

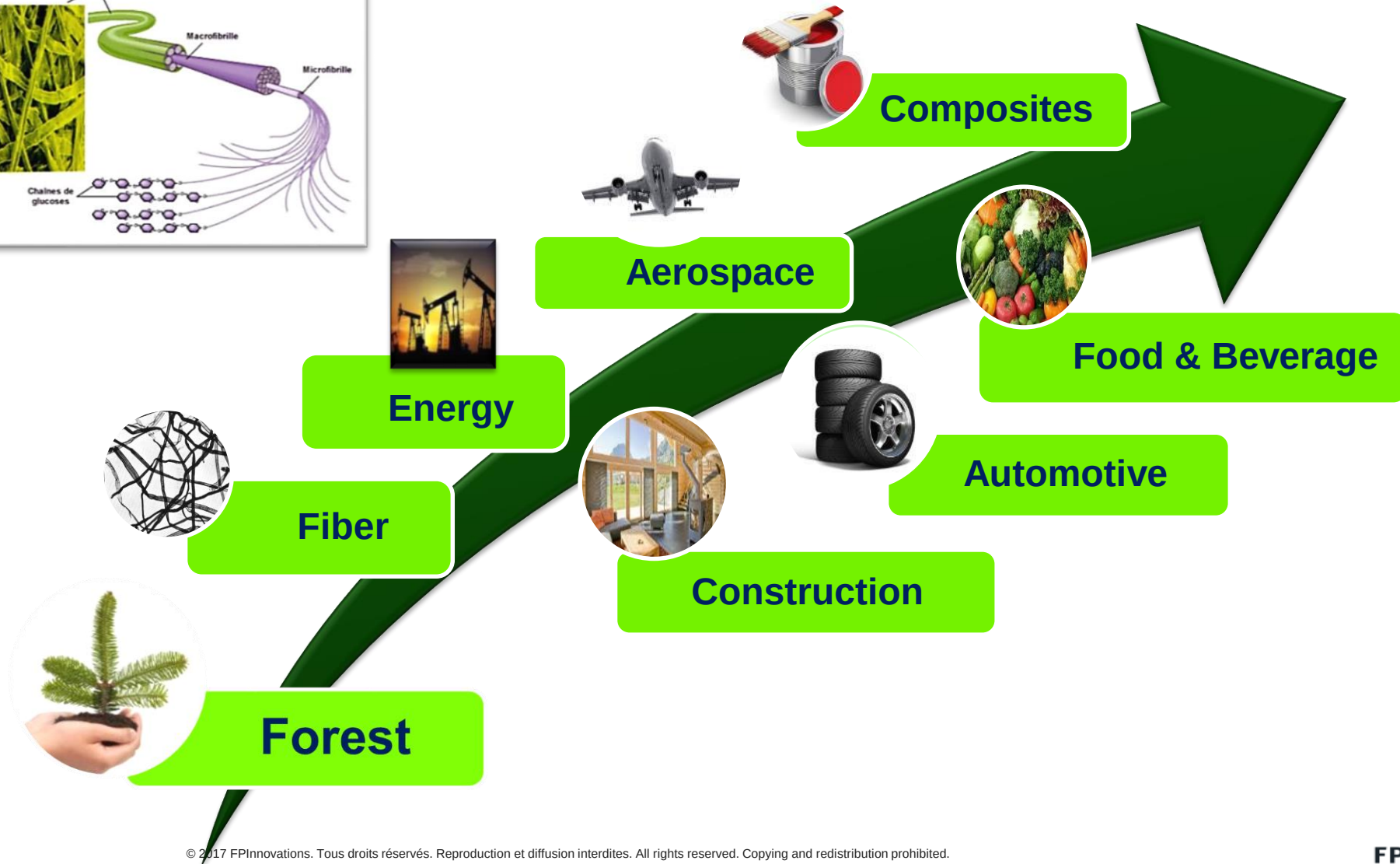
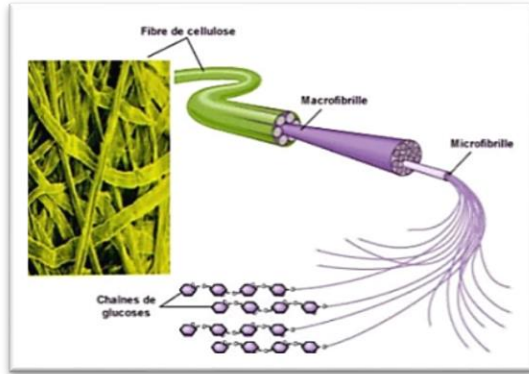


OUR NAME IS INNOVATION

The Bioeconomy Hub: Innovative products from biomass

Tim Caldecott and Douglas Singbeil

Opportunities are everywhere! Building new connections and supply chain is the challenge.

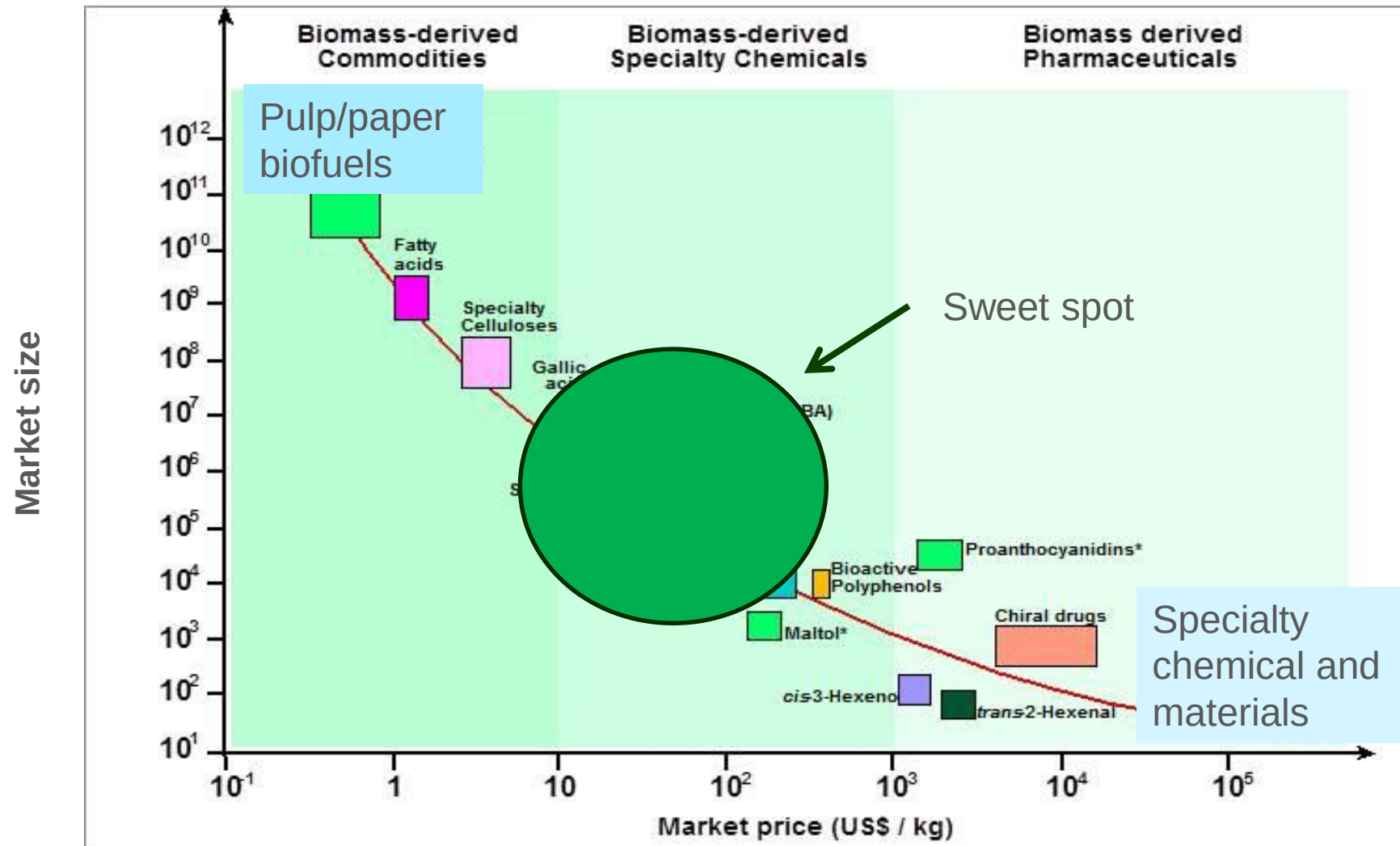


Biomass is bulky and expensive to transport

Fibre supply chains need to be short and optimized. Better to process the biomass at a hub and send semi-finished or finished products to market.



Volume and Value



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Source: "Thermochemical Strategies for Biofuels, Green Chemicals, Polymeric Biomaterials and Biofuels", Esteban Chornet, November 2005.

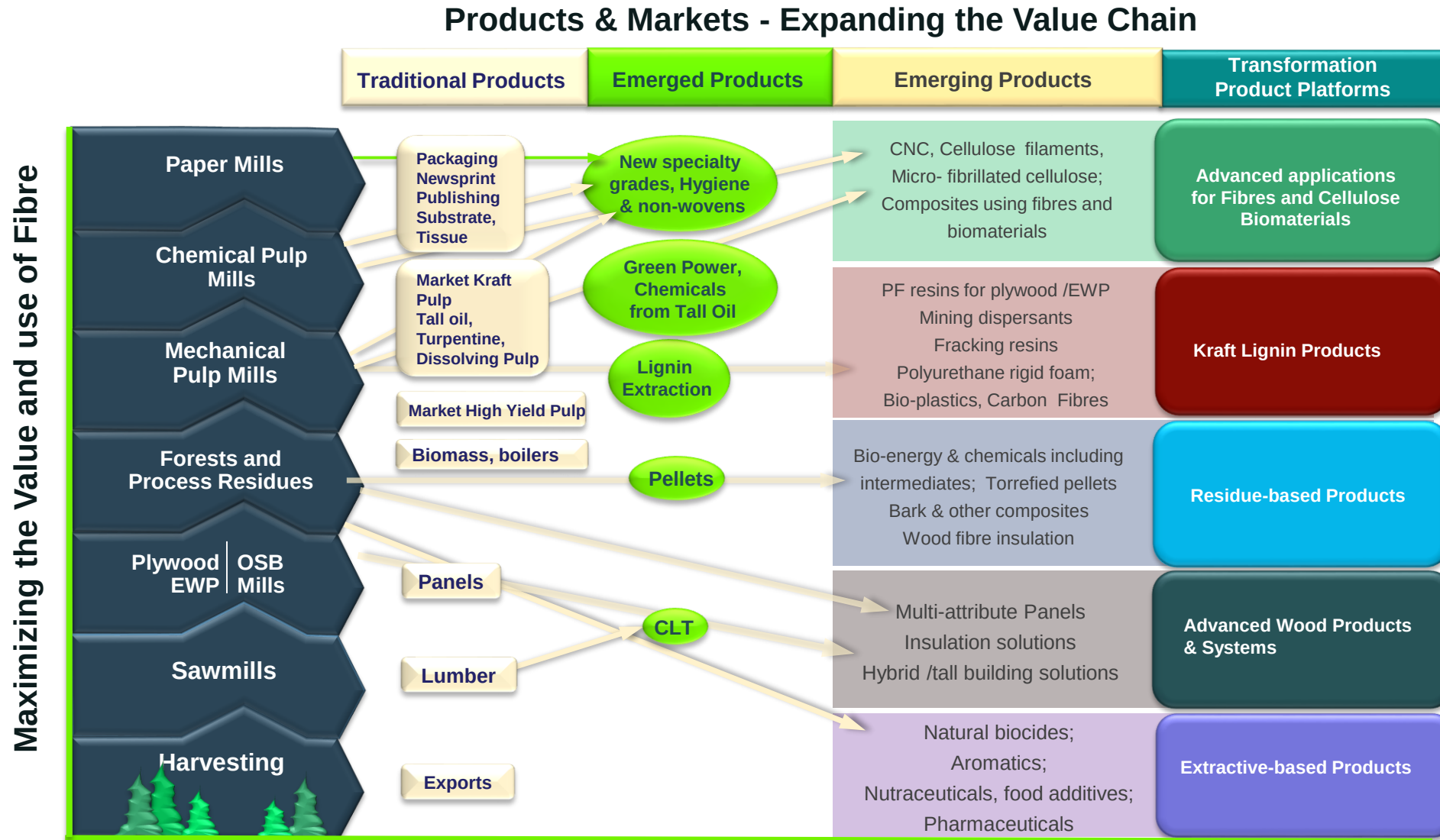
Value of residues from macro to nano

New Wood Attributes

- “green” substitutes
- Light-weighting
- Stronger
- Stretchable
- Improved aesthetics
- New attributes
- Not necessarily cheaper

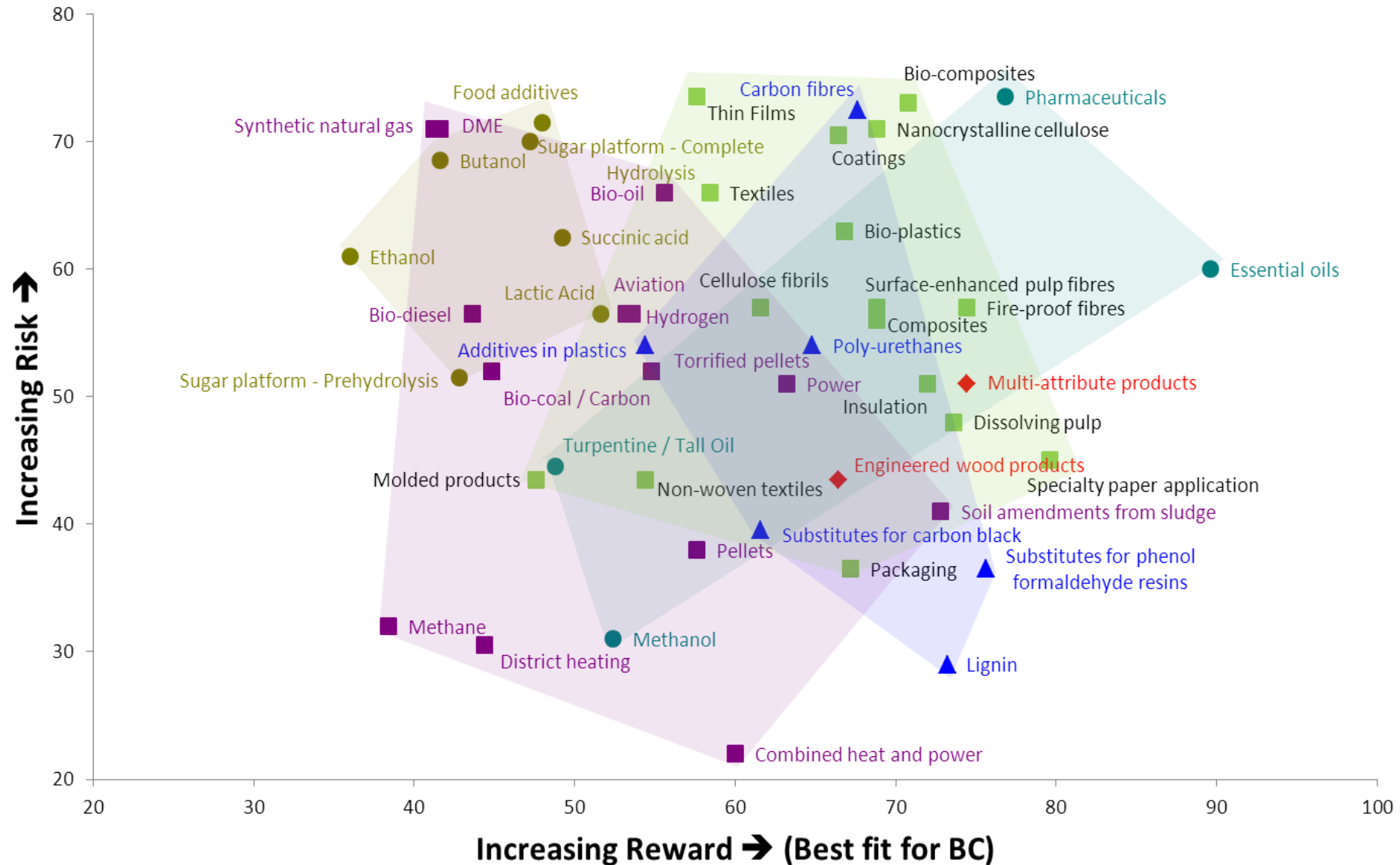


The Bio-economy from a BC Context



BC Bio-product Best Bets - Grouped by Product Platform

- ◆ Wood-based products
- Pulp-based products
- ▲ Lignin-based products
- Extractives-based products
- Residue-based products
- Sugar-based products



Lignin-Based Products

Wood products

Pellets



Polyol in polyurethane foams



Foundry resins



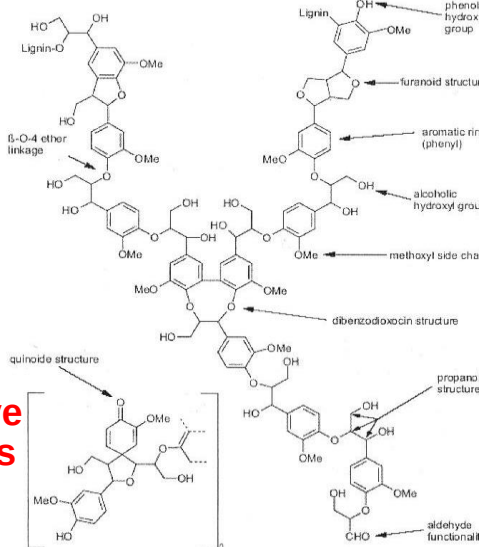
Resins & modifiers



Dispersant / Flocculent



Adhesive (binding) properties



High chemical derivatization potential

Hydrophobic Antioxidant Antiozonant properties

Dispersive properties

High carbon density

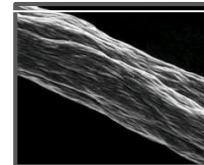
Activated carbon



Carbon black



Carbon fiber



Chemicals



Thermoplastics & Composites



Packaging



Sunscreen & Shampoos



Novel Fibre Applications

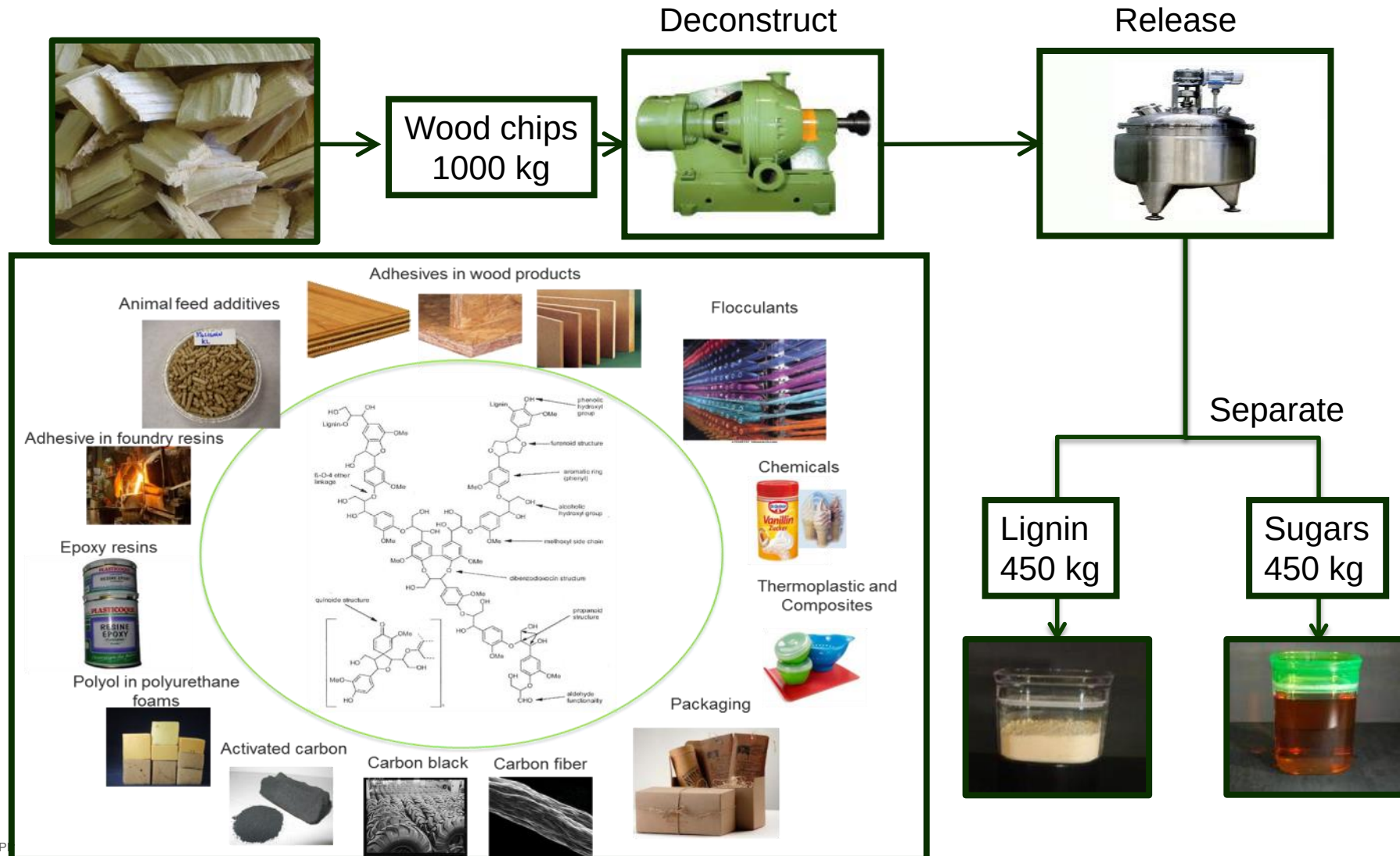


Cellulose Nanocrystals (CNC) Applications



Commodity Sugars from Trees

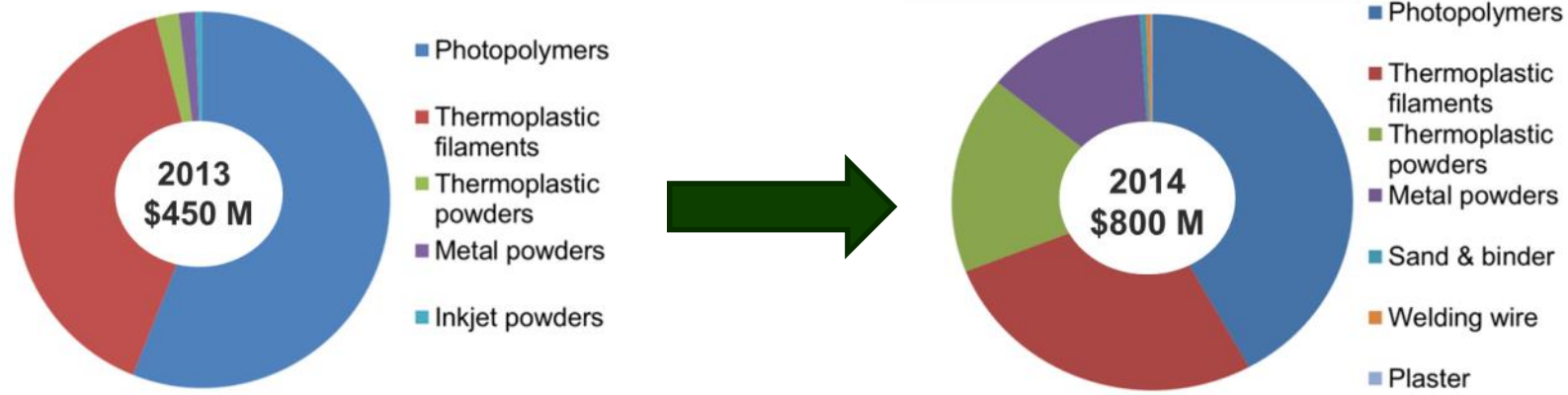
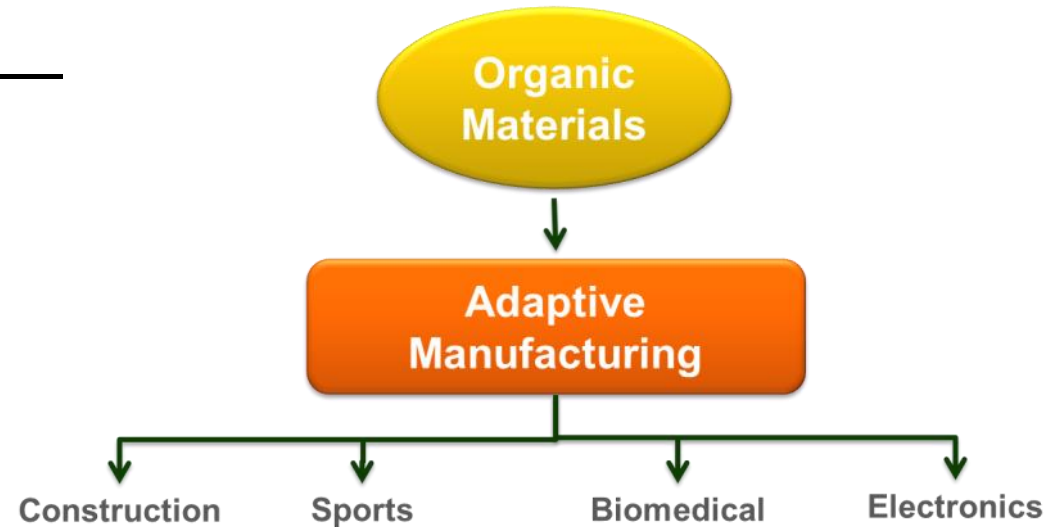
Thunder Bay



Adaptive 3D Manufacturing

#9 on Top Disruptive Technologies - +\$200B impact by 2025

- Demand for biomaterials—
CNCs, CFs, Pulp Fibres,
Wood Flour, Lignin
 - Sustainability
 - Biocompatibility
 - Functionality
 - Printability

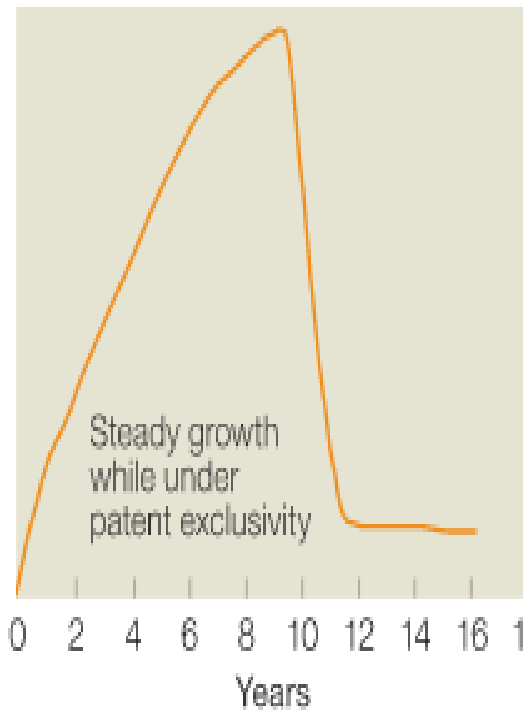


Materials and Chemicals Represent a Specific Challenge

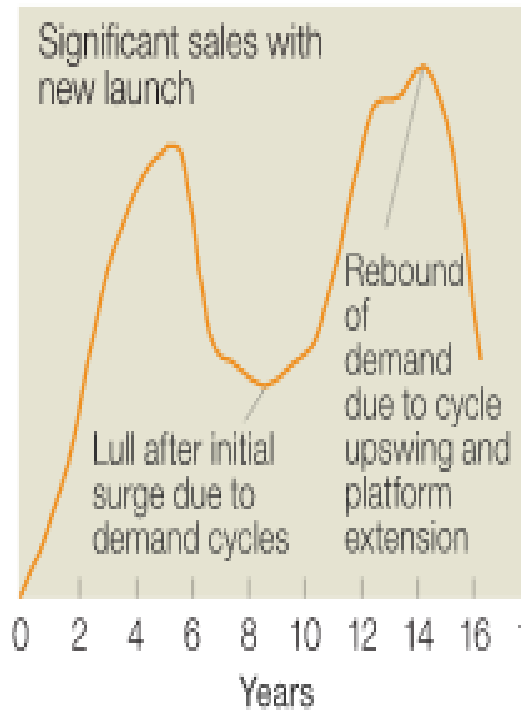
Risky and long but rewarding

That's us!

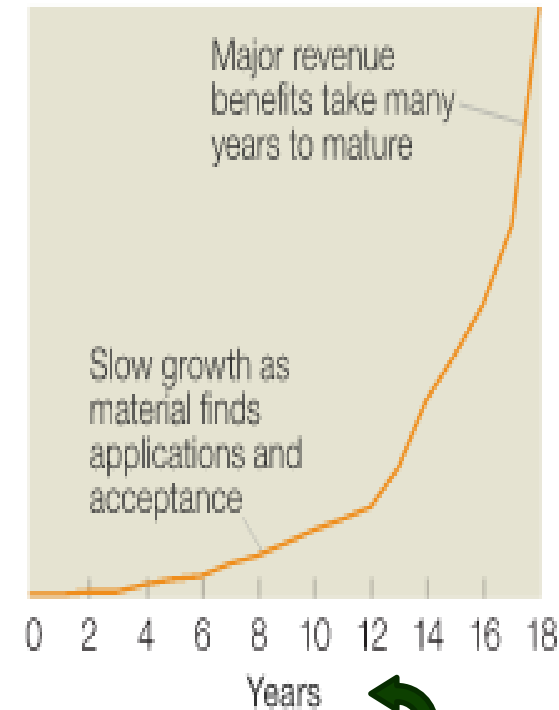
Pharma (new drug)



Aerospace (new aircraft platform)



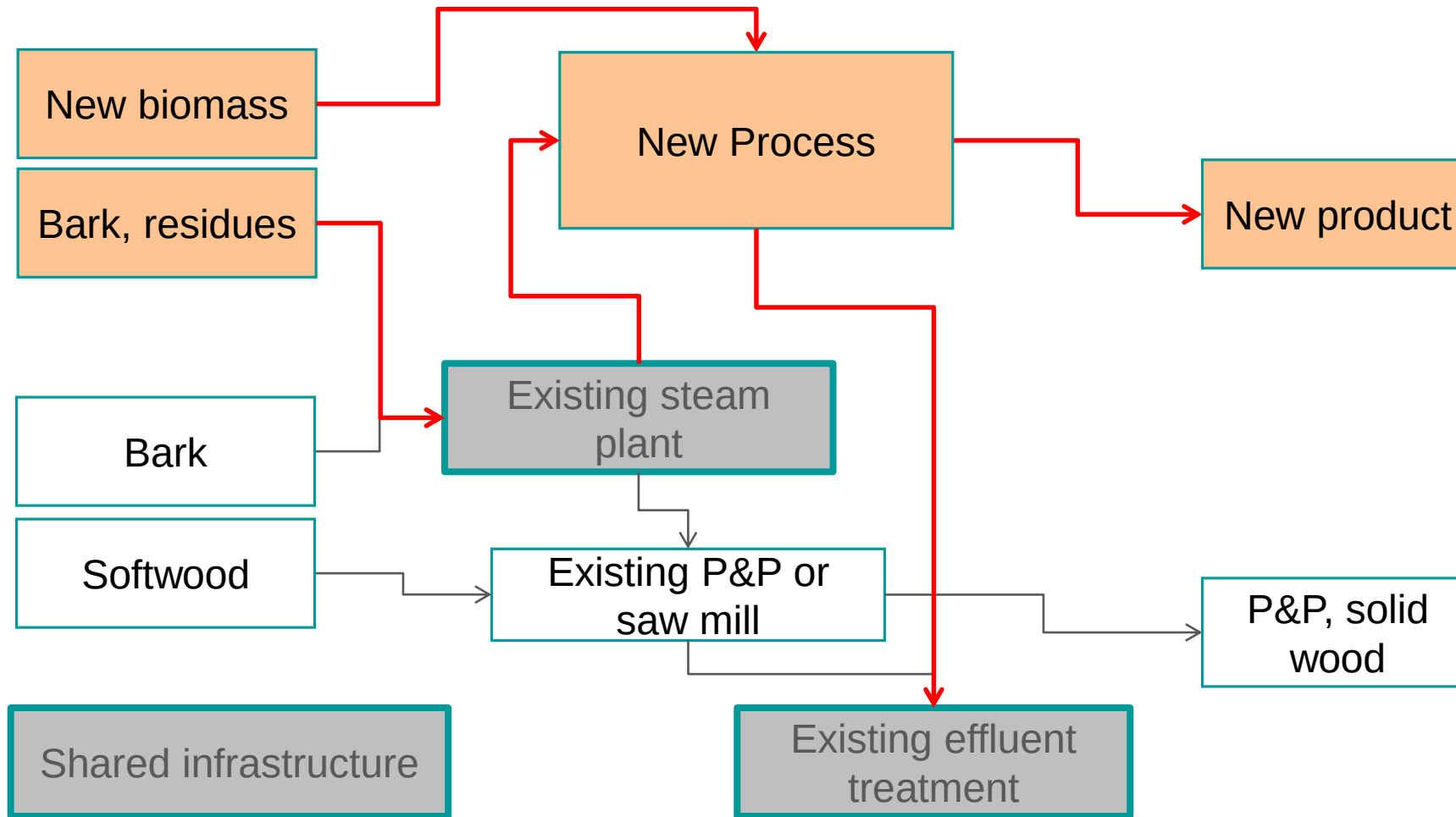
Materials/chemicals (new product launch)



"The path to improve returns in material commercialization", by M. Boren et al. (Aug. 2012)

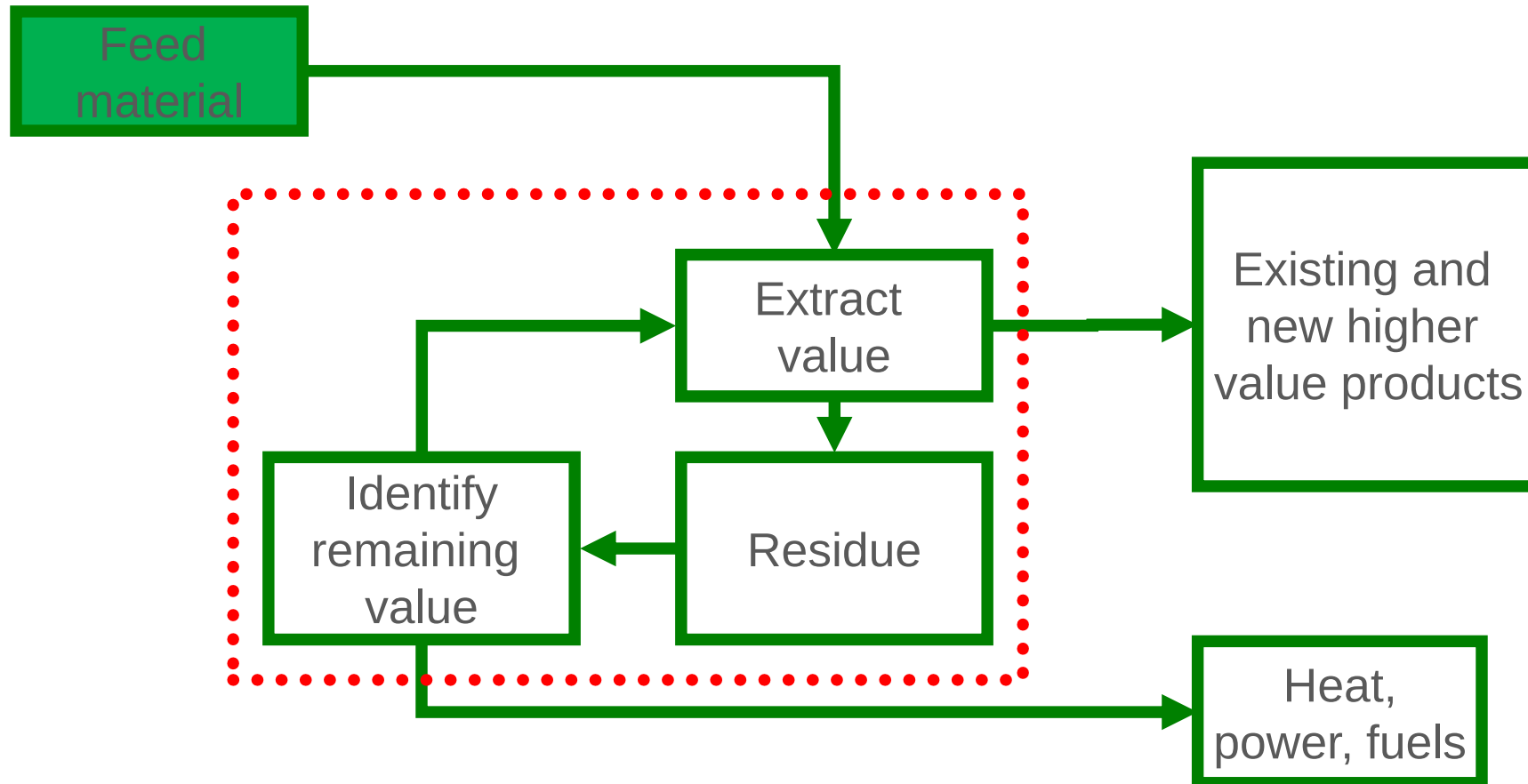
Look at time scale

The co-location advantage: bolt-on plant today; principal process in 10 years



Look for the highest value first

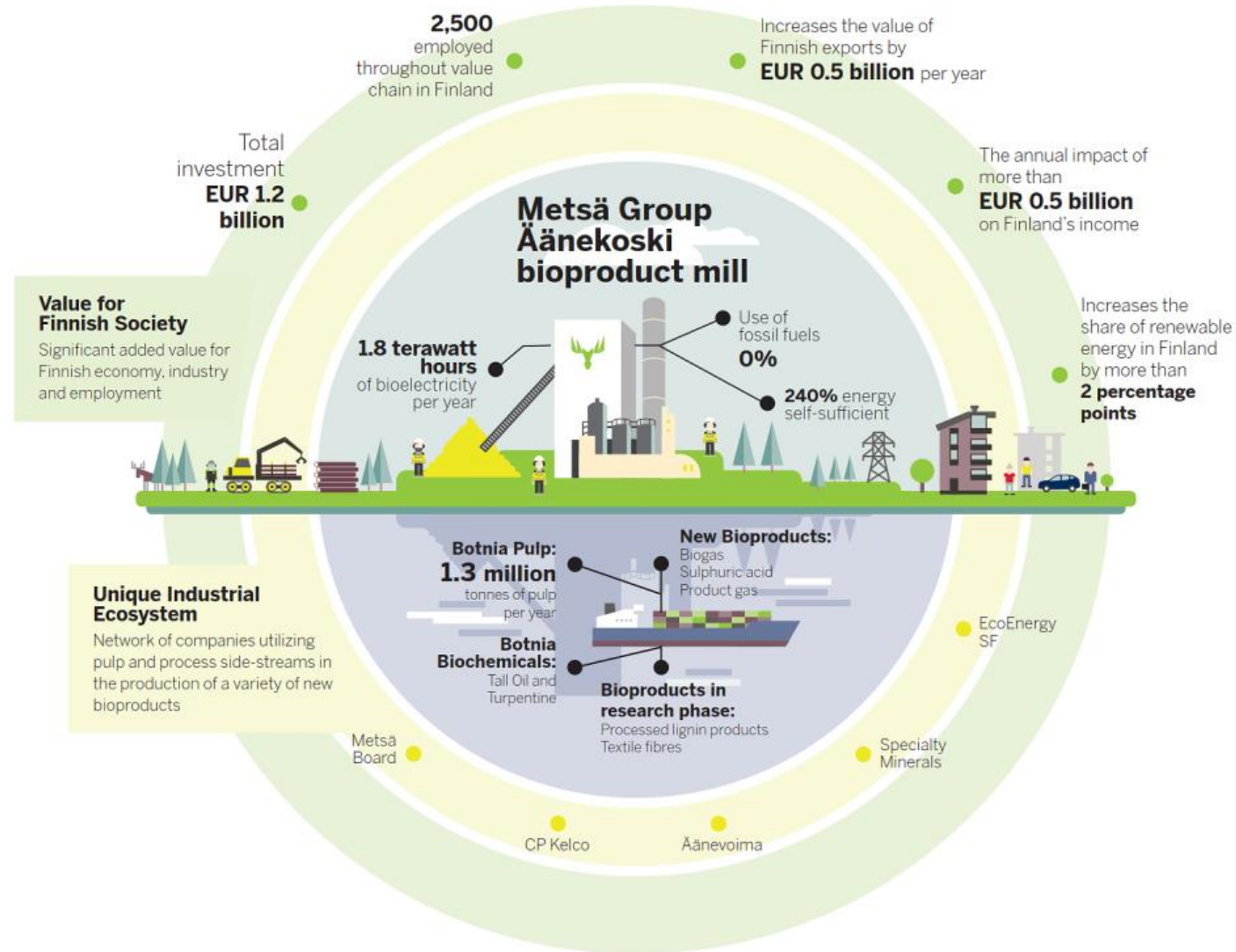
Highest value products will be made from expensive feedstock. Energy products will come from residues... and residues will come from higher value products:



Connecting fibre suppliers and technology to processors and end-users

- Technology developers
 - Often don't know forest industry (isn't fibre free?)
- Fibre suppliers
 - Don't have links to their new customers
 - Need to understand specialty markets and supply chains
- End customers
 - Already have established supply chains they trust
 - Materials in end products come with warranties and guaranties
 - Performance and cost sensitive

The Finnish bioeconomy eco-system – a model for Quesnel



Rotterdam – new forest-based biochemical capital of the world. A model for Quesnel



- Port of Rotterdam expects to receive 8 Mt/y pellets by 2020
- Plans in place to build a Bio-Port on 80 hectares of land
- Vision is for a chemical plant processing 2-4 Mt/y pellets by 2022
- Products will be sugars, sugar-derived chemicals, lignin, polyphenols and aromatics



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