

Why Bioeconomy? Inevitable future

Bioeconomy is more than just Bioenergy

Review of the Bioeconomy sectors –
towards value-added applications

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Bioeconomy trends and opportunities

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Novel is *different*.
Novel means *rare*.
Rare is *valuable*.

NISCluster is a **unique concept** that combines detailed knowledge of international forest biomass value chains with novel ideas on the bioeconomy.

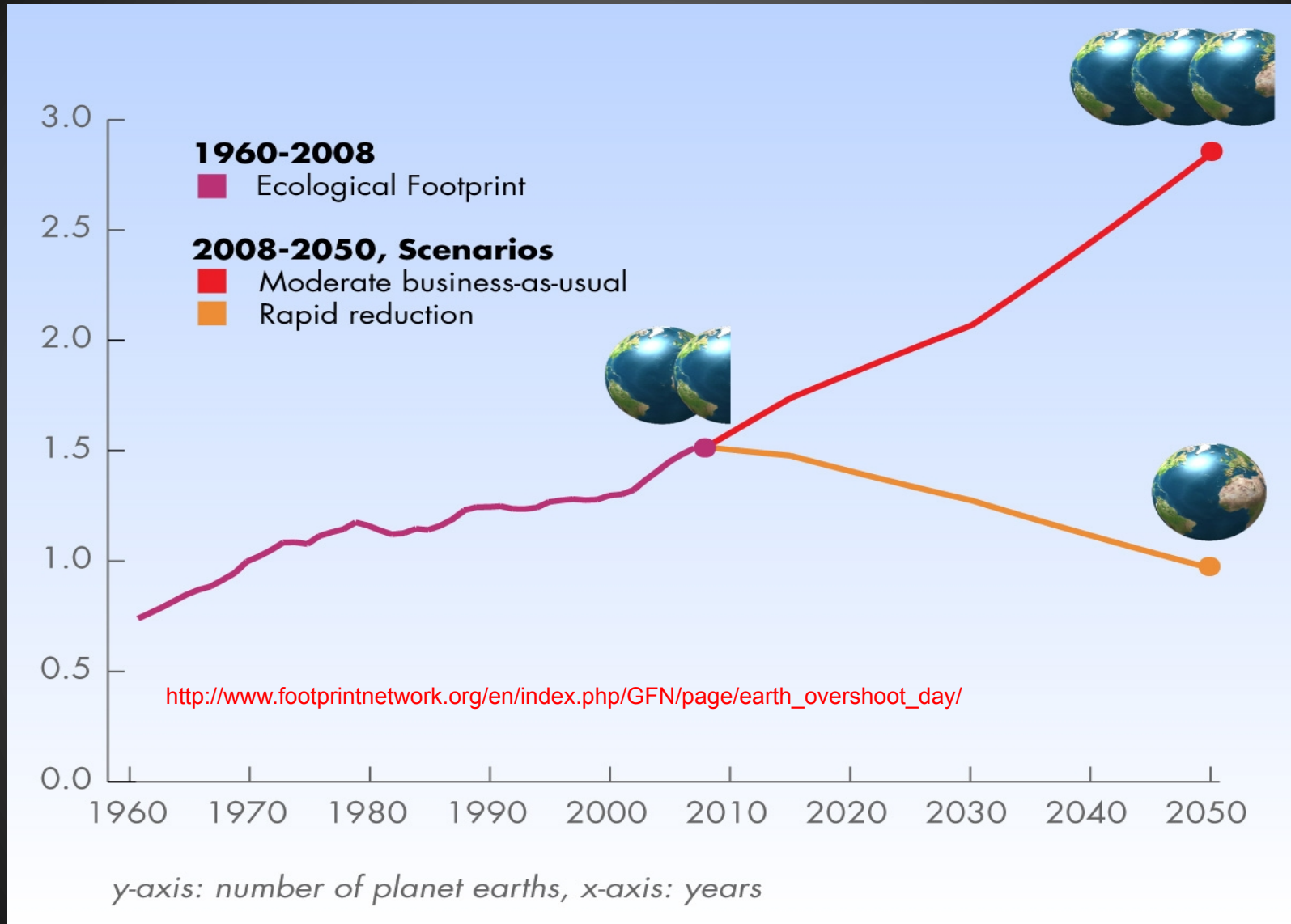
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Close collaboration with leading institutes keeps **us up-to-date on the latest progress** in the bio-refinery sector - even before any clear business development trends can be seen by investors.

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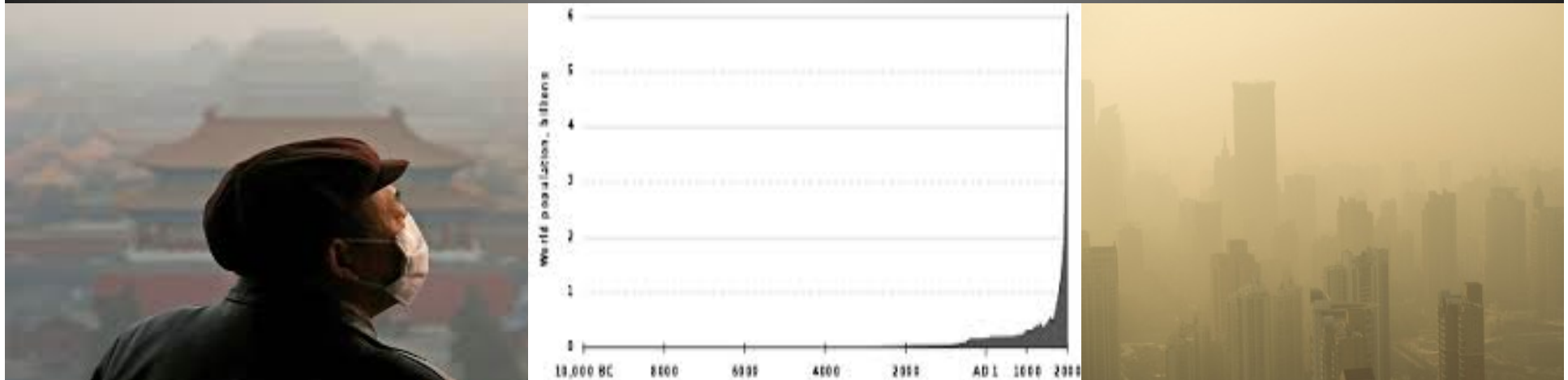
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How sustainable is our planet?



Megatrends

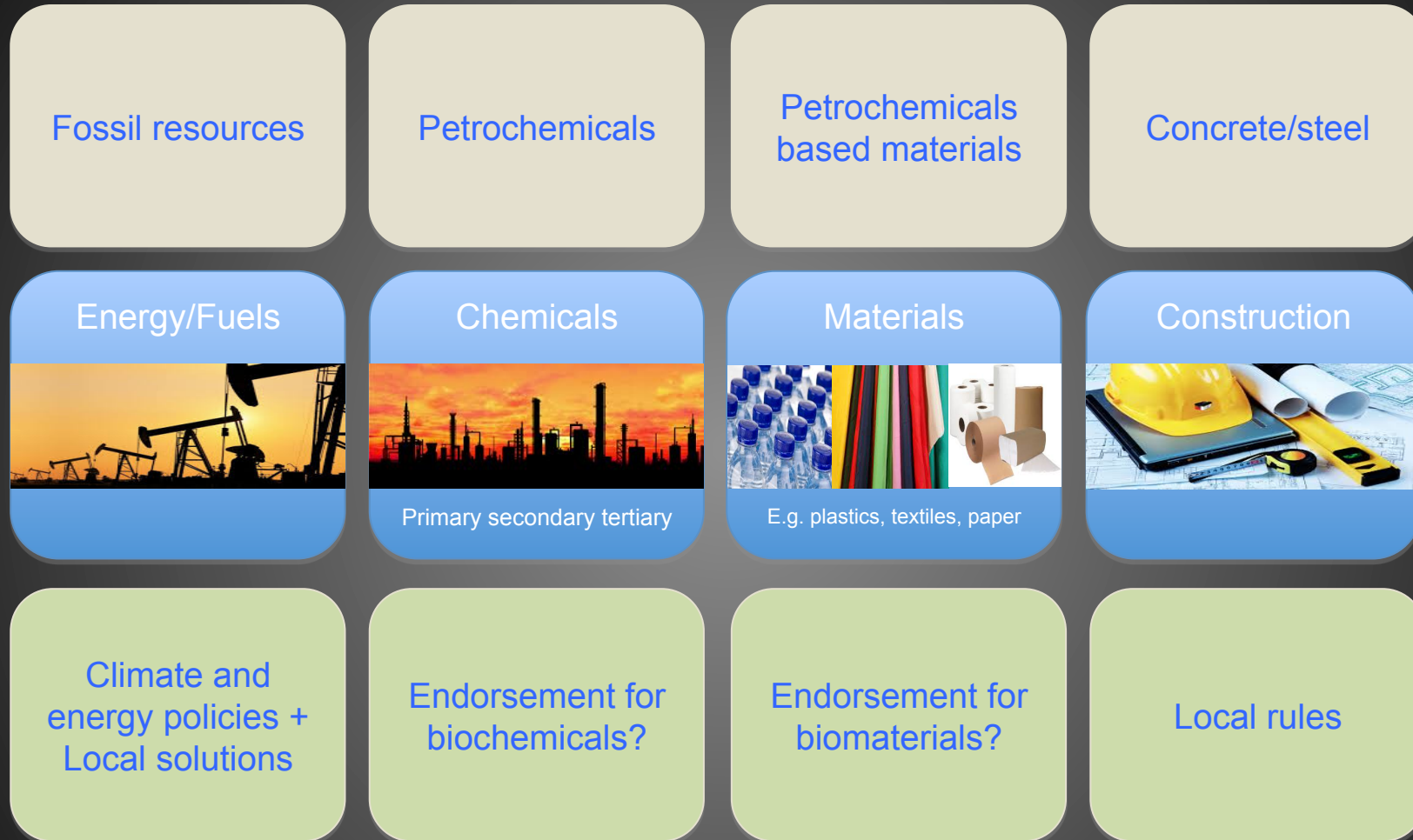
- Population growth
- Accelerating Urbanization
- Resource scarcity and climate change
- Shift of economical power
- Technological breakthroughs



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Woody biomass is an option



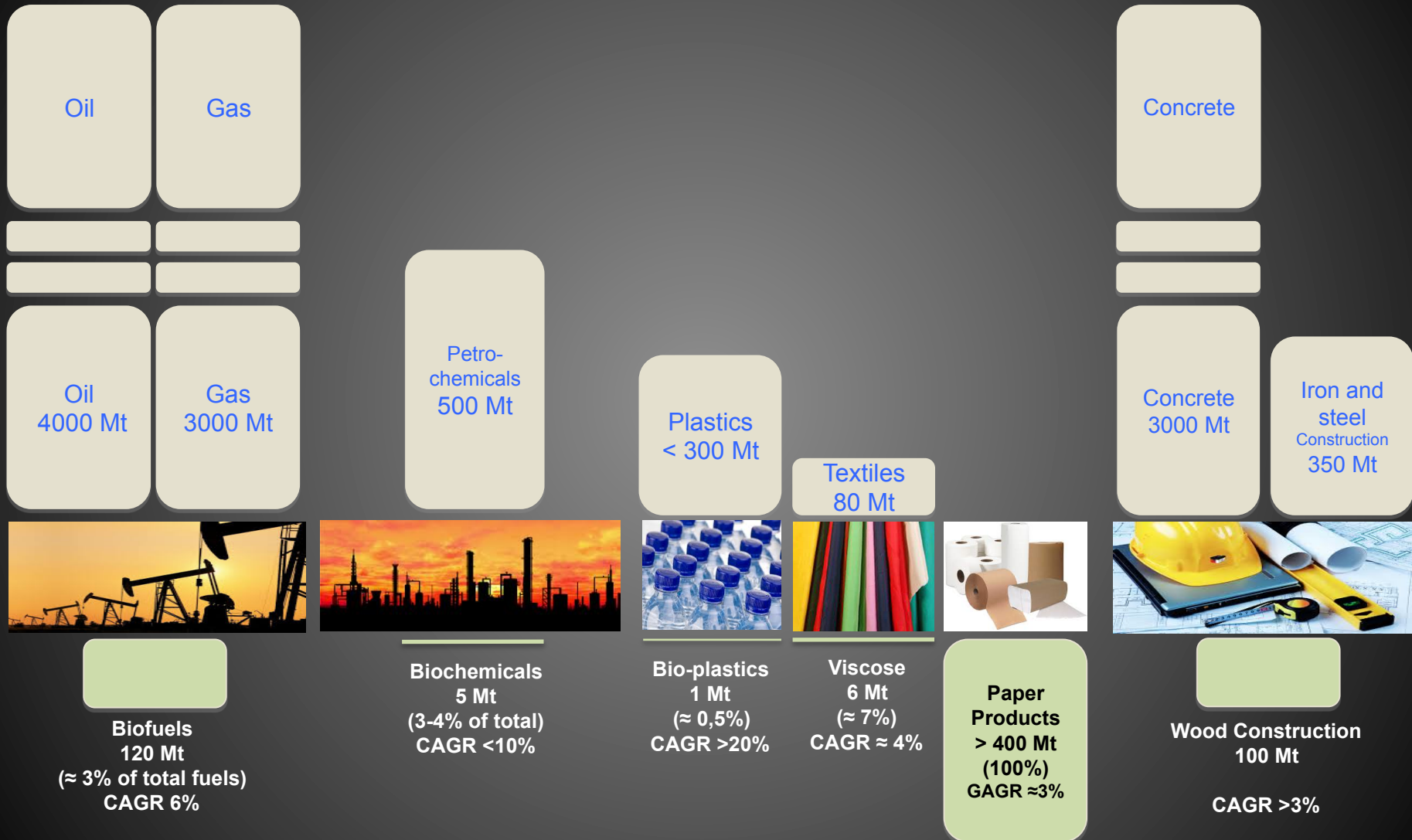
Added value for wood

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Non renewable vs. biobased

Scale difference



Carbon emissions and reduction potential of Biomass

Globally $\approx 50\,000$ Mt CO₂



CO₂-EMISSION REDUCTION POTENTIAL BY REPLACING FOSSILS WITH BIOMASS

Global Forest Resources

1G -> 2G , added value for woody biomass

”BASF and Renmatix agree on a joint development for the production of industrial sugars from forestbiomass”

“The Chemicals Industry will be more and more green and sustainable. This is the strong message that comes from Ecochem”

- Global forest resources over 4 billion ha
- Deforestation slowing down – though net loss 5 M ha globally. Mainly in conversion of tropical forest to agriculture land
- Broad afforestation programs and natural growth will reduce deforestation. In Europe forest area increased $\approx 700\,000$ ha a year during 2000 – 2010. Projections for further growth still possible in the future.
- Evolution of bioeconomy will bring opportunities for wood biomass as a raw material for chemicals and materials. Energy generation cannot be a long term solution for woody biomass – only local resolution

Lähde: FAO (FRA 2010)

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Energy

A focus of regulation – 2G emerging Potential for local energy solutions



- USA the leading producer of biofuels
 - ✓ Global capacity for ethanol \approx 90 Mton/a \approx 50% from USA, 25% from Brazil
 - ✓ Europe's share: about 9.5 Mton a year
 - ✓ Focus on ethanol, but Europe is mainly for biodiesel
- Oil industry is forcing back – RFS2 under debate
- First investments in 2G
 - ✓ Betarenewables in Italy (Crescentino)
 - ✓ More to come up in USA (POET-DSM)
 - ✓ ST1 in Finland – First for wood
- EU: Revision of RES directive under discussion
- Local decentralized solutions
- Maintaining harvesting infra
- Situation in Europe
- Various technologies
 - ✓ From combustion to gasification...
- The biggest pyrolysis plant just got started in Finland by Fortum (Valmet)
- Boilers – well established technology
- CHP – several suppliers
- Gasification:
 - ✓ Large scale: Valmet, Andritz...
 - ✓ Small scale: Gasek, Volter....



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Chemicals

Dominance of USA and chemicals giants

Huge investments needs



- Growing awareness of bio-products
- Technologies evolving – most exiting ones
 - ✓ Hydrolyses, fermentation, enzyme treatment
 - ✓ Challenge: wood decomposing to sugars
- Current applications mainly based on 1G sugars – 2G under way, challenge with the yield?
- Largest investments in USA. Investors are favoring USA policy acknowledging biochemicals as a vital part of the bioeconomy
- EU: no specific polices or endorsement programs for biochemicals



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Materials

Potential for plastics and textiles

Fibre solutions providing new features



- Growing market potential
 - ✓ Plastics – \approx 300 Mton – petrochemicals \approx 99 % market share
 - ✓ Textiles – 80 Mton – Polyester and other synthetic fibres > 65 % market share
- Advantages of bio-based materials
 - ✓ GHG-reduction
 - ✓ Renewable, sustainable raw material
- Status of the technology (bio-products)
 - ✓ Composites already available
 - ✓ MCC (microcrystalline cellulose) and NCC (nanocrystalline cellulose) products under launching
 - ✓ Viscose fibre well-known technology
- No EU-level regulatory framework to favor biomaterials instead of non-renewables

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Fasern aus der Natur
Fibers designed by Nature

FMC Corporation

NIPPON PAPER GROUP

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MINGTAI CHEMICAL CO., LTD.

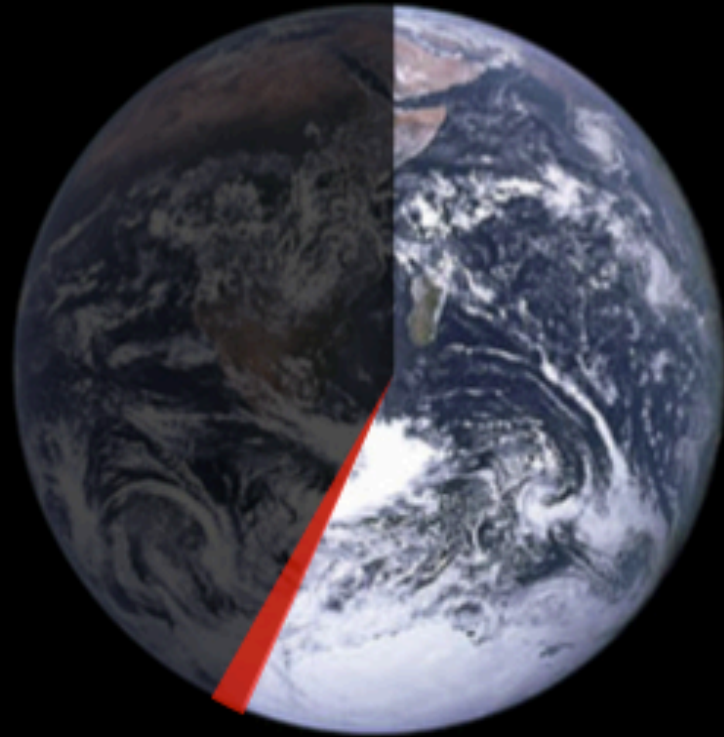
**Engineered
Fibers
Technology**



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Around 40% of greenhouse gas emissions come from the built environment.

Cement manufacturing alone causes 5-7% of global GHG emissions.

Construction and mechanical wood products

Local rules, zoning



- Almost half of wood usage in Europe is in the mechanical wood industry $\approx 200 \text{ M m}^3$
- Mechanical industry provides majority of revenue for forest owners
- Side streams of sawmills bringing opportunities for biorefinery feedstock options
- Wood construction is an effective way to reduce GHG
- Solid wood constructions vary across Europe depending on acceptance of wood solutions
- Local authorities playing vital role with zoning and acceptance of wood construction
- New competitive edge: Solid wood CLT elements 70 % lighter than concrete
=> impacts construction value chain and moves work from building sites into factories
- CLT and gluelam applicable for various uses such as bridges, large scale construction, halls etc.



Heinola, Finland, 2011;
5-storeys

Bioeconomy trends

- The bioeconomy is competing with vast, well established industries like petrochemicals and cement – will take efforts to catch up
- Value of the woody biomass increasing as result of transition from 1G to 2G
- Investments are the most advanced in the energy sector – market created by regulators
- Biochemicals dominated by chemical companies and USA
- Potential in biomaterials with advanced properties
- GHG-reduction with wood construction
- Regulatory framework for chemicals, materials, construction could facilitate evolution of bioeconomy

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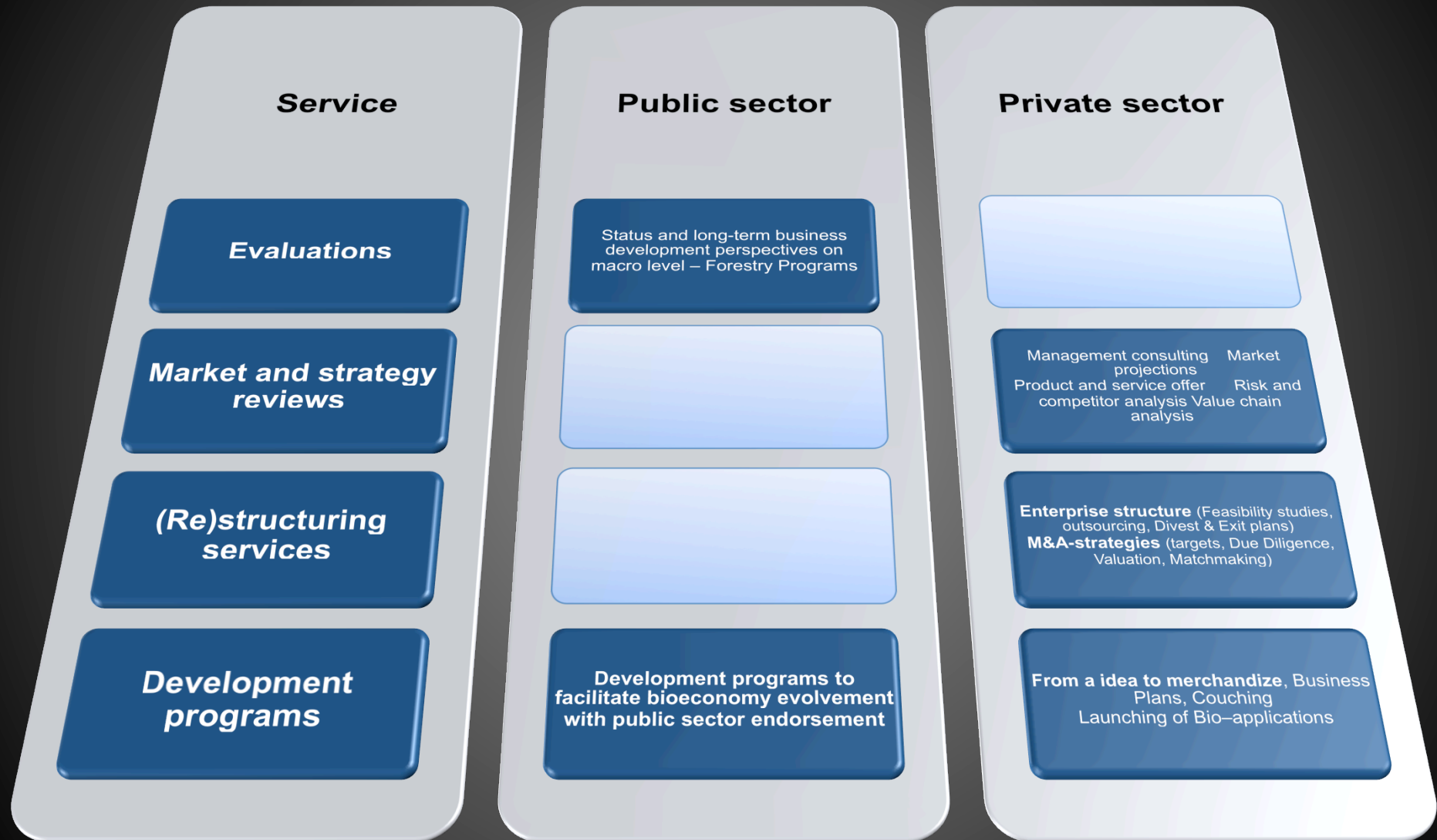
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Service offer



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NISCluster – the way we work

Core team



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PARTNERS

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