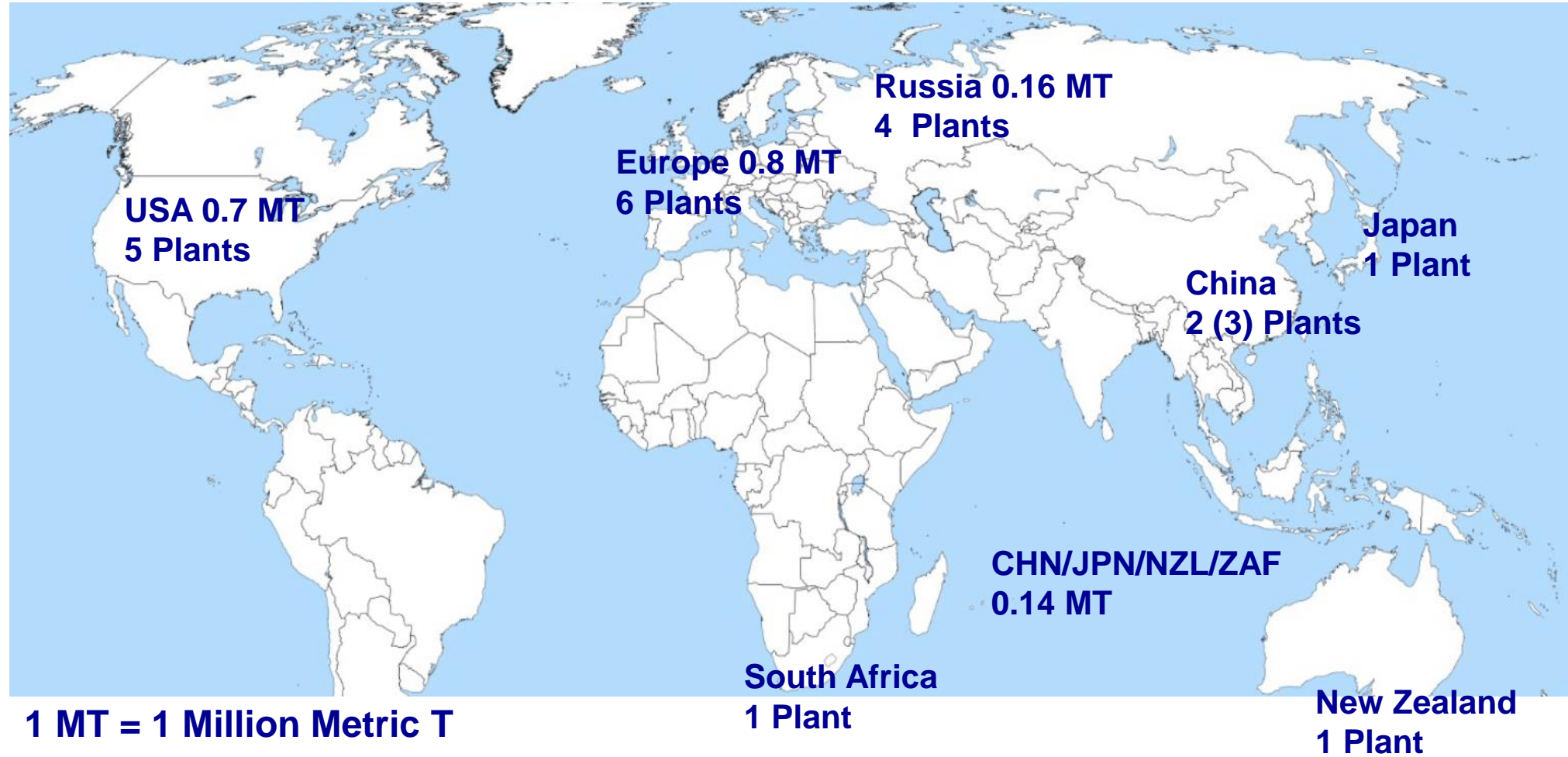
40-60 Kg / T Softwood Kraft Pulp



Y2019 CTO Demand / Market Segment

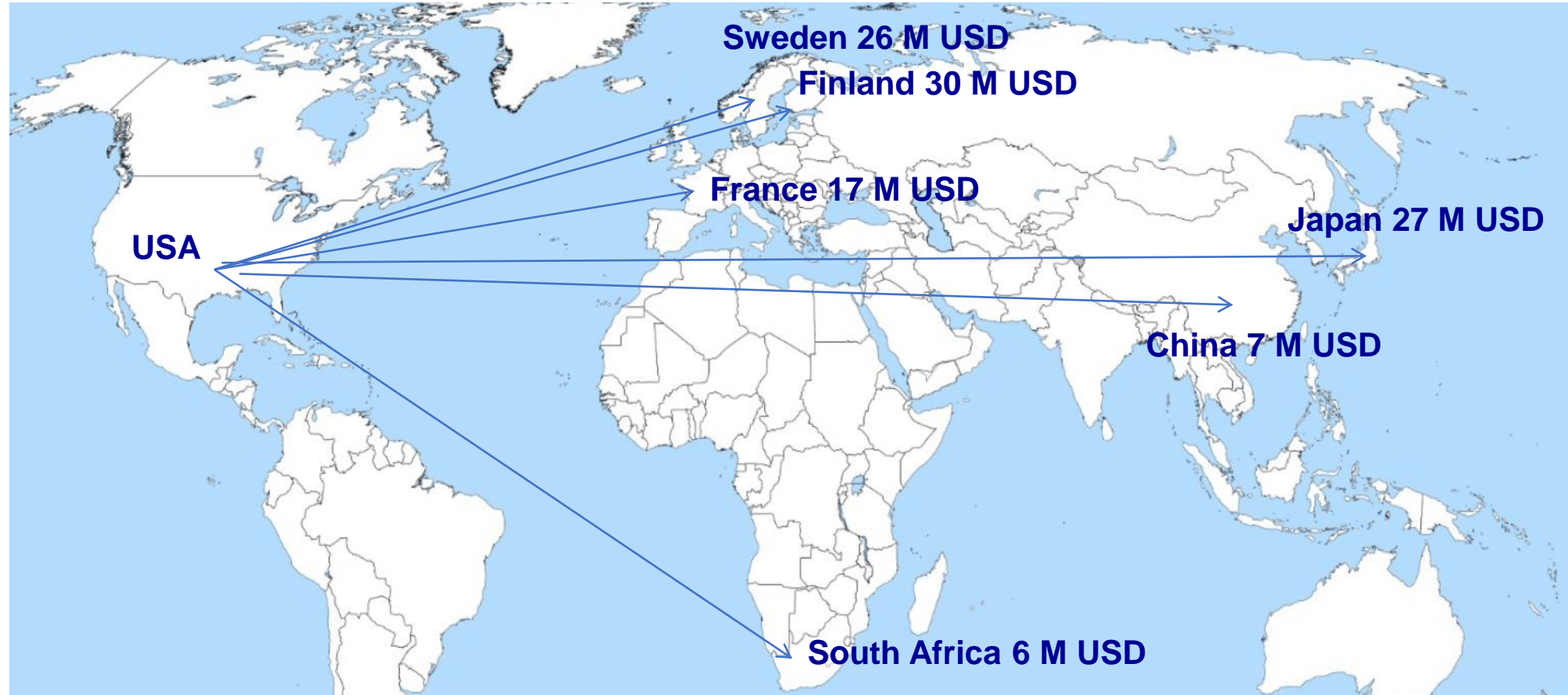


Y2019 World CTO fractionation capacity 1.8 Million T (Capacity in use: 1.5 Million T)



CTO Exports from USA

Y2018: 115 Million USD / 250 000 T



Source: Customs statistics
Million USD : M USD

Y2018 CTO Other Main Exports



Source: Customs statistics

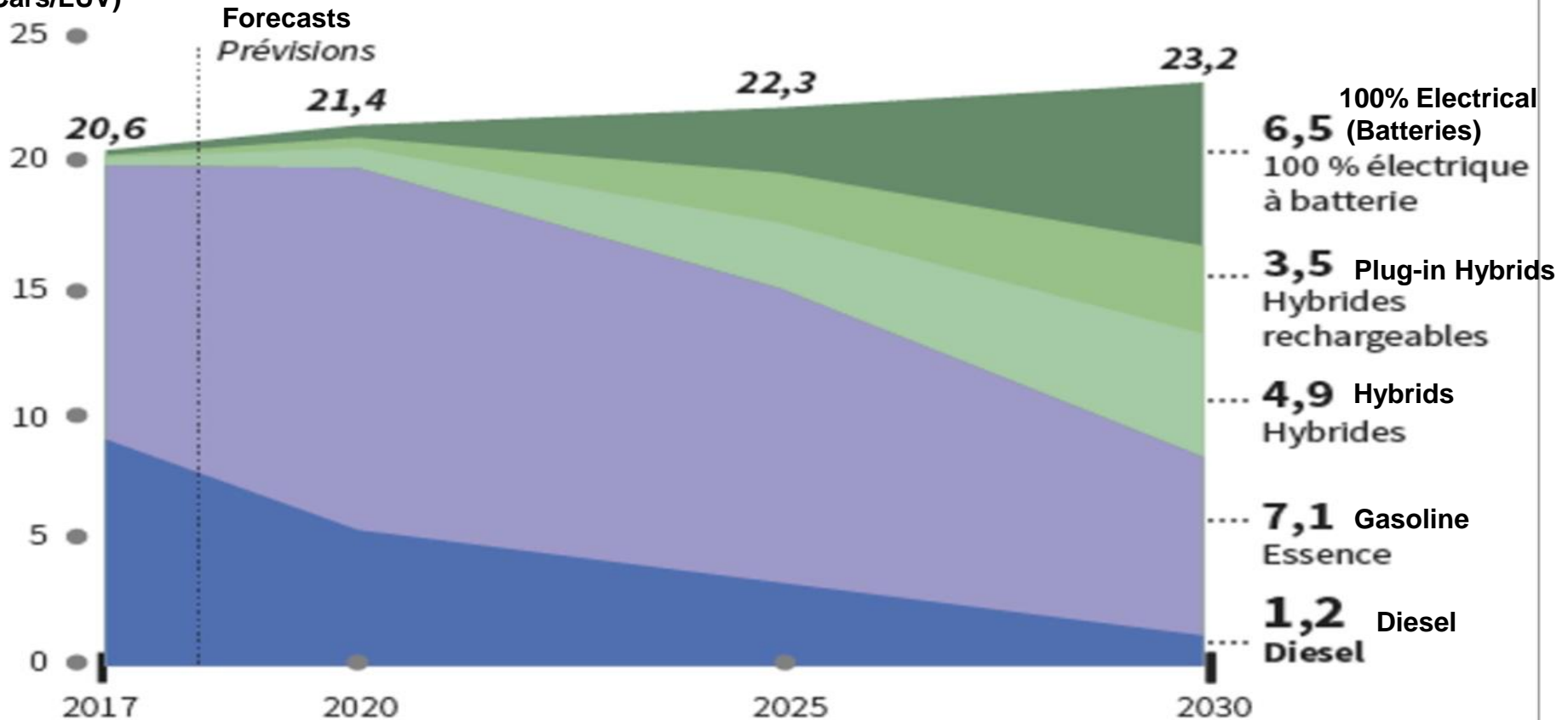
Million USD : M USD

Pulp And CTO Developments

- 2020/2025 : Investments at pulp mills will result in 200 kT additional CTO but CTO demand for biofuels might increase by 200 kT / 500 kT
- From CTO to Biofuels : FAME , HVO , Co-processing at refinery
- Biofuel prices based on fossil fuel prices + Taxes
- Regulations : Europe (RED , ILUC, REDII) , USA (AFMC expired end Y2013)
- Diesel technology questioned in many countries
- Bio-diesel production out of CTO: Destroying a precious resource

From Dieselpgate to Dieselcrash

Europe
Millions of vehicles
(Cars/LUV)

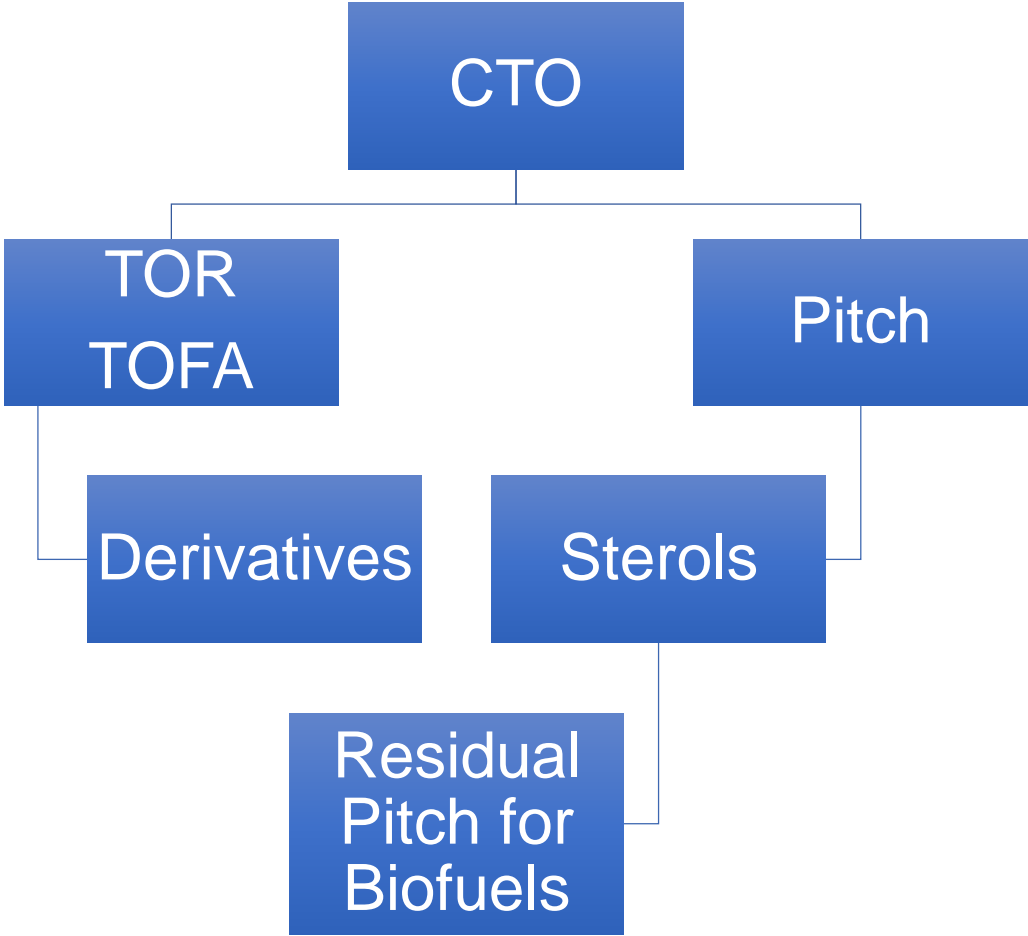


Source: AlixPartners

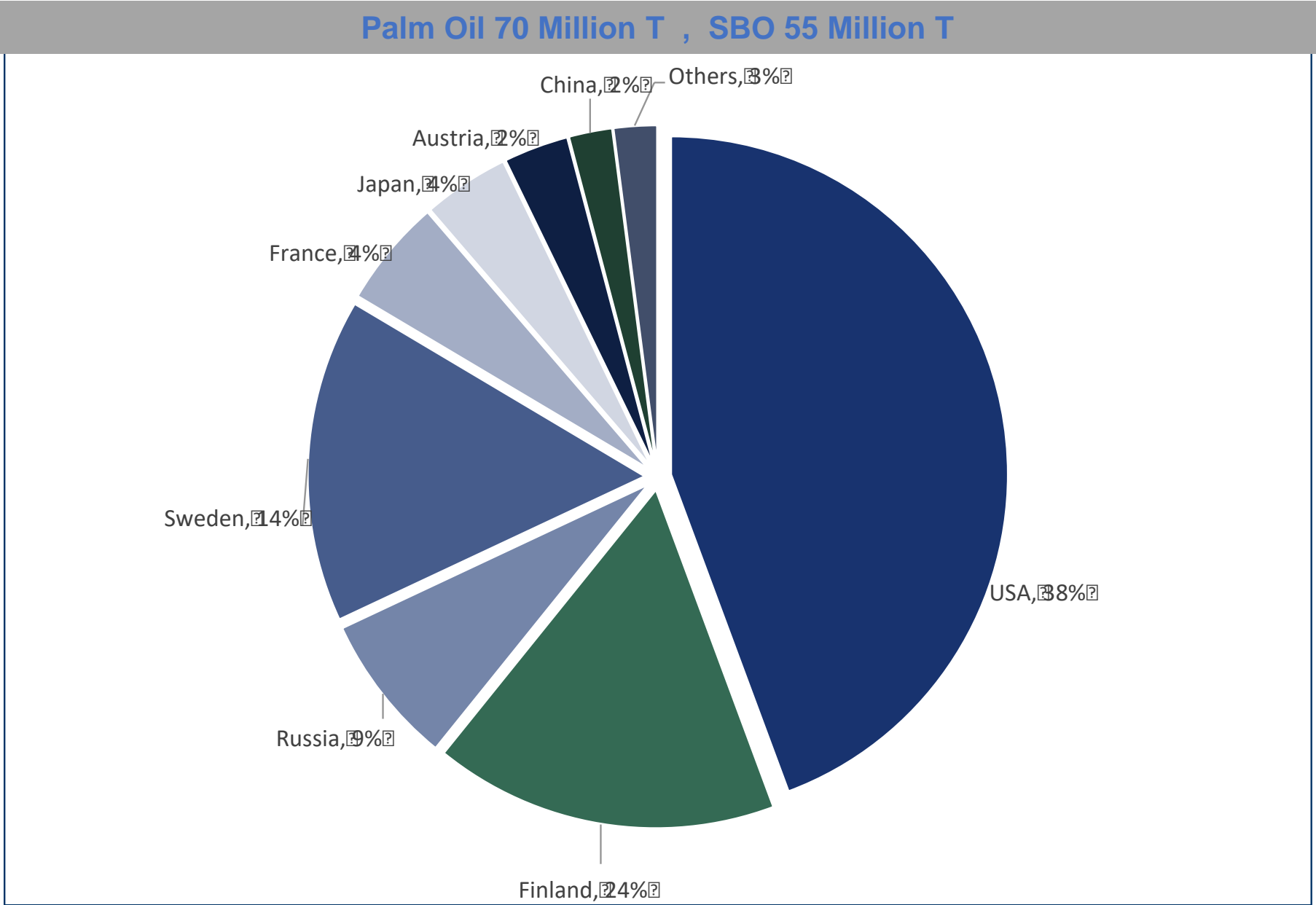
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Cascading is the only intelligent and efficient way to use CTO

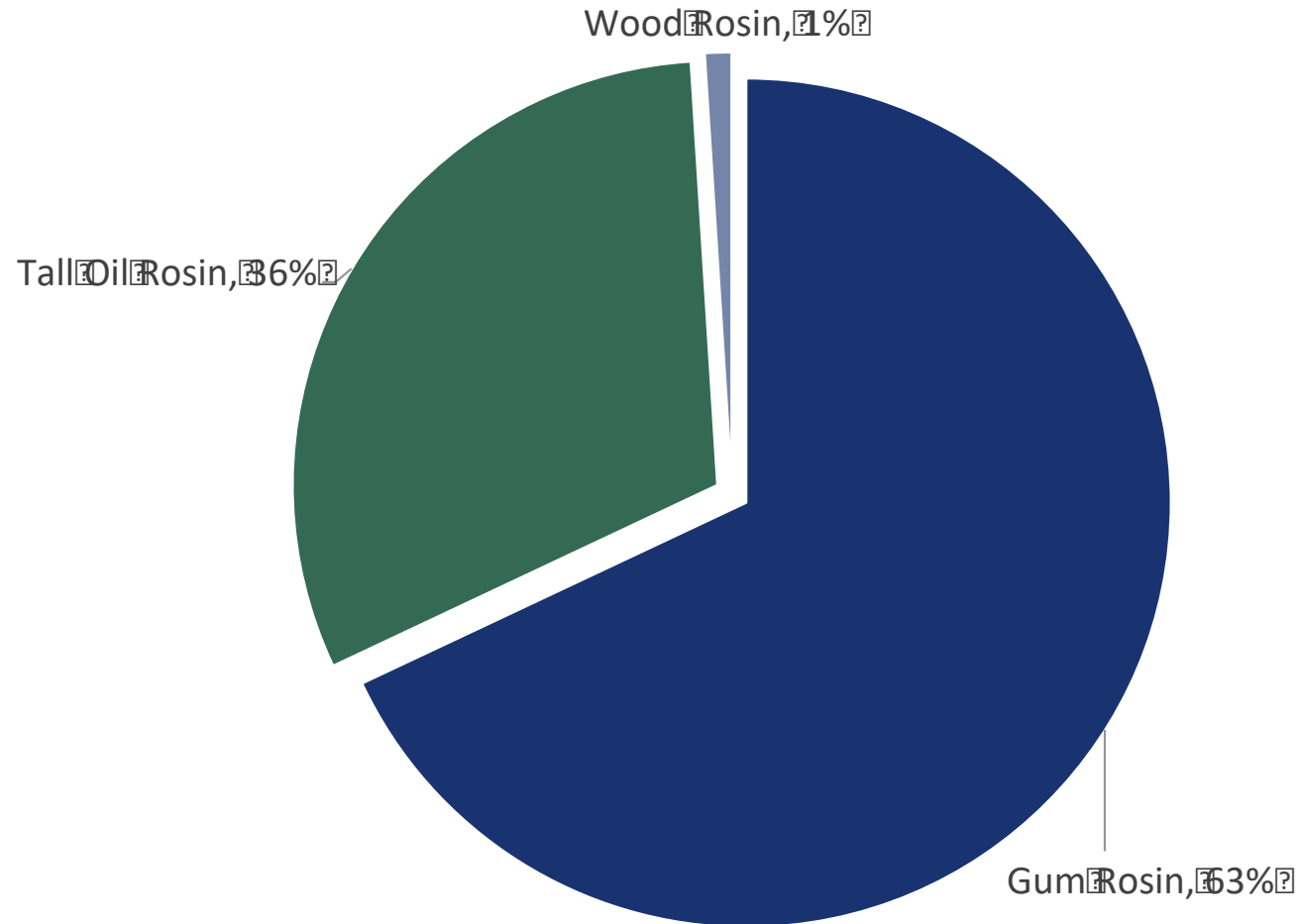


Y2019 Global TOFA Production: 460 000 T



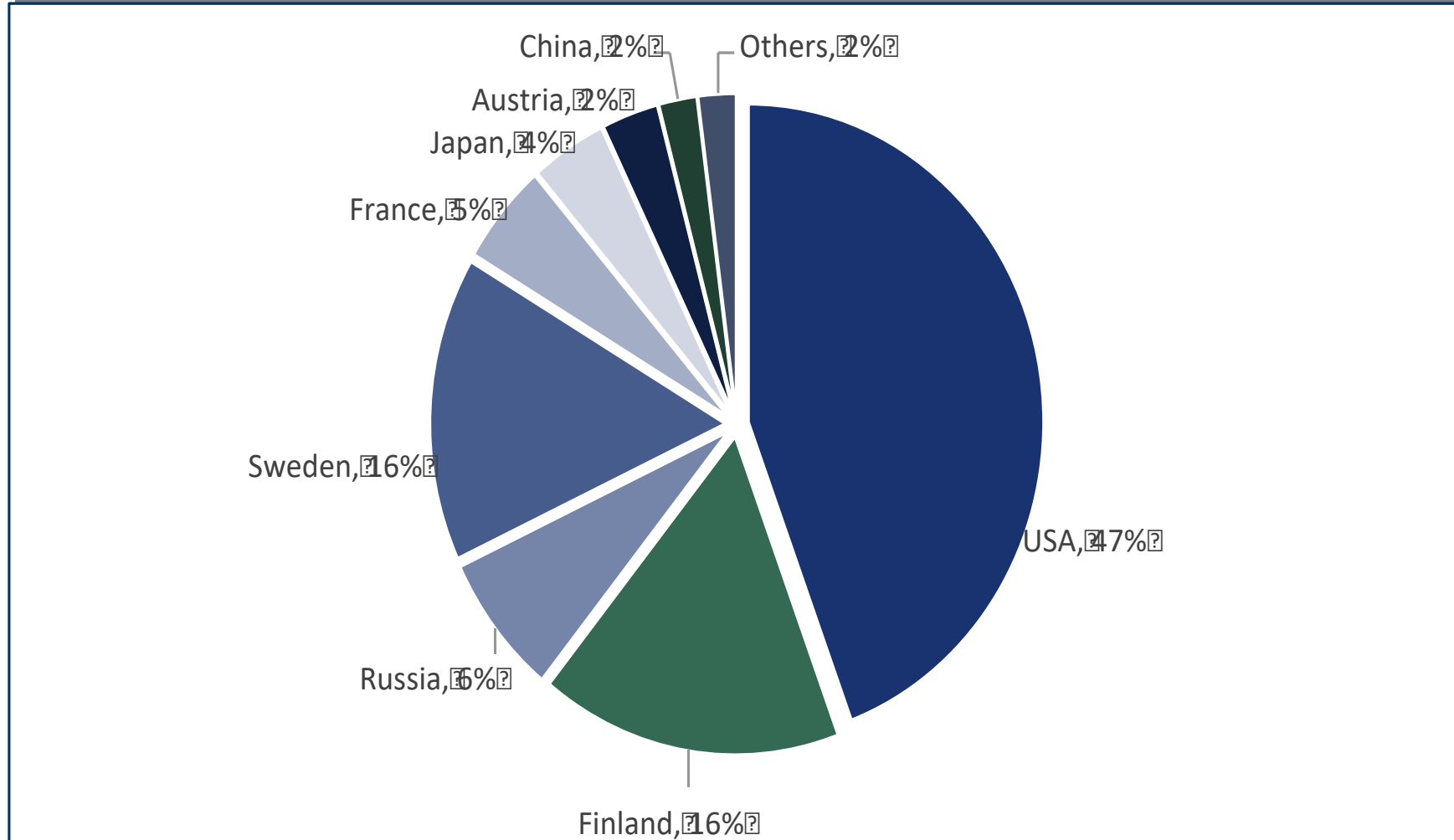
Y2019 Global Rosin Production: 1 270 000T

Rosin production going on increasing since Y2016

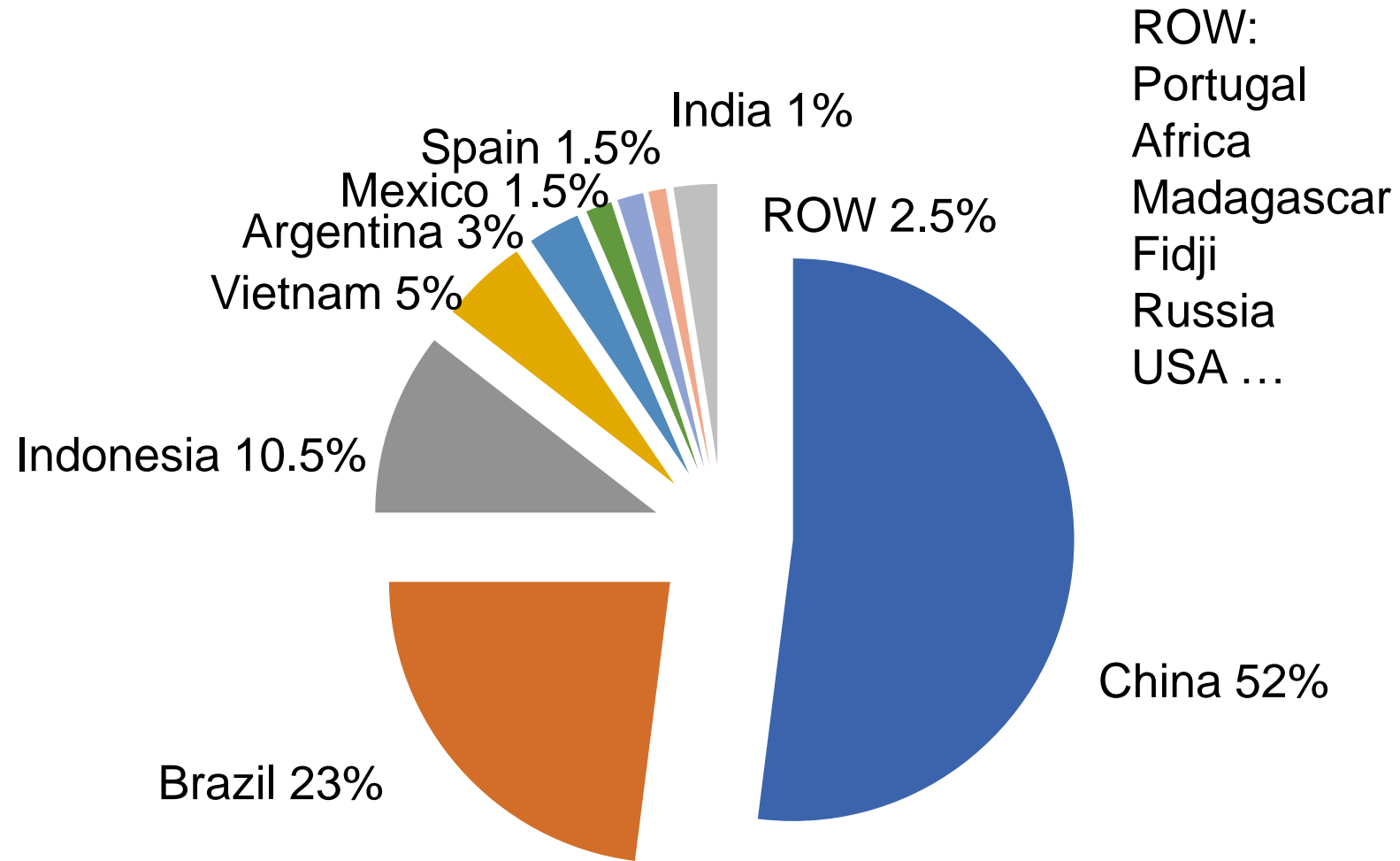


Y2019 Global Tall Oil Rosin (TOR) Production: 450 000 T

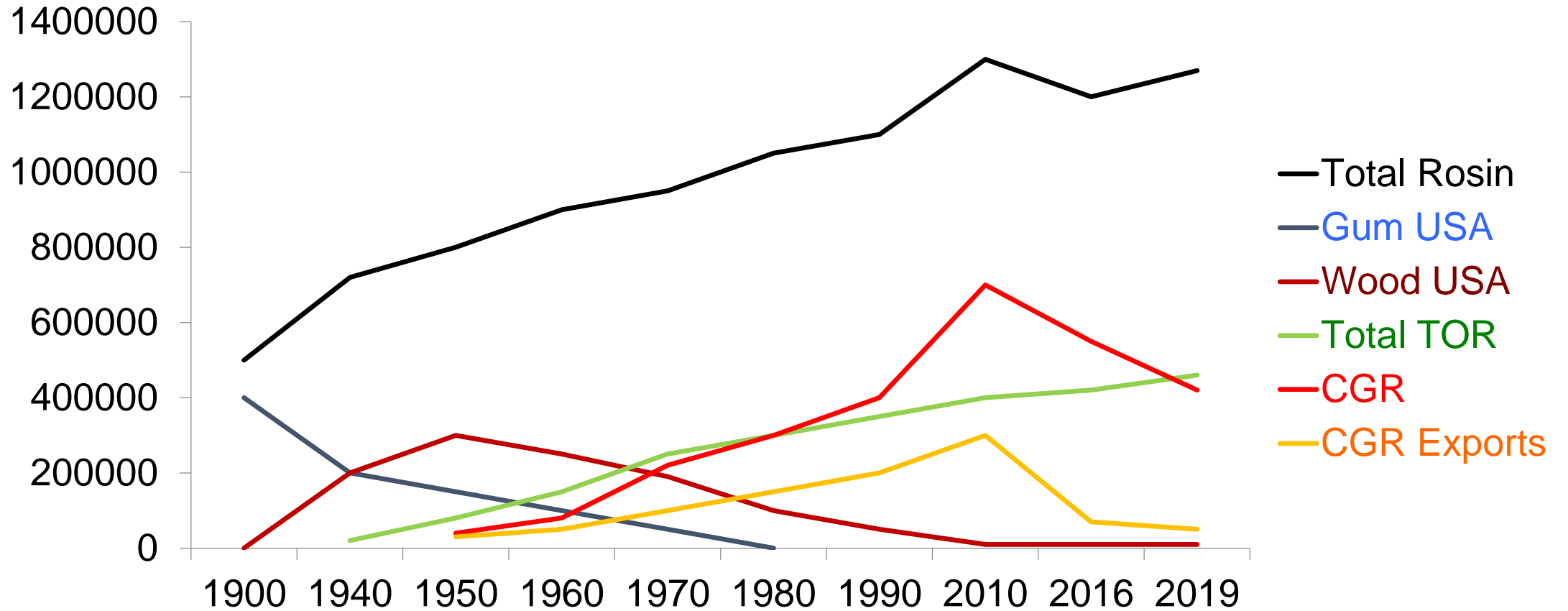
Y2020 : Min +15 000T



Y2019 Global Gum Rosin production: 805 000 T



Rosin production



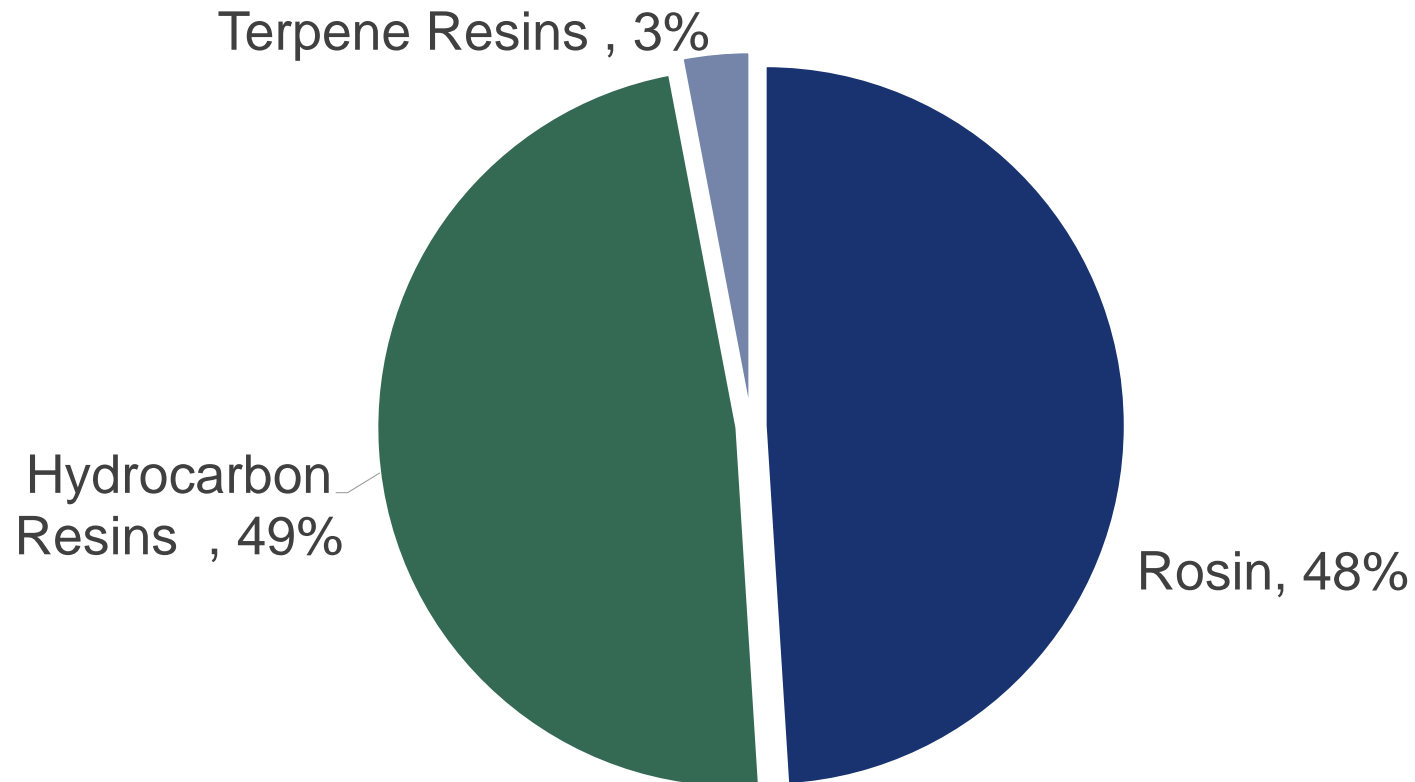
Rosin quality

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

	P. Massoniama	P. Elliotii	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)

Y2019 Global Resin Production: 2 650 000 T

Hydrocarbon resins becoming commodities...but crackers in China might change from Naphta to Gas
Terpene resins : Feed costs have been decreasing since a few months



Outlook for the Pine Chemical market

- Pine Chemical market reaching 5 Billions USD and growing at a higher rate than average GDP growth .
- Asia will have the fastest growth and will drive the demand.
- Lower carbon footprint of Pine derived chemicals.
- Growing environmental concerns will favour Pine Chemicals.
- Pine Chemical market has proven its resilience and capability to adapt to variations of raw material costs.



THANK

YOU