DNV·GL

ENERGY

Advantages and drawbacks for international trade of torrefied products

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Central European Biomass Conference

15th to 18th January 2014, Graz, Austria

Combining two major players

- Founded 1864

- Høvik, Norway
- 10,400 employees

Dedicated competences in:
- Tankers
- Offshore Classification
- Power & Transmission
- System certification

DNV GL Group

- Shared ambition for quality and innovation

- Head office in Høvik
- 17,100 employees

A leading company in:
- Classification
- Oil & Gas
- Energy
- Business Assurance

- Founded 1867

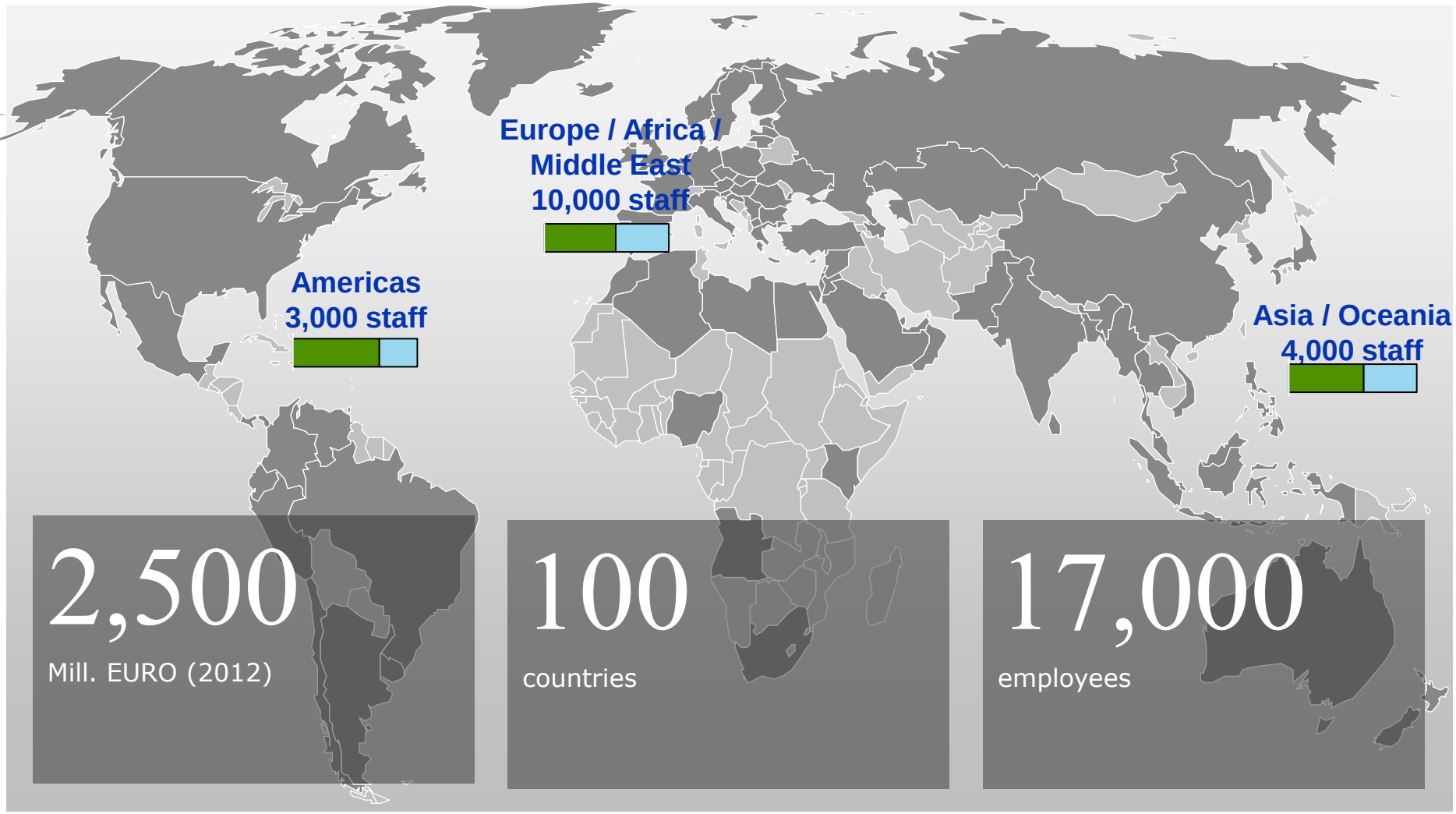
- Hamburg
- 6,700 employees

Dedicated competences in:
- Container ships
- Energy efficiency
- Marine warranty
- Renewables

DNV GL - Energy

- DNV GL - Energy offers innovative solutions to customers across the energy value chain, ensuring reliable, efficient and sustainable energy supply, now and in the future.
- 2,800+ experts across all continents
- A heritage of nearly 150 years
- Headquartered in Arnhem, the Netherlands

Global delivery capability and strong presence



DNV GL - Energy and upgraded biomass

- We consider ourselves as an independent party to supply investors, suppliers, and end-users with dedicated upgraded biomass technical and business support to integrate upgraded biomass processing technologies (primarily torrefaction and steam explosion) in the biomass supply chain while ensuring the availability, reliability, sustainability and profitability of the generation of electricity and heat

- DNV GL - Energy continuously tracks and evaluates the development of torrefaction and steam explosion technologies and commercial parties that bring torrefaction and steam explosion to the next level.

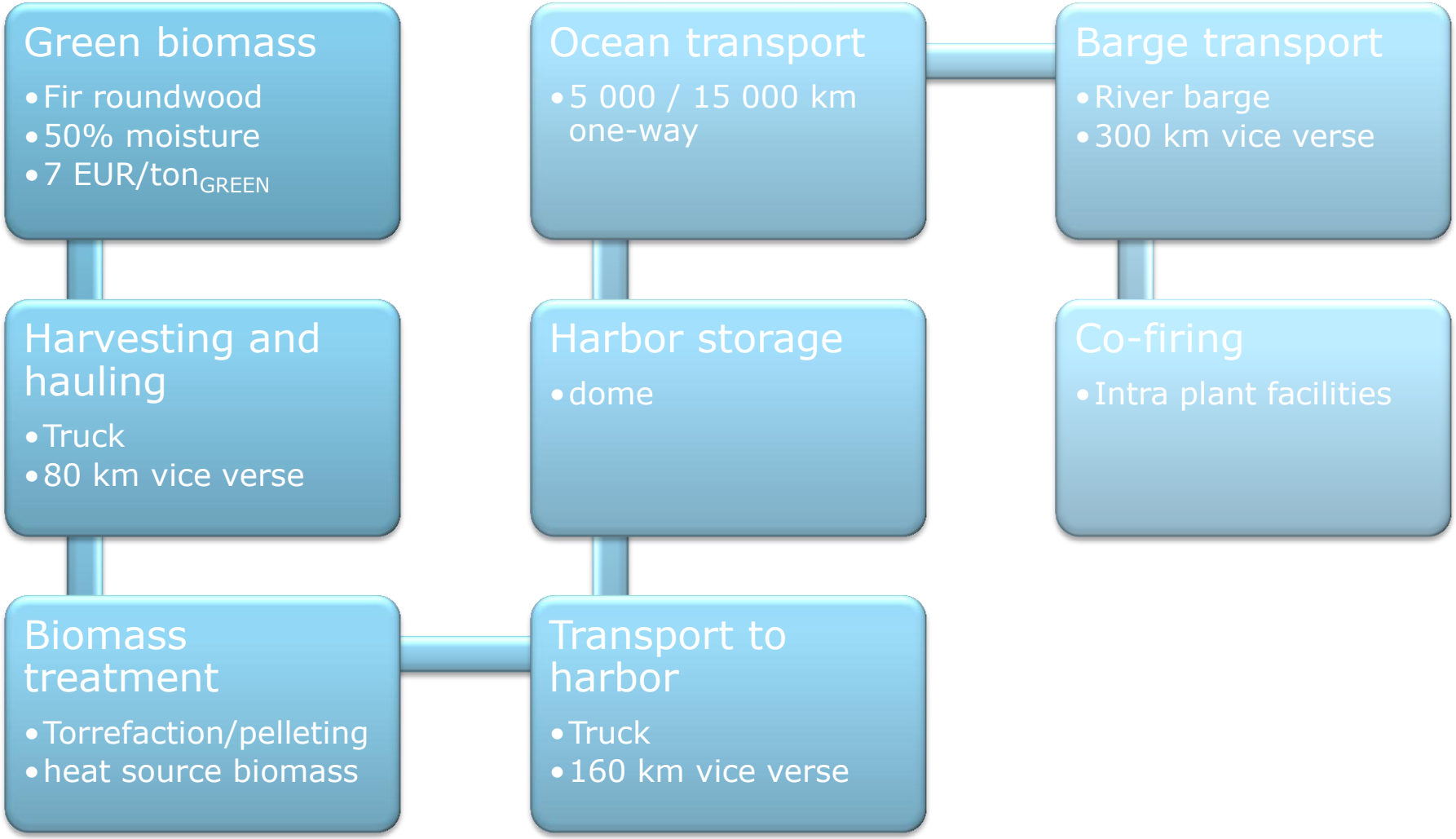
- Our biomass upgrading services include technology verification, technical due diligences, tendering assistance, process and design reviews, co-firing feasibility studies / operational impact studies, guarantee measurements, measurement campaign support, risk assessments

Case study

- Evaluation of chains for wood pellets and torrefied pellets
  - Originating from green biomass Canada/US
  - Pellet production near to biomass source
  - Transported to a pulverized coal fired power station in the Netherlands

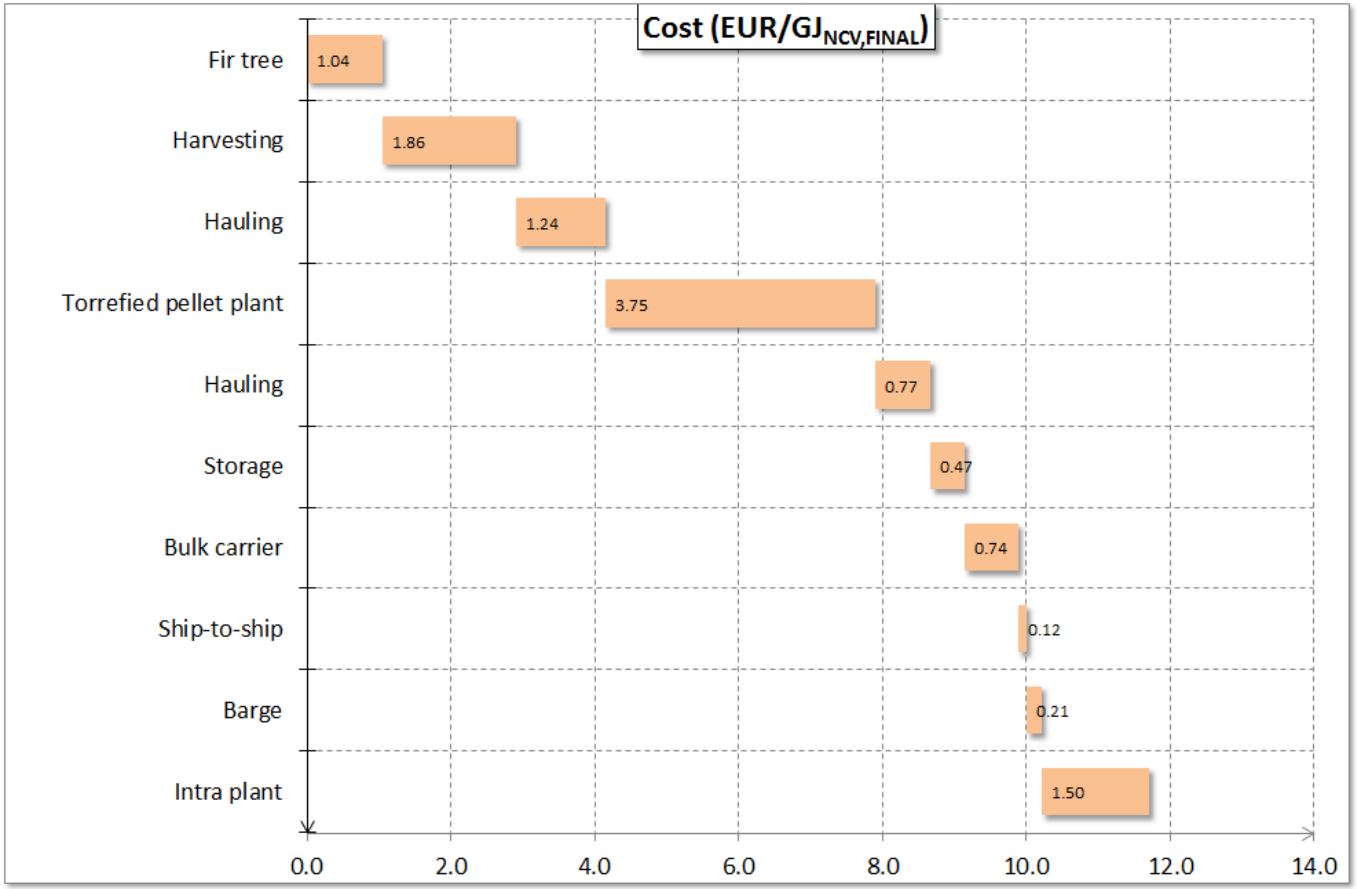
- Items of study
  - Basis cost price
    - Impact of ocean carrier distance
  - CO_2 intensity levels
    - Impact of ocean carrier distance

Supply and consumption chain



Biomass supply chain - costing

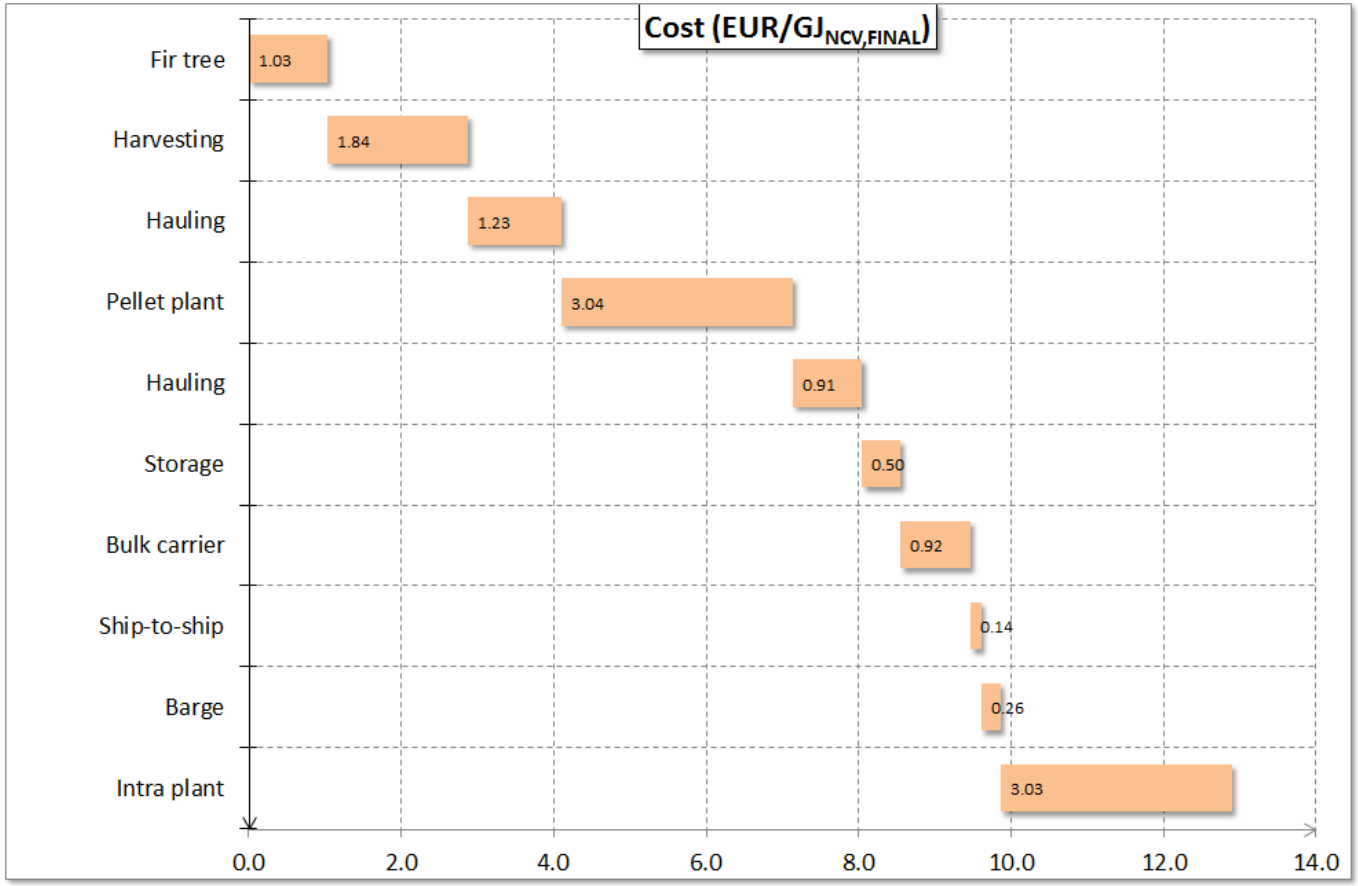
- Torrefied pellets (delivered and consumed at power plant)



- *Bulk carrier distance 5000 km*

Biomass supply chain - costing

- Wood pellets (delivered and consumed at power plant)



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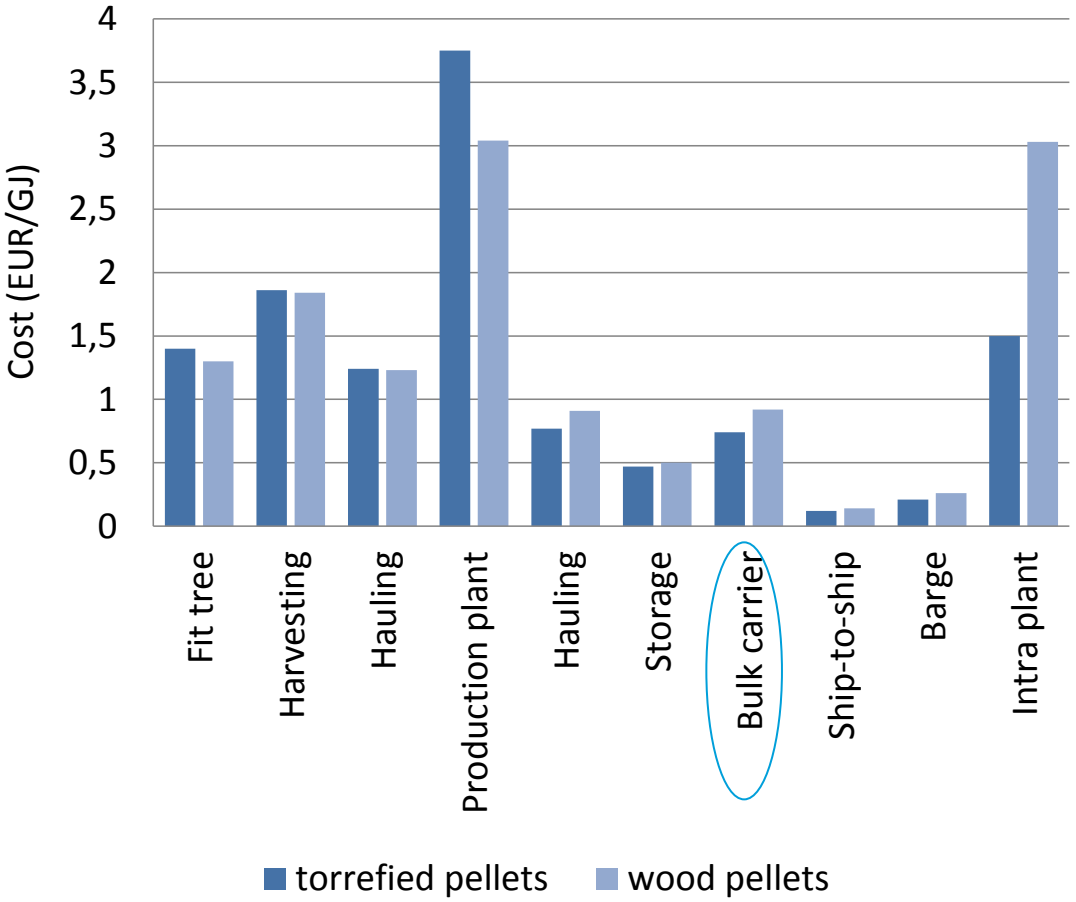
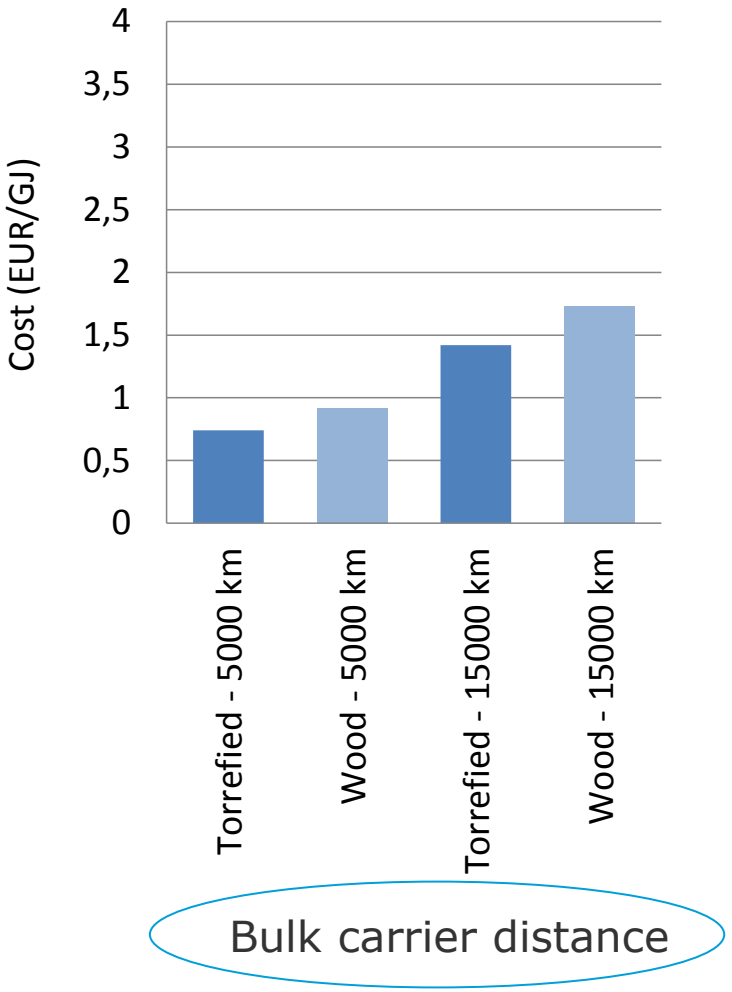
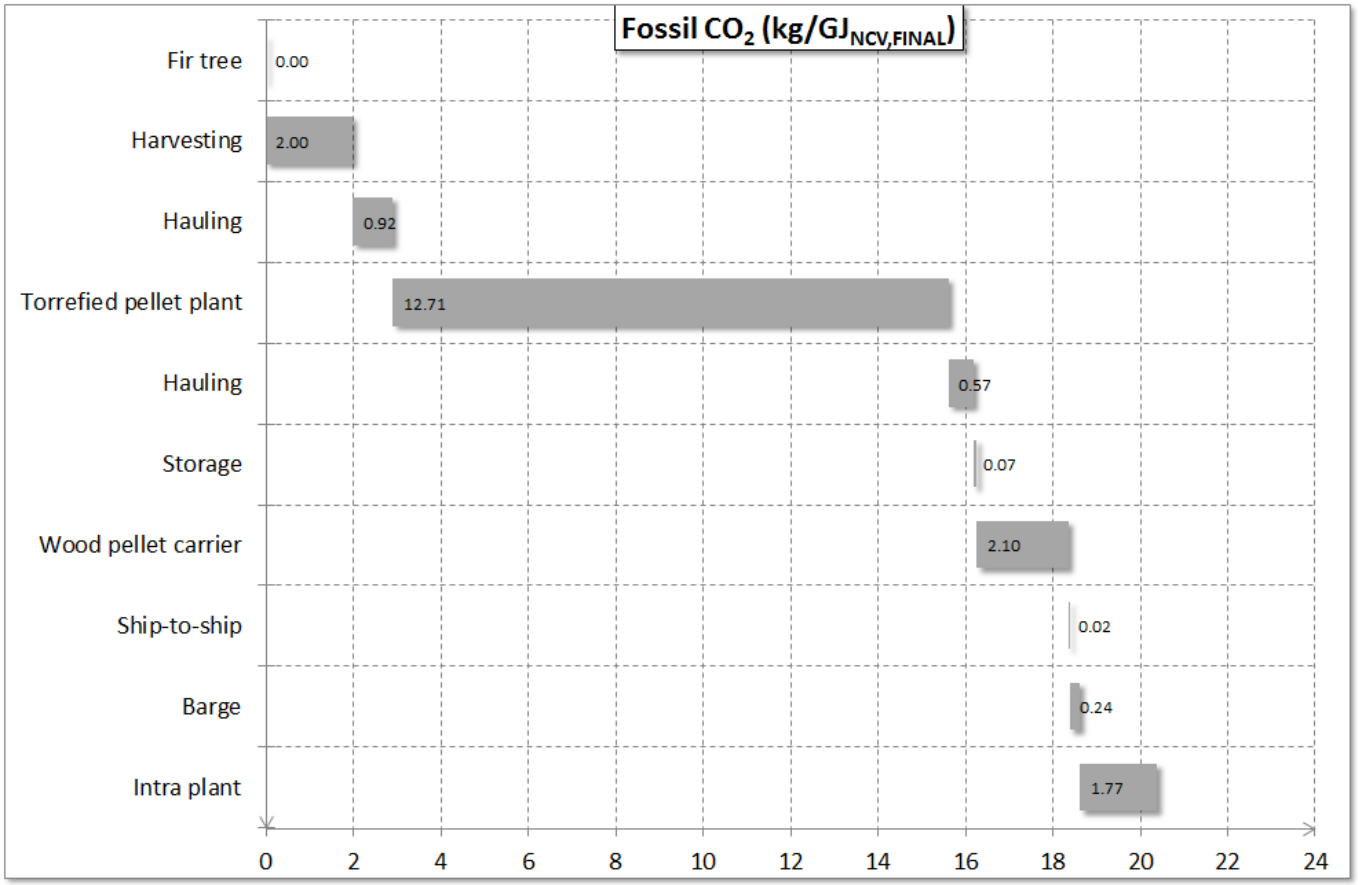
Comparison torrefied and wood pellets





Biomass supply chain - CO_2

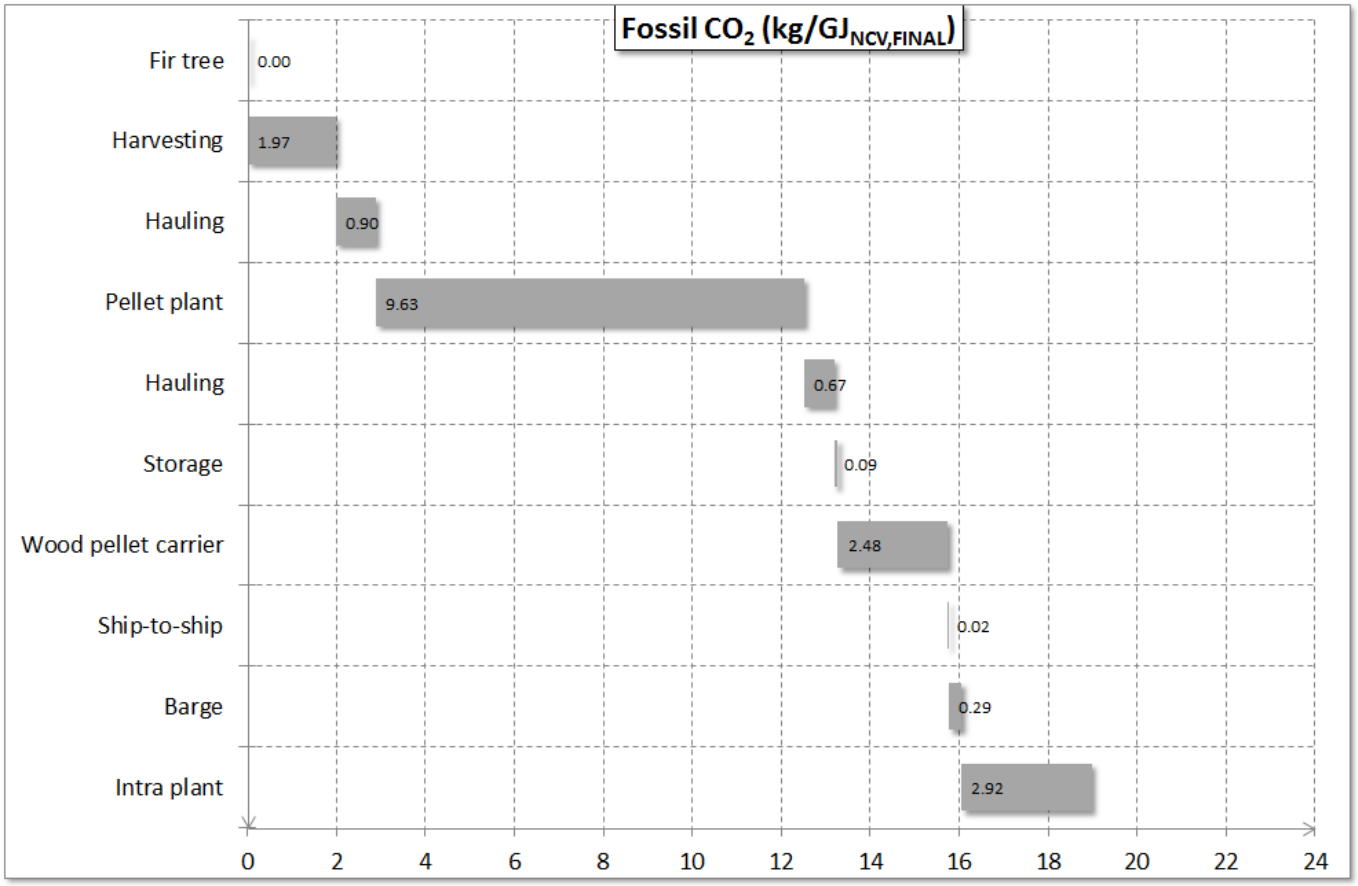
- Torrefied pellets (delivered and consumed at power plant)



- *Bulk carrier distance 5000 km*

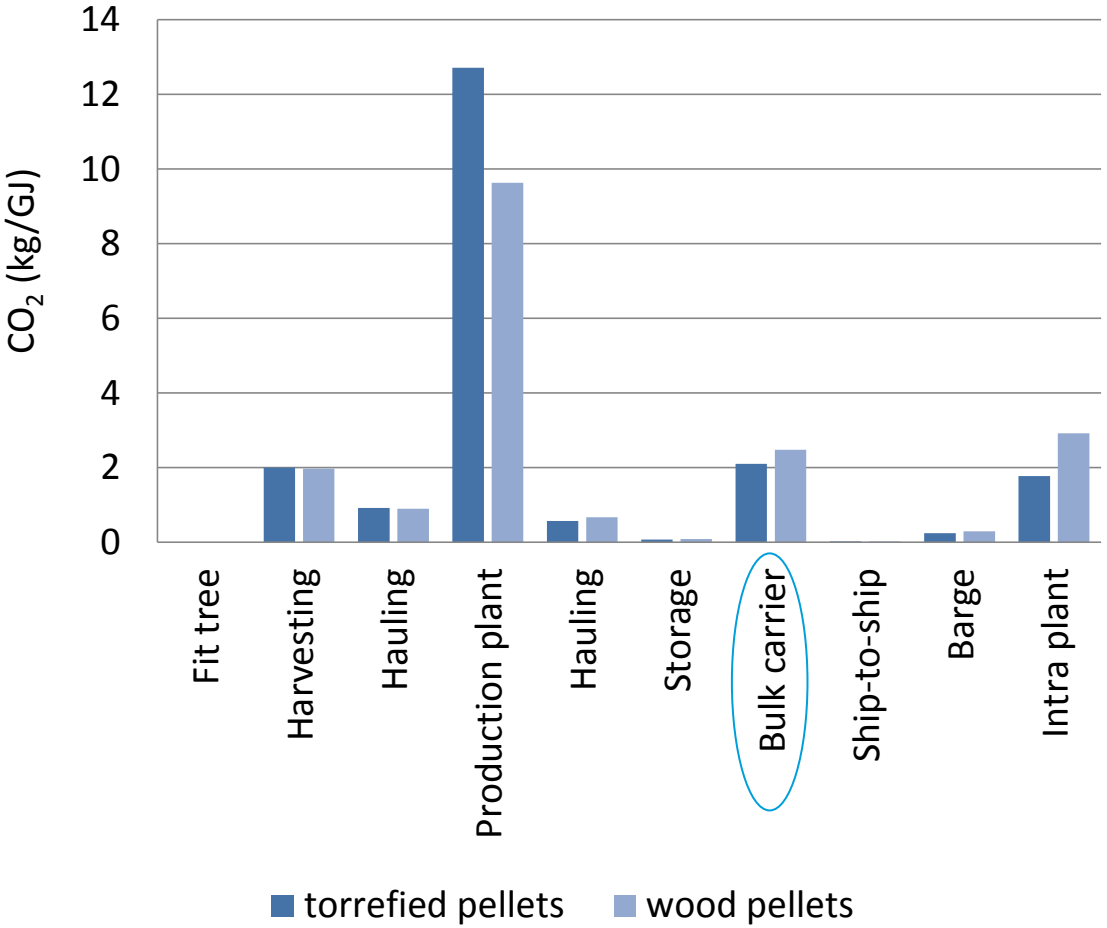
Biomass supply chain – CO_2

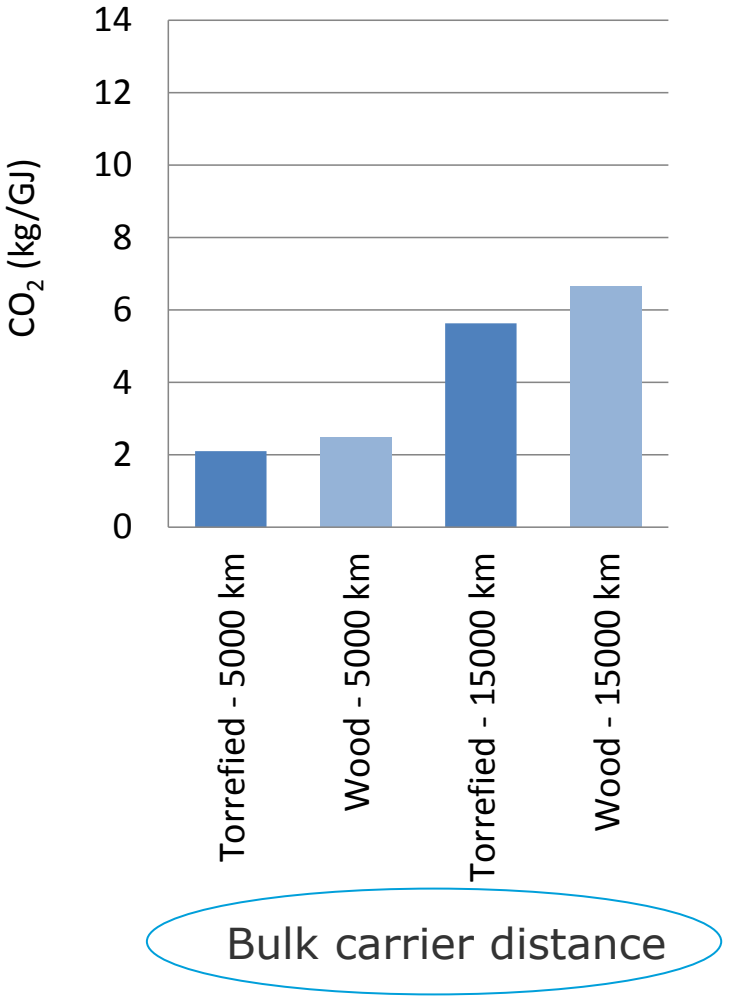
- Wood pellets (delivered and consumed at power plant)



- *Bulk carrier distance 5000 km*

Comparison torrefied and wood pellets





Conclusions

- Supply chain cost torrefied pellets same order of magnitude as wood pellets (case)
- Total production cost of torrefied pellets and wood pellets is 7.1 and 5.9 per GJ
- Cost of logistics (transport, storage and transshipment) is 15-20% lower for torrefied pellets
- Cost associated with investment at power plant is significantly lower for torrefied biomass
- The primary fossil CO_2 source in whole supply chain is that of biomass processing
- Ocean freight accounts for 10-30% of total emitted CO_2
- There is a need for harmonization of the assumptions made

Thank you for your attention

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