Environmental Evaluation of Biorefinery Concepts
-
Co-production of Transportation Biofuels, Electricity, Heat and Chemicals from Biomass

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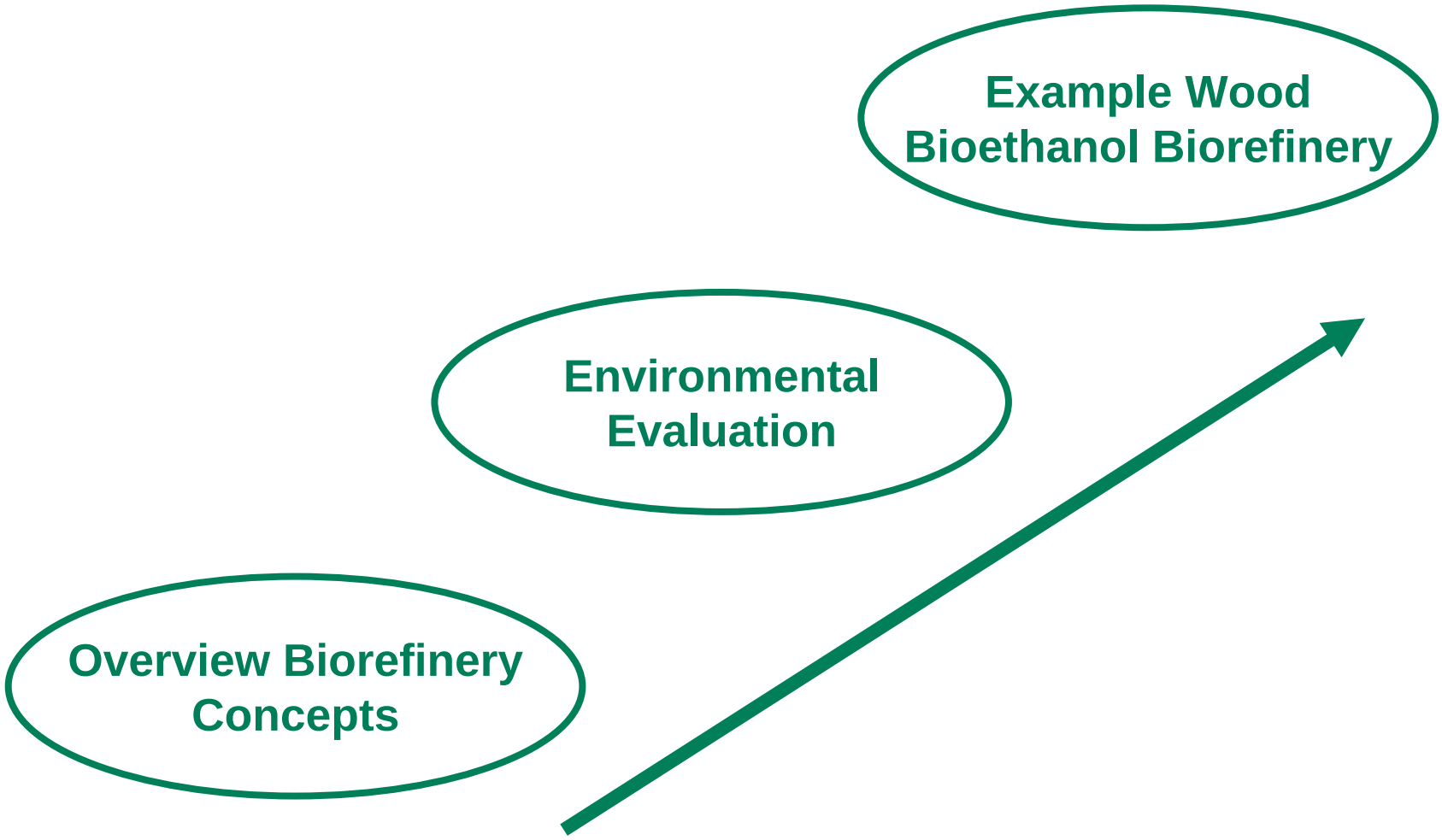
Workshop Biorefinery – Austrian Activities and IEA Bioenergy Task 42

4. October 2007, Vienna, AUSTRIA

Outline

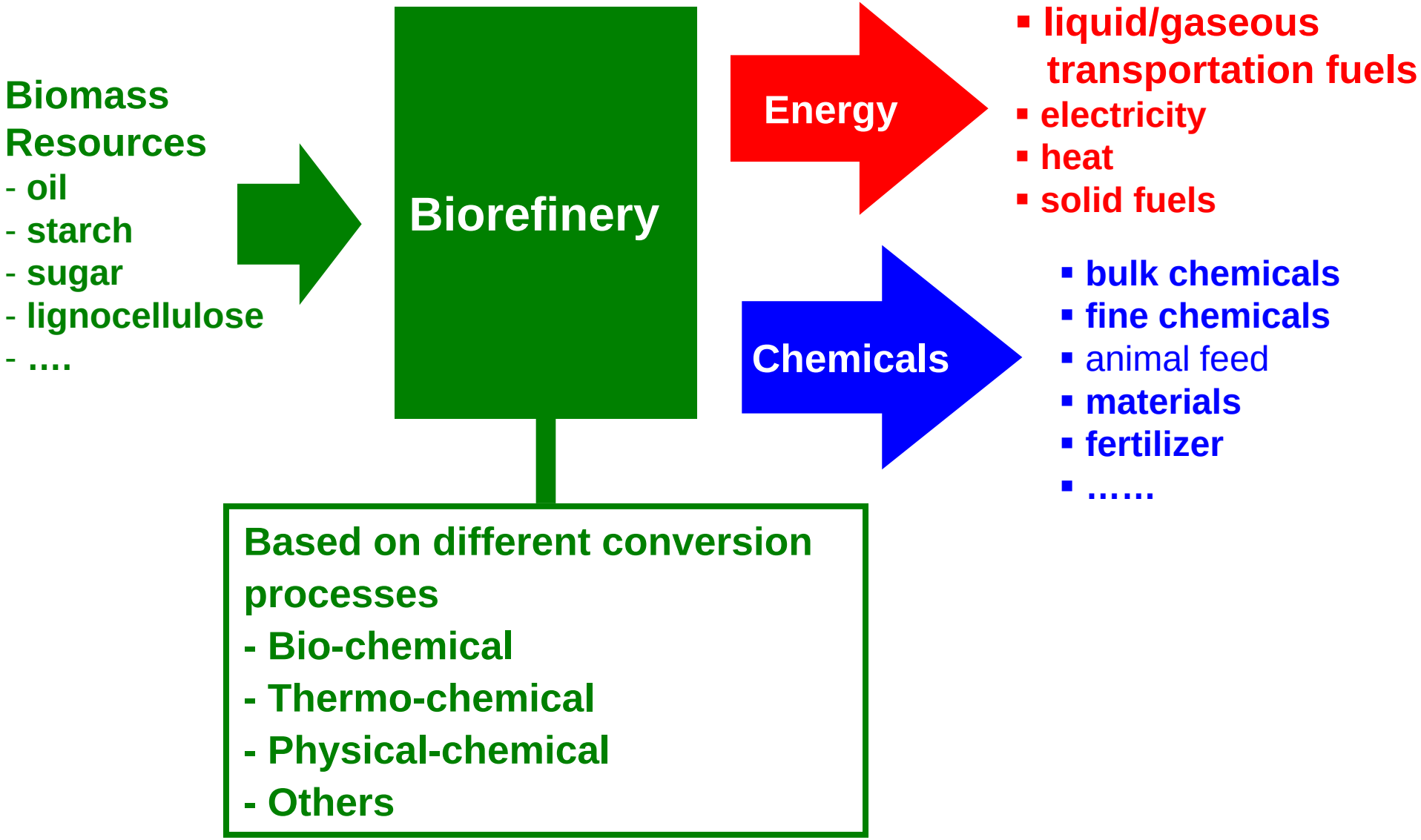

Example Wood Bioethanol Biorefinery
Environmental Evaluation
Overview Biorefinery Concepts

European Roadmap for Biofuels

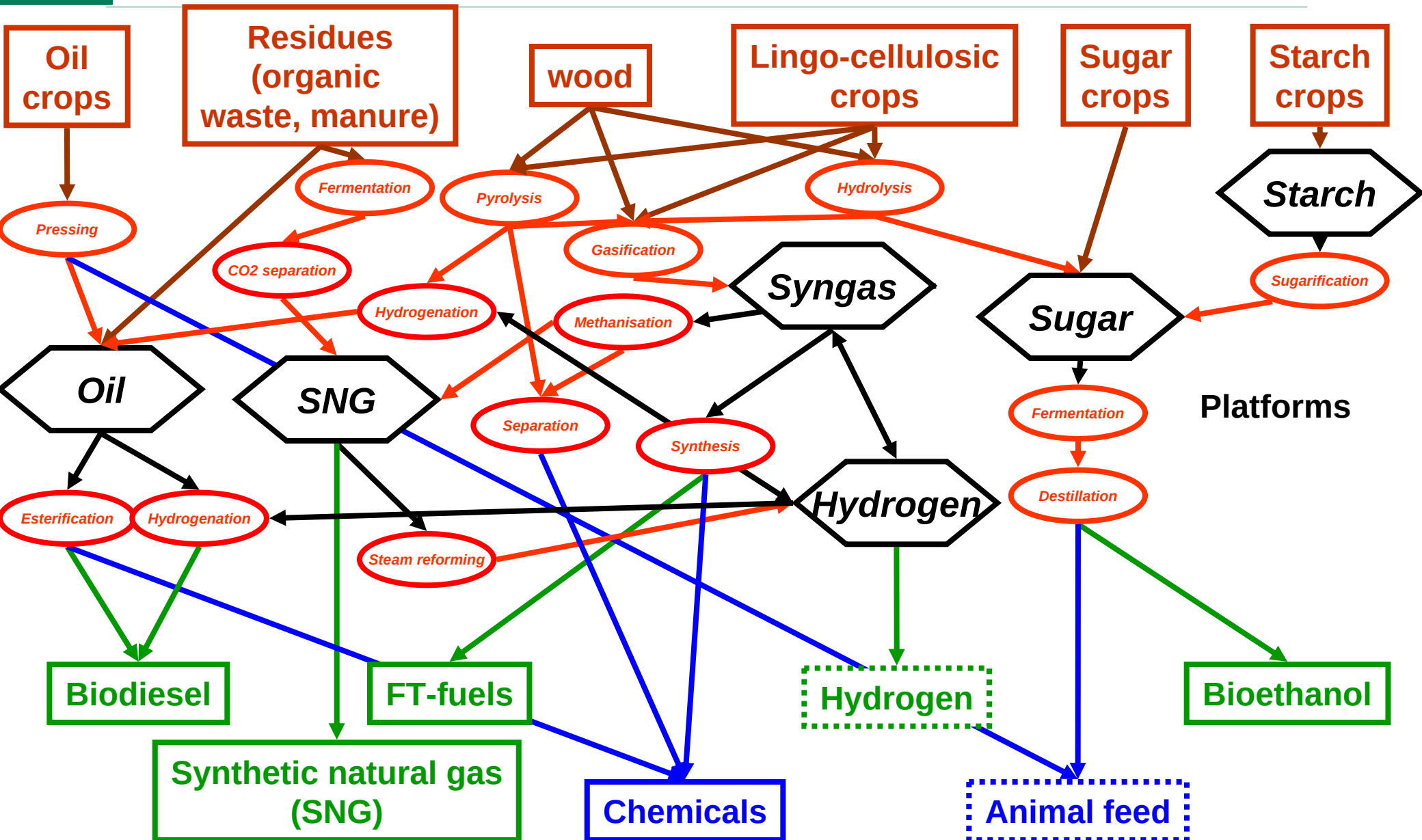
Vision 2030: 25% Biofuels

Source: Biofuels in the European Union – A vision for 2030 and beyond, Final report of the Biofuels Research Advisory Council, June 2006

Biorefinery With Transportation Biofuel Orientation



“Multi-Platform” Biorefinery with Transportation Biofuel Orientation

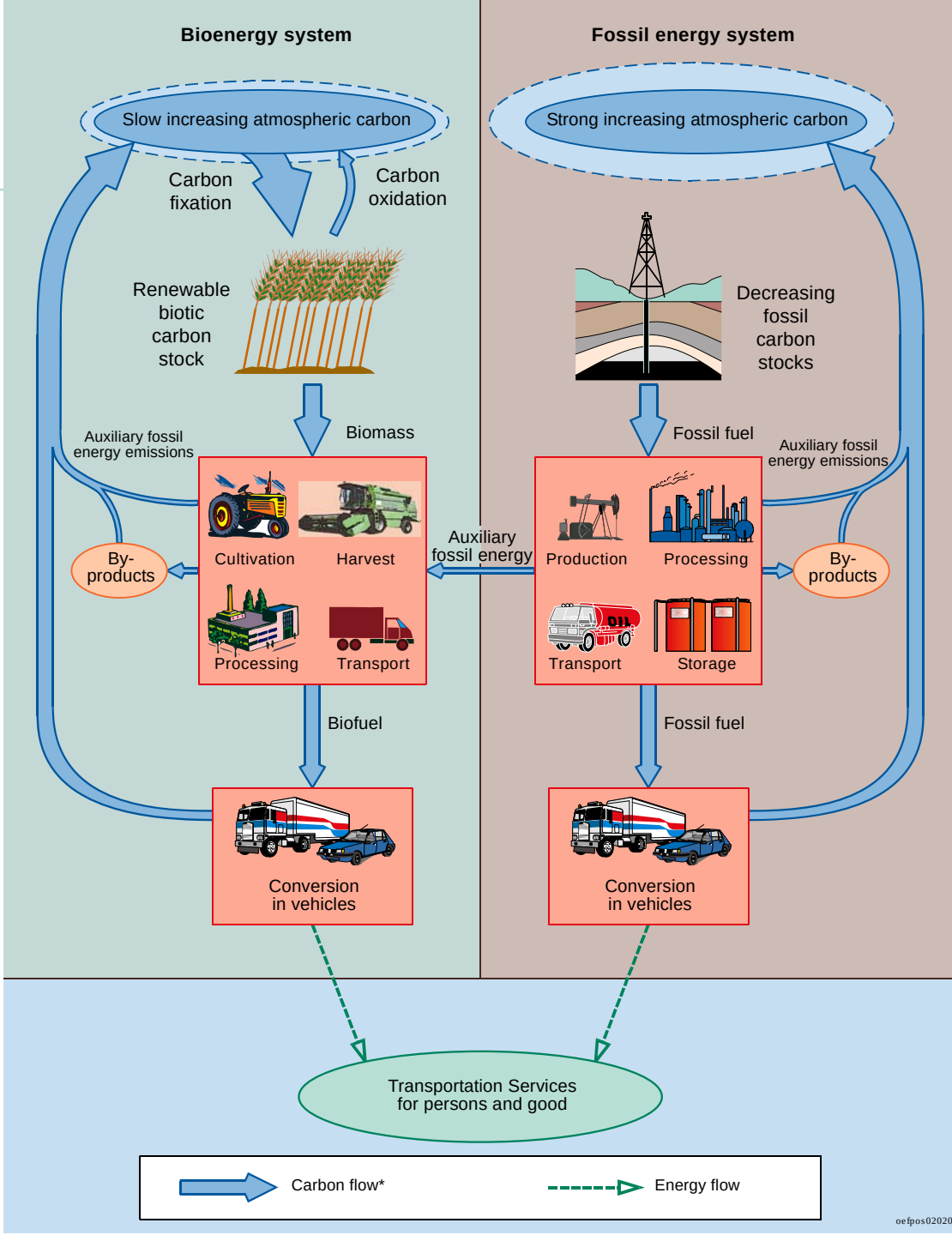


LCA Methodology

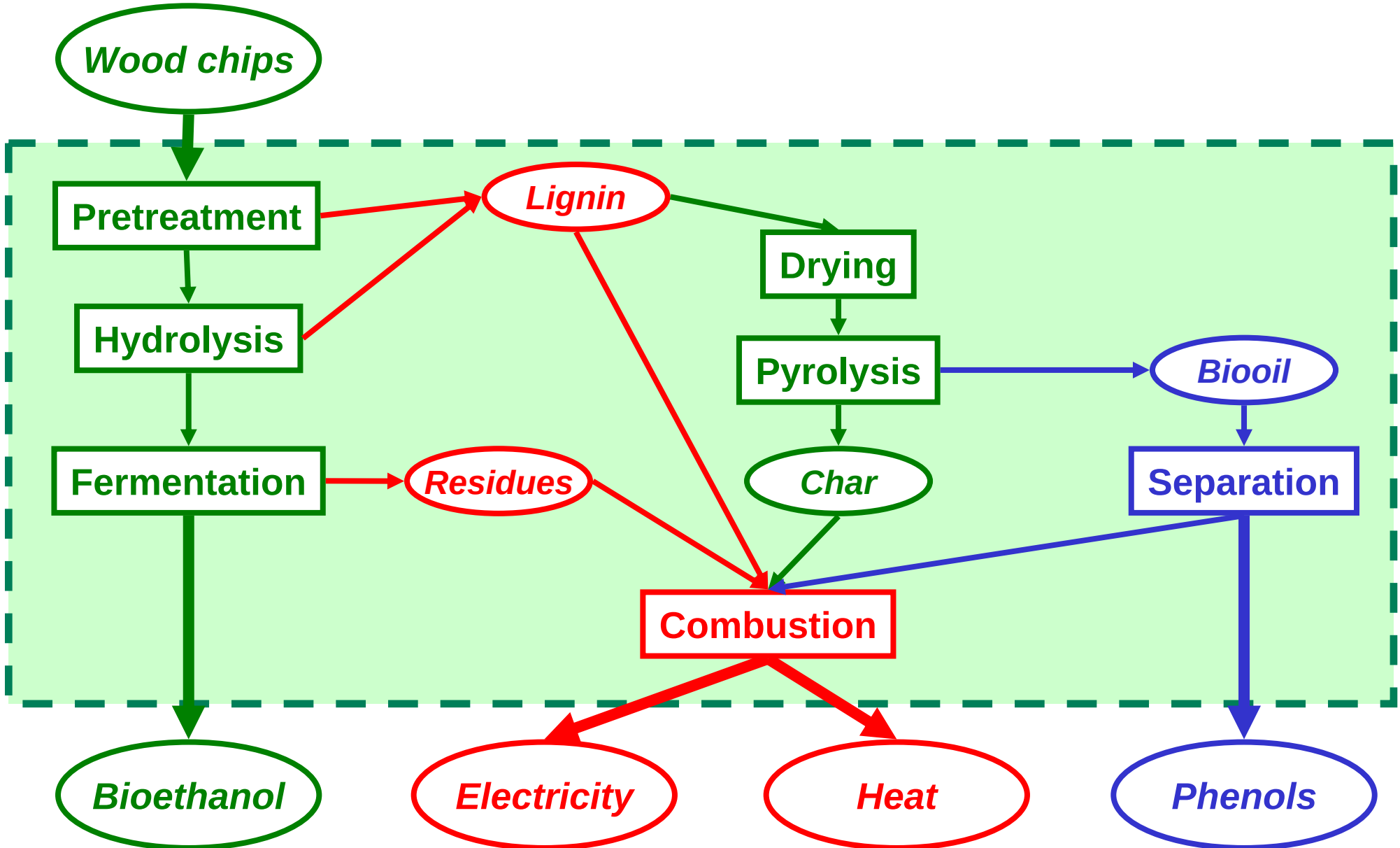
According to

- ✓ ISO 14 040 „Life Cycle assessment“
- ✓ Standard Methodology of IEA Bioenergy Task 38 „*Greenhouse Gas Balances of Bioenergy systems*“
- ✓ Recommendations of COST Action E9 „*Life Cycle Assessment of Forestry and Forest Products*“
- ✓ *JRC/CONCAWE/EUCAR: Well-to-Wheels analysis of future automotive fuels and powertrains in the European context*

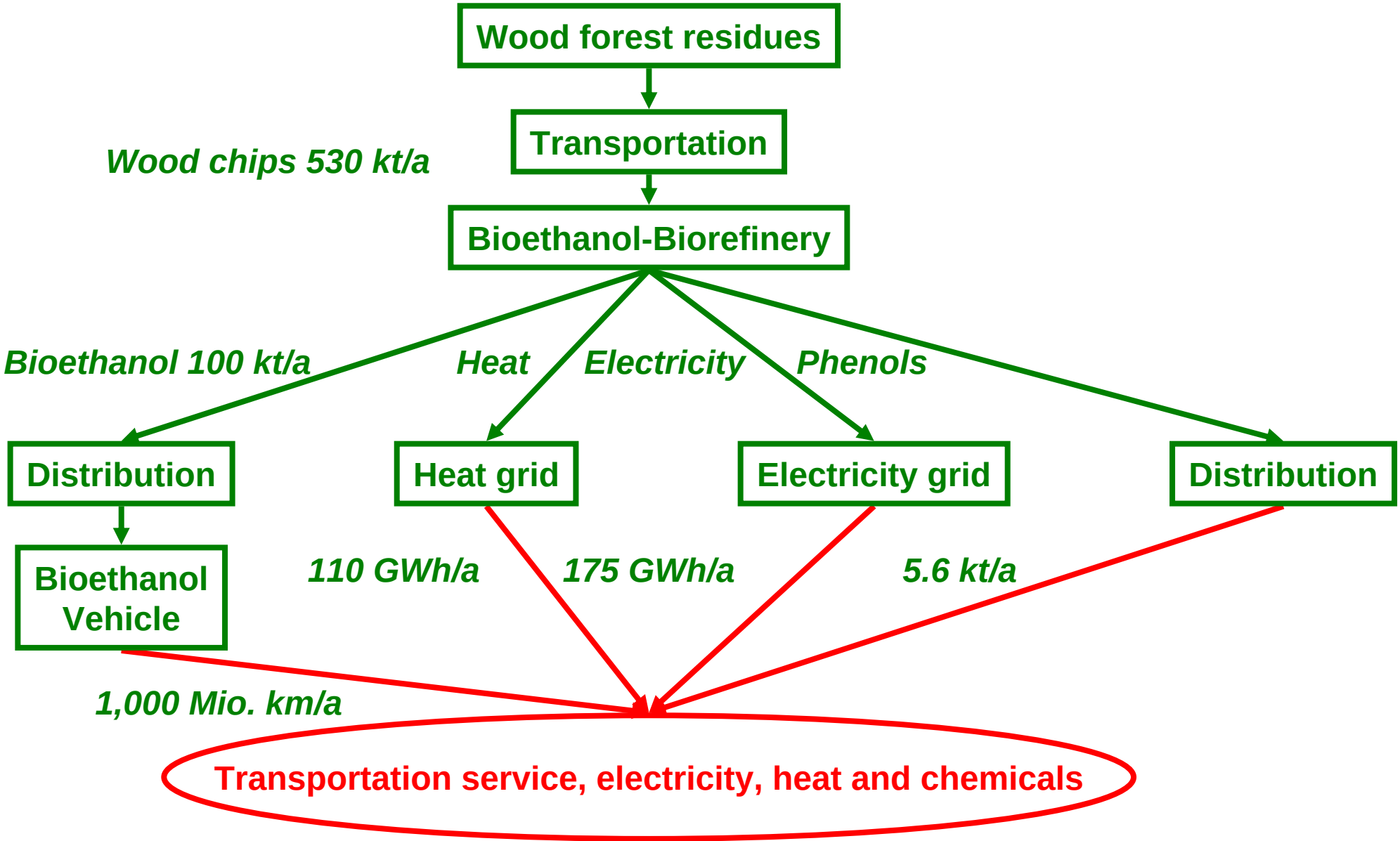
Common methodology available



Process System: Wood Bioethanol Biorefinery



LCA of Wood Bioethanol Biorefinery

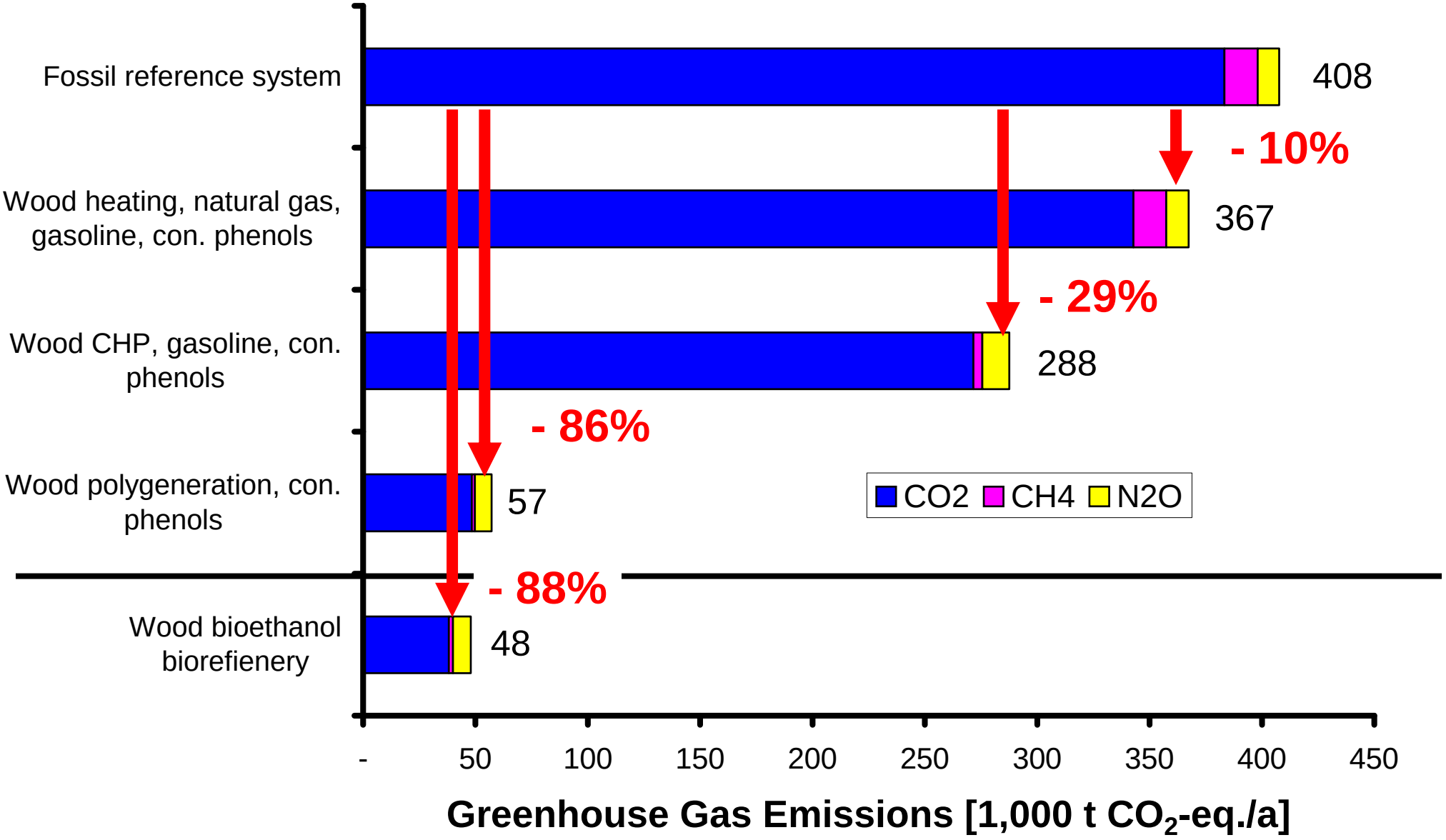


System Description for Example Environmental Evaluation

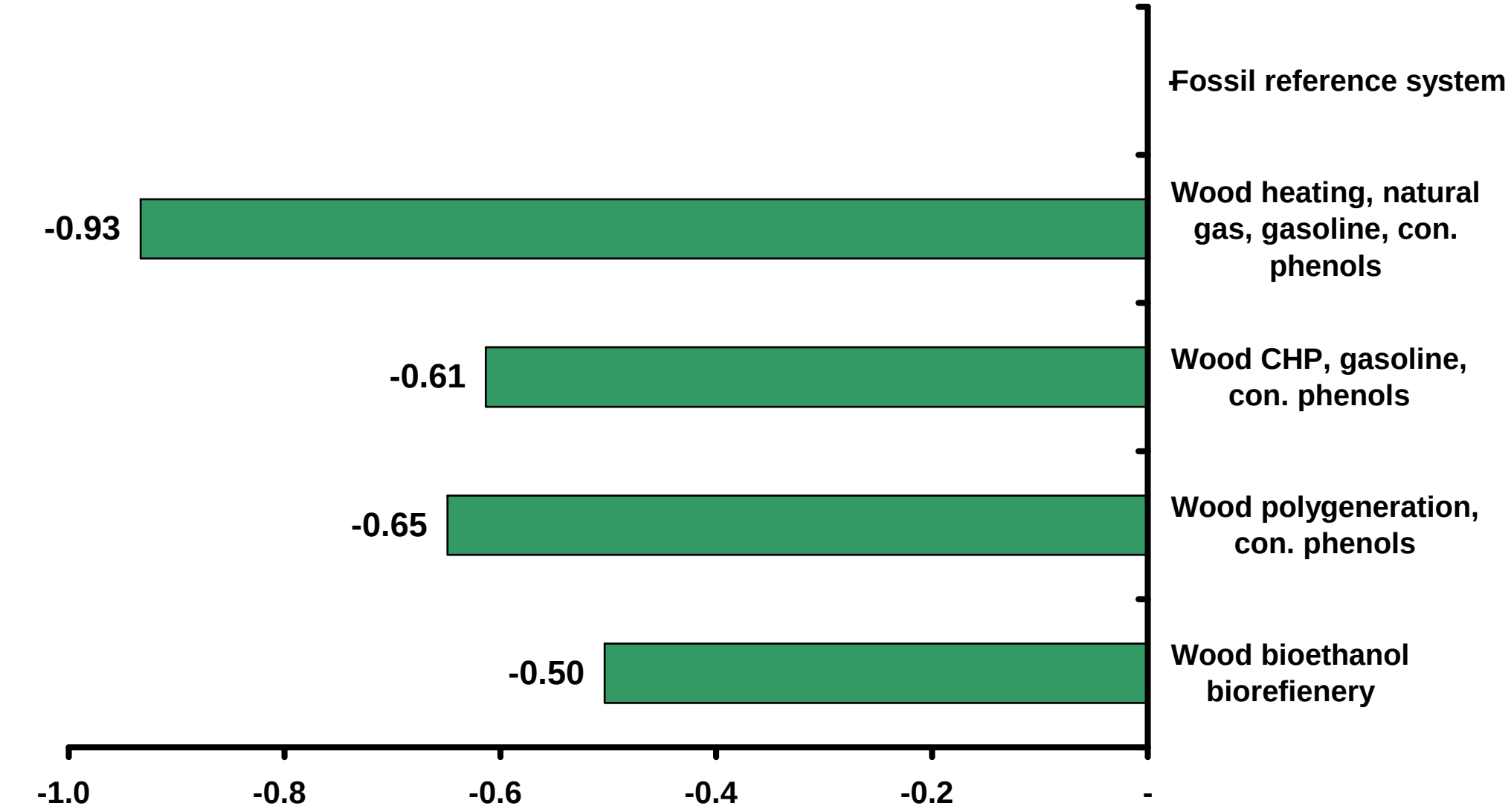
Systems	Supplied energy services			
	Heat	Electricity	Transportation service *)	Phenols
	110 GWh/a	175 GWh/a	1,000 Mio. km/a	5,600 t/a
Wood bioethanol biorefienery	wood			
Wood polygeneration, con. phenols	wood			oil
Wood CHP **), gasoline, con. phenols	wood		gasoline	oil
Wood heating, natural gas, gasoline, con. phenols	wood	natural gas	gasoline	oil
Fossil reference system	oil	natural gas	gasoline	oil

*) Bioethanol: 100.000 t/a
**) Combined heat and power

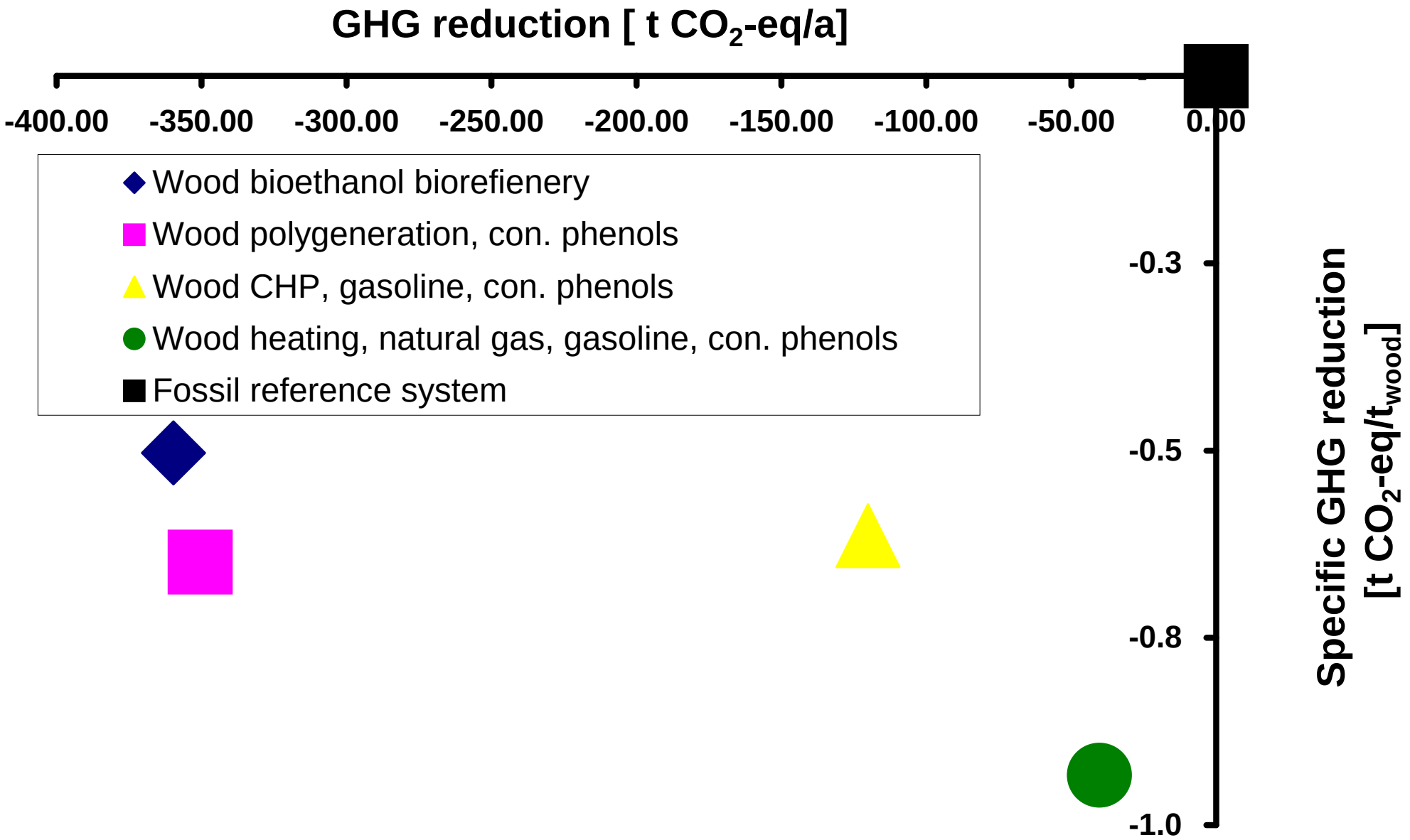
Greenhouse Gas Emissions



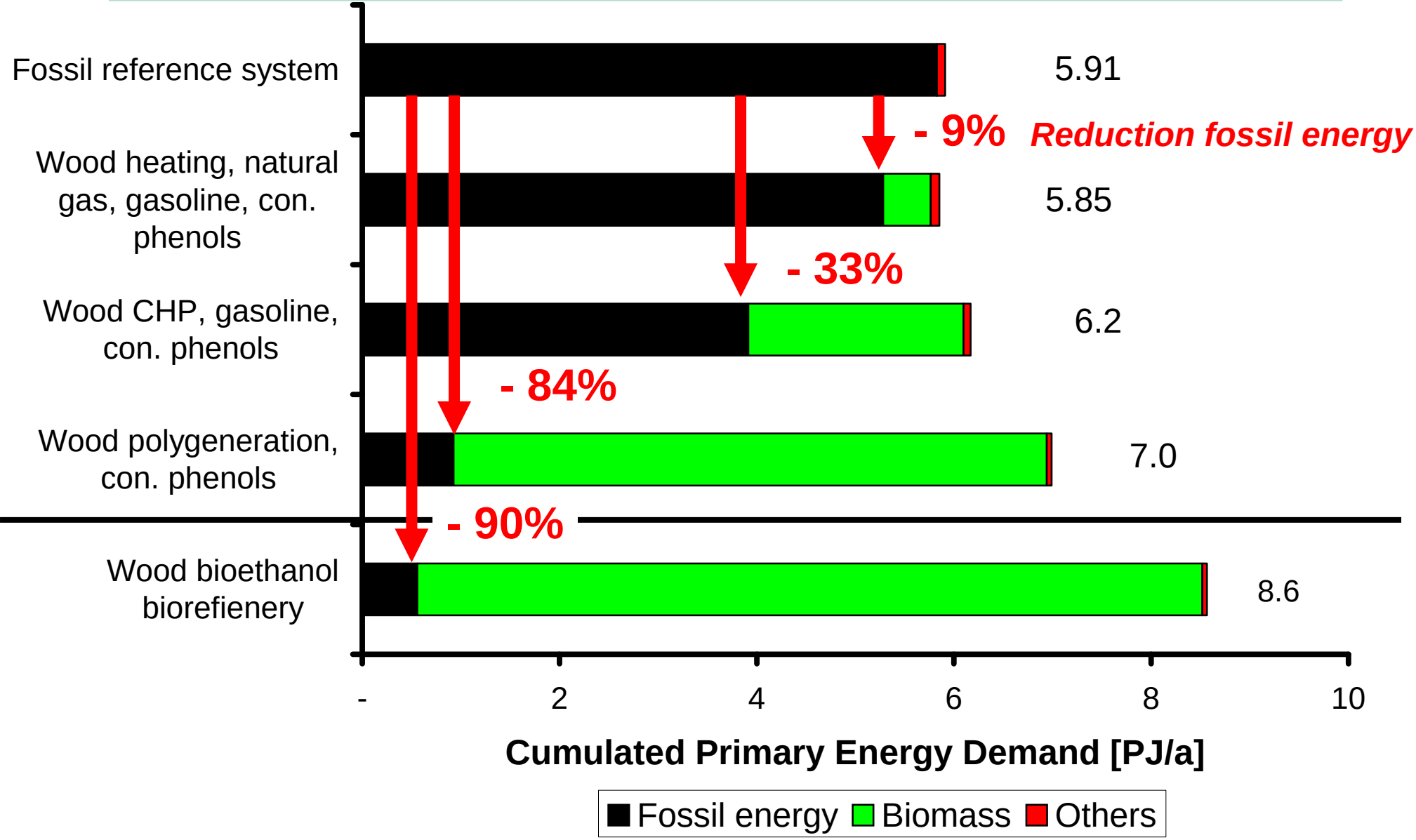
Indicator for Environmental Evaluation: Specific GHG Reduction



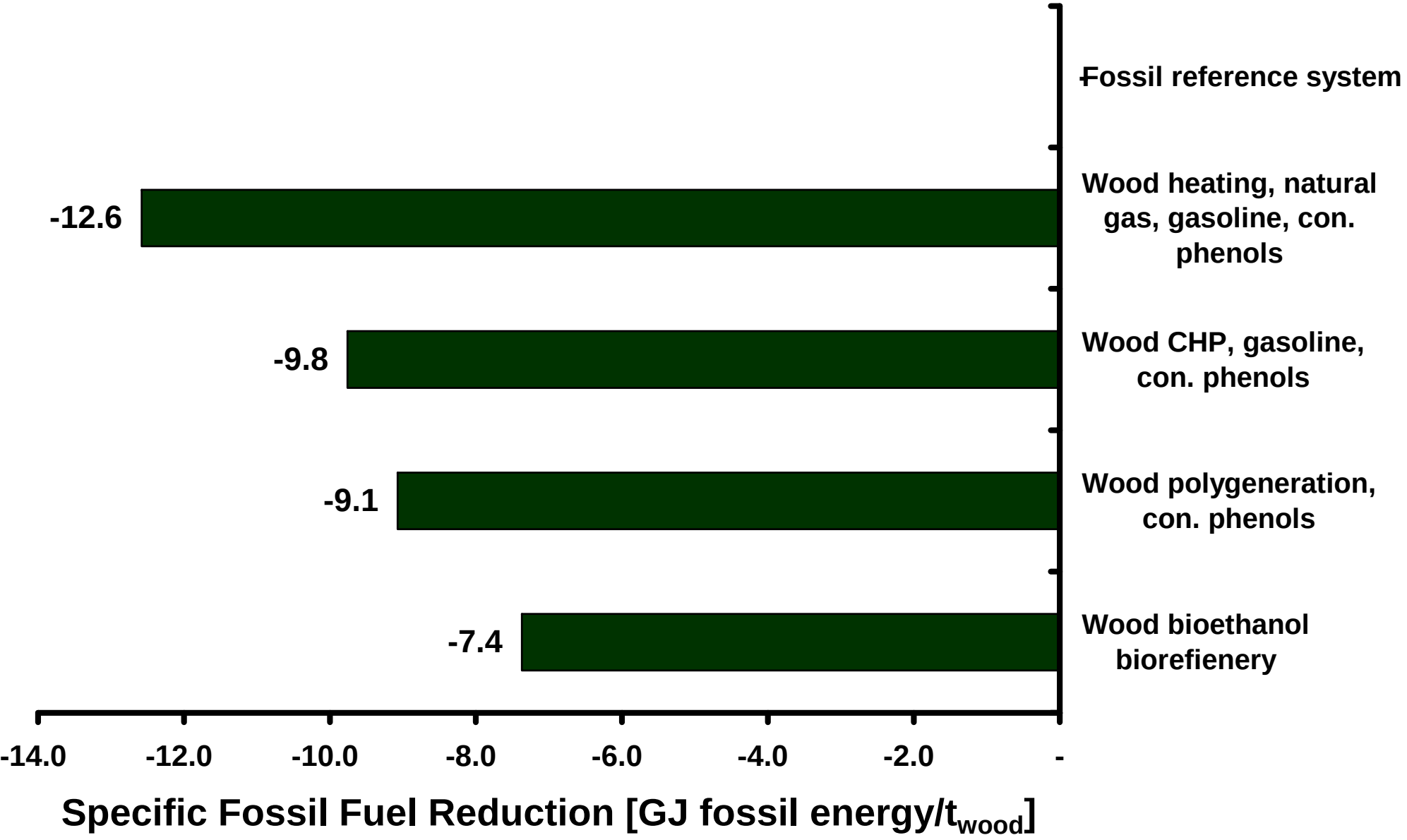
Indicator for Environmental Evaluation: Trade Off (I)



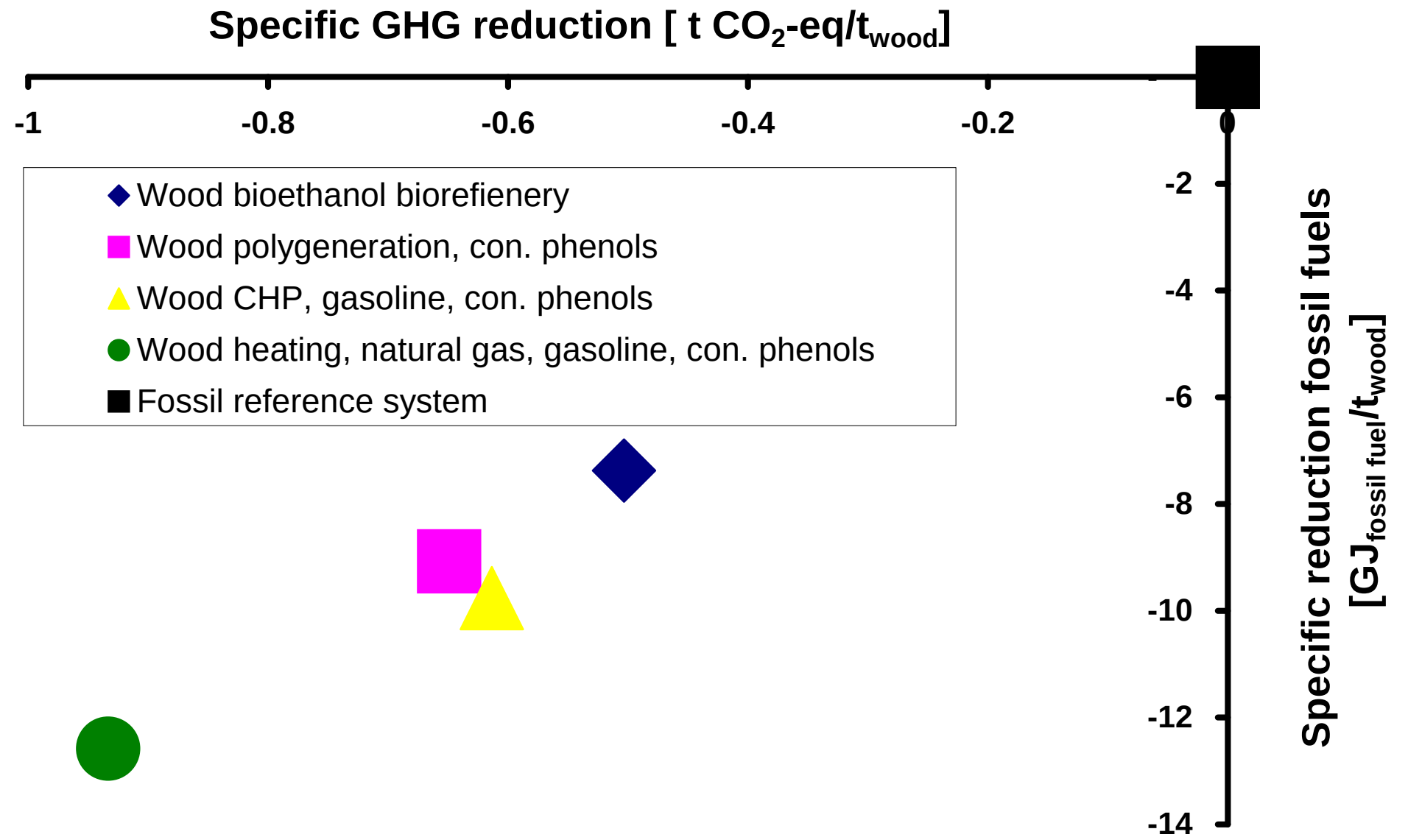
Cumulated Primary Energy Demand



Indicator for Environmental Evaluation: Specific Fossil Fuel Reduction



Indicator for Environmental Evaluation: Trade Off (II)



Conclusions

Indicators developed for environmental evaluation CO_2-eq and fossil fuel saving (specific/absolut terms)

Evaluation of biorefinery systems is possible

“Multi-platform biorefinery system” might be biorefinery complex of the future

Many different biorefinery systems – focus on transportation biofuels orientated systems