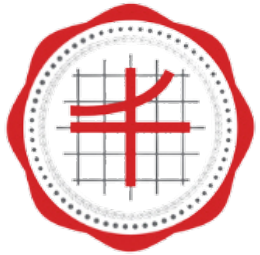

คณะวัฒนธรรมสิ่งแวดล้อม
และการท่องเที่ยวเชิงนิเวศ
มหาวิทยาลัยศรีนครินทรวิโรฒ

LCA study for FT-Methanol

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Introduction

The aim of Life cycle assessment (LCA)

1. to determine the environmental performance of biomass conversion to synthetic gas along with further Fischer-Troph reaction to super-clean fuels.

2. the scope of these study, boundary, input and output under the estimate consumption to interpret the guidelines for the LCA study

3. the collection systems and to perform a sensitivity analysis of different biomass with four different super-clean fuels regarding the energy source.

4. the LCA is considered from cradle to grave. (B2C)

Methodology

SimaPro™ 9.0 educational license used the Ecoinvent v3.0 database was used to obtain the environmental impacts associated with the input materials

The quantitative indicators used were the Eco-Indicator 99 and the IPCC2003 GWP.

The Eco-indicator 99 defines the “environment damage” in three categories: Human health, Ecosystem quality, and Resources. The standard Eco-indicator values can be regarded as dimensionless figures.

the Eco-indicator 99 is used, a damage oriented method since the main objective of the study is the influence of the energy source. Of all the emissions, extractions and land use in all processes, the damage they cause to human health, ecosystem quality and resources is calculated

To determined GWP; it was used the IPCC 2013 Indicators, the Global proposed by the Intergovernmental Panel on Climate Change (IPCC), which quantify the climate change impacts of greenhouse gas emissions due to human activities by aggregating them into a common unit, e.g. CO2-equivalent

Methodology & Materials

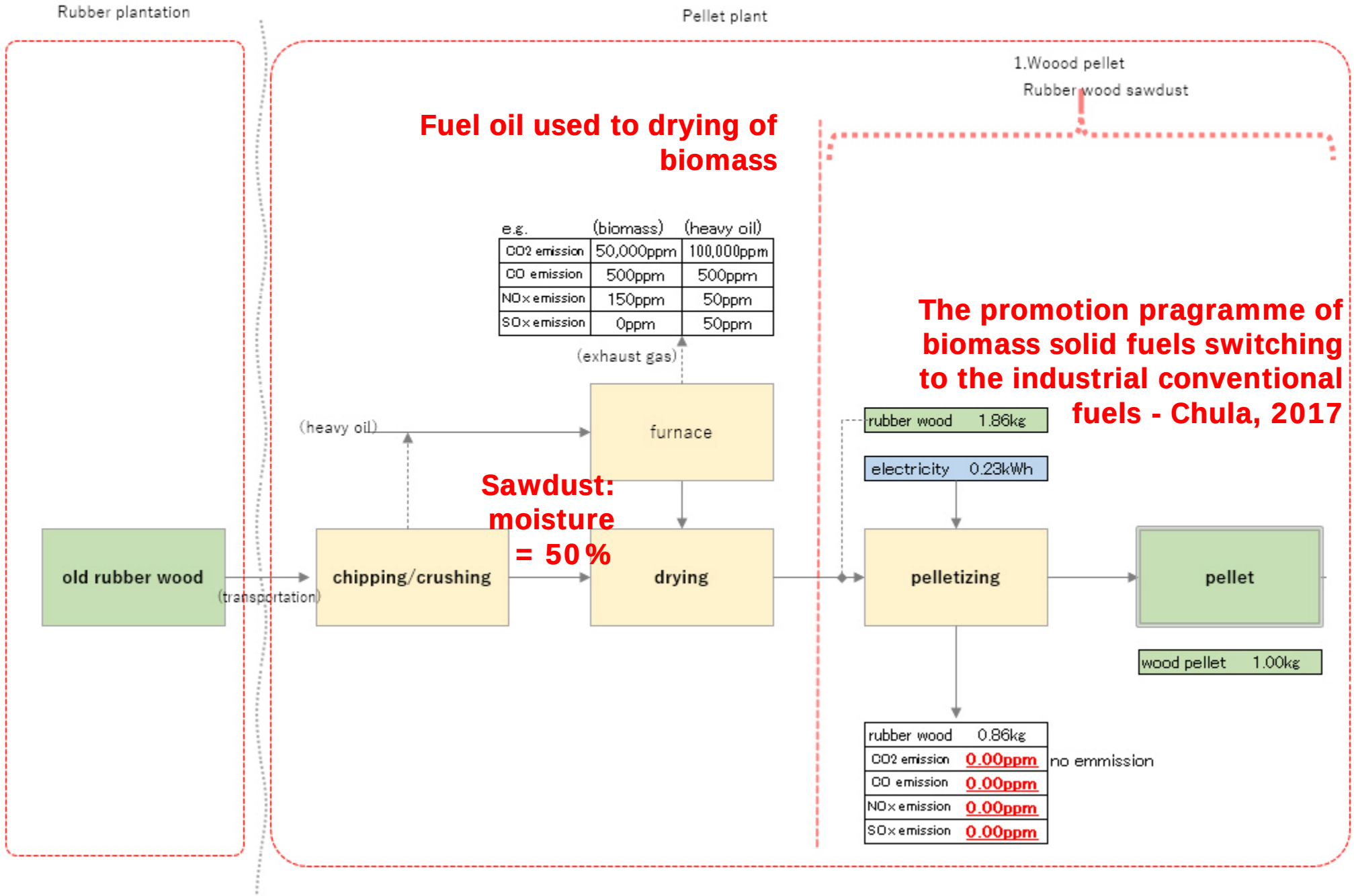
The SimaProTM which has been the world's leading life cycle assessment (LCA) software, was developed to help effectively apply LCA expertise to drive change – to provide the facts needed to create sustainable value.

SimaPro are meant to signal to consumers that a product fulfills certain criteria on its environmental impacts, leading to a reduced environmental footprint.

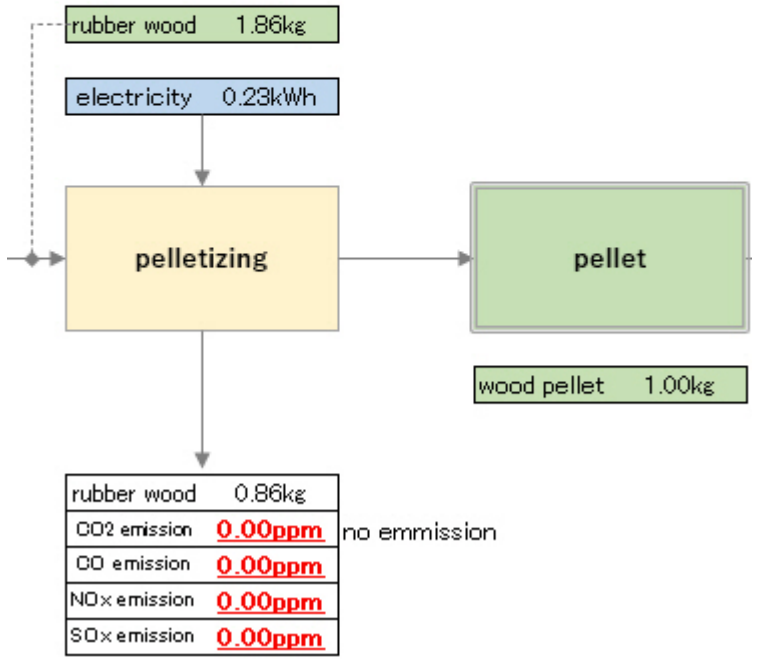
The main objective is to determine a set of minimum criteria that a product must meet in order to be considered as an example of a product with a good sustainability profile.

The main assumptions of the gasification of wood pellet study considered were:

1. Transporting of 2 tonne rubber wood pellet from NRE in Prachinburi to Chulalongkorn University Saraburi were carried out with diesel engine vehicles (euro4) for a distance of 200 kilometers.
2. Bill collection of softening water into gasifier is negligible is not studied.
3. Recycling of CaO in tar removal stage is negligible is not studied because of a lack of data
4. The construction and maintenance of whole pilot plant are neglected due to the lack of information to include it, and the fact that the construction and maintenance of gasifier system are not considered underestimates the environmental impact for Fischer-Tropsch system.


Rubber plantation
Pellet plant
1.Woood pellet
Rubber wood sawdust
Fuel oil used to drying of biomass
e.g. (biomass) (heavy oil)
CO2 emission 50,000ppm 100,000ppm
CO emission 500ppm 500ppm
NOx emission 150ppm 50ppm
SOx emission 0ppm 50ppm
(exhaust gas)
(heavy oil)
furnace
The promotion pragramme of biomass solid fuels switching to the industrial conventional fuels - Chula, 2017
rubber wood 1.86kg
electricity 0.23kWh
Sawdust: moisture = 50 %
old rubber wood
(transportation)
chipping/crushing
drying
pelletizing
pellet
wood pellet 1.00kg
rubber wood 0.86kg
CO2 emission 0.00ppm
CO emission 0.00ppm
NOx emission 0.00ppm
SOx emission 0.00ppm
no emmission

pellet production from rubber wood



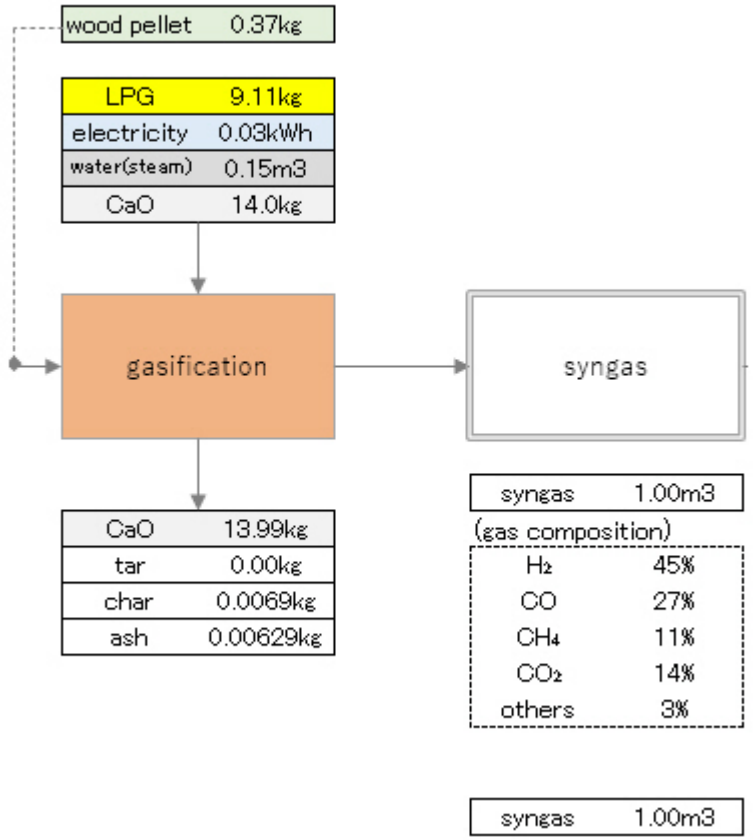
Goal : wood pellet 1 kg

Input : wood sawdust (dry) 1.86 kg
electricity 0.23 kWh

Output: wood pellet 1 kg
pellet residuals and dust 0.86 kg

Emission: CO2/CO/Nox/Sox **neglected**

Syngas production from rubber wood pellet



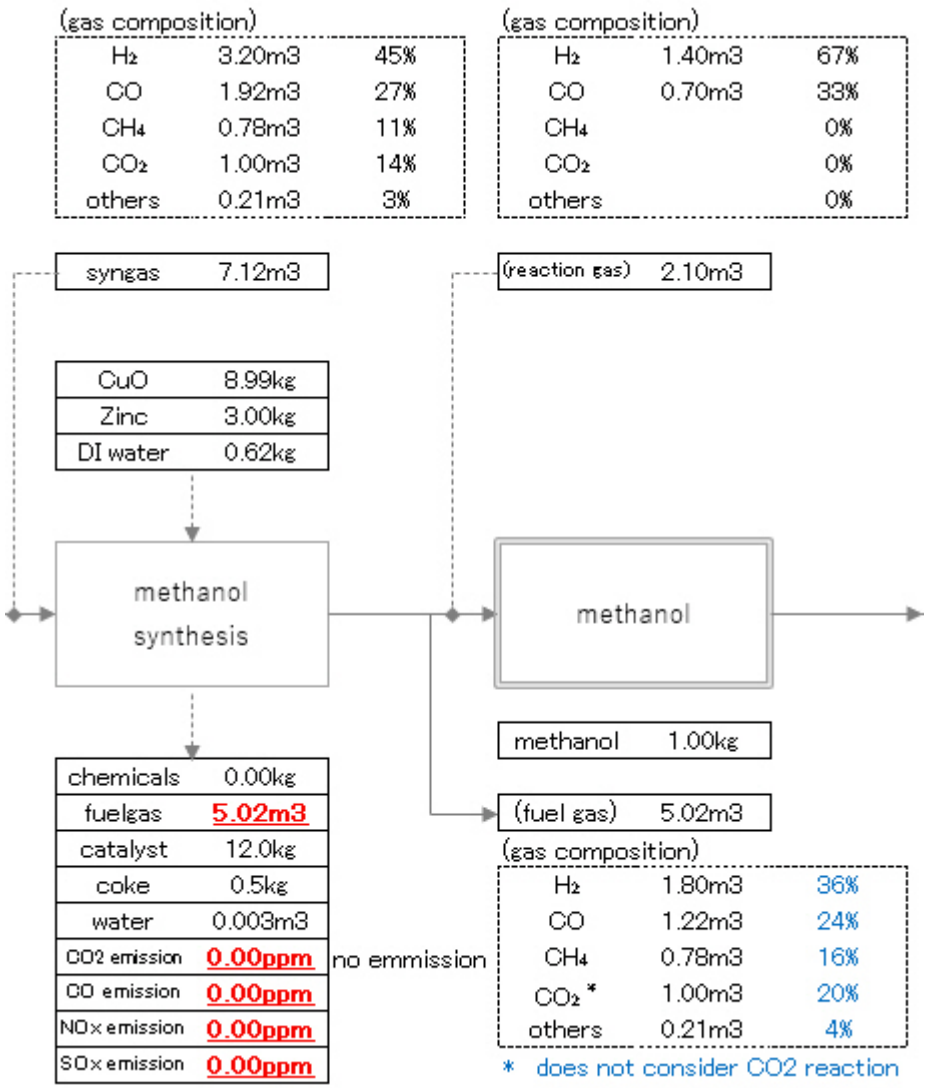
Goal : syngas of 1.00 m^3

Input : wood pellet 0.37 kg
CaO (in tar removal unit) 14.0 kg.
Output: syngas of H_2/CO = 1.67

Waste : ash 0.00629 kg
char 0.0069 kg

CaO regenerated into next reaction 13.99 kg.

Methanol synthesis in FT-reactor



Goal : methanol of 1.00 kg

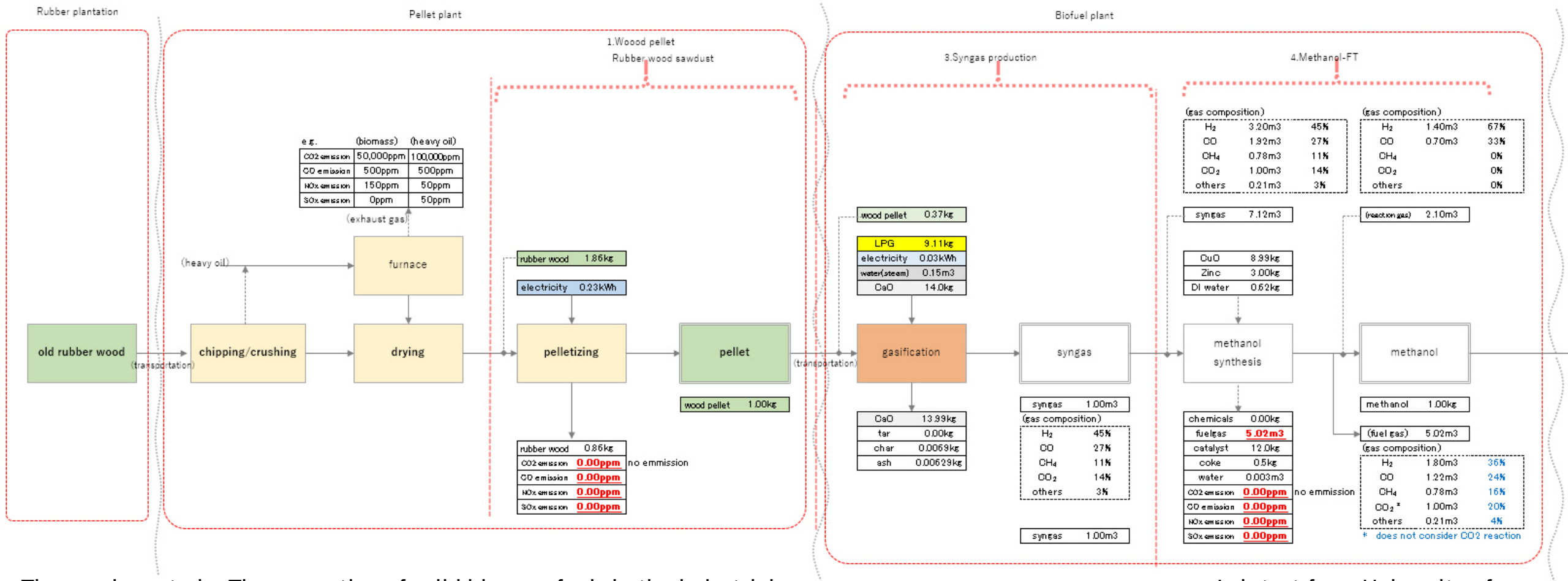
Input : syngas (H2/CO 1.67) 7.12 m^3
Catalyst CuO 8.99 kg and Zn 3.00 kg

Output: methanol 1.00 kg
fuel gas 5.02 m^3

Emission gas : CO2/CO/NOx/SOx neglected

Waste: catalyst of 12 kg.
coke 0.5 kg

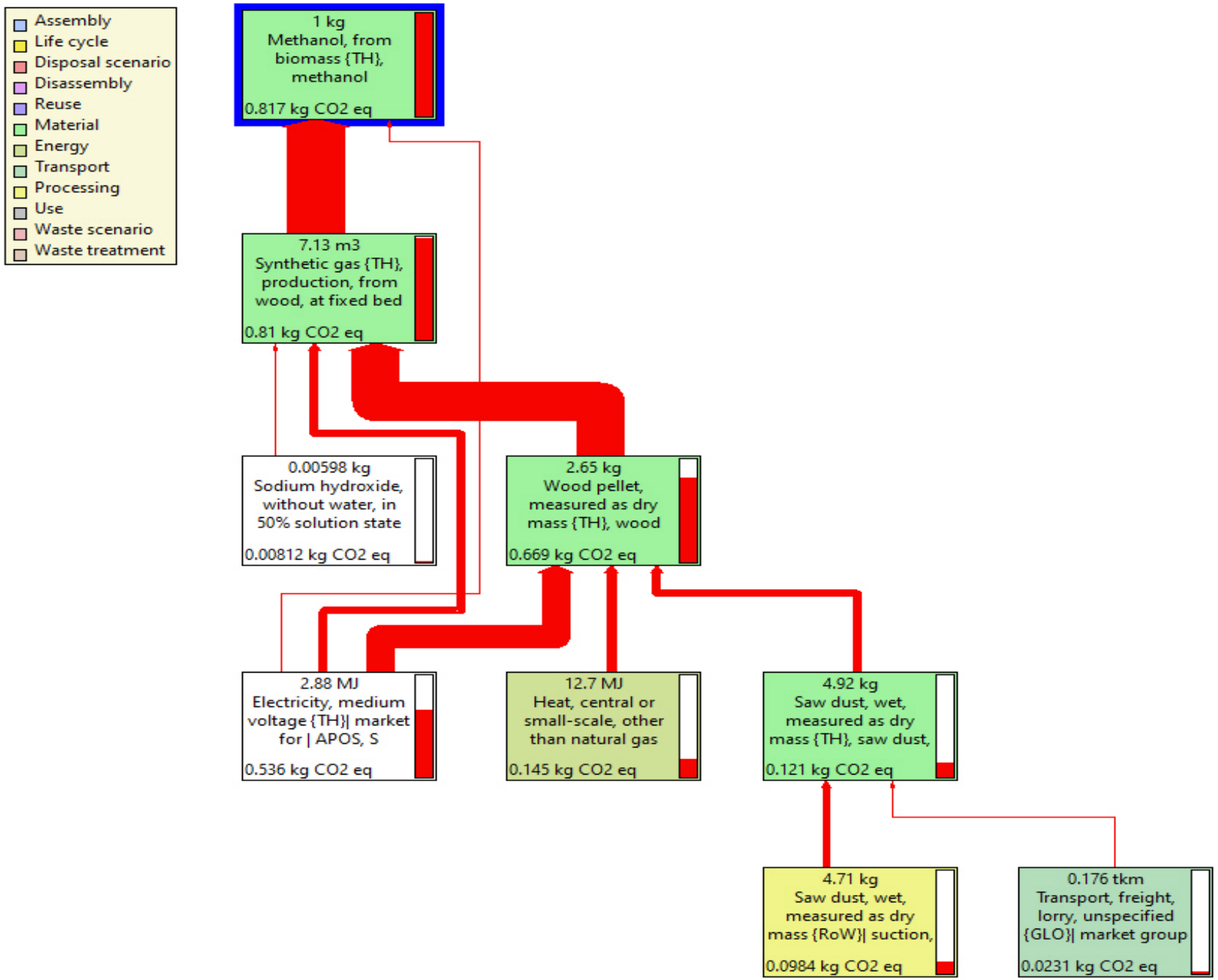
Assembly process of FT-methanol



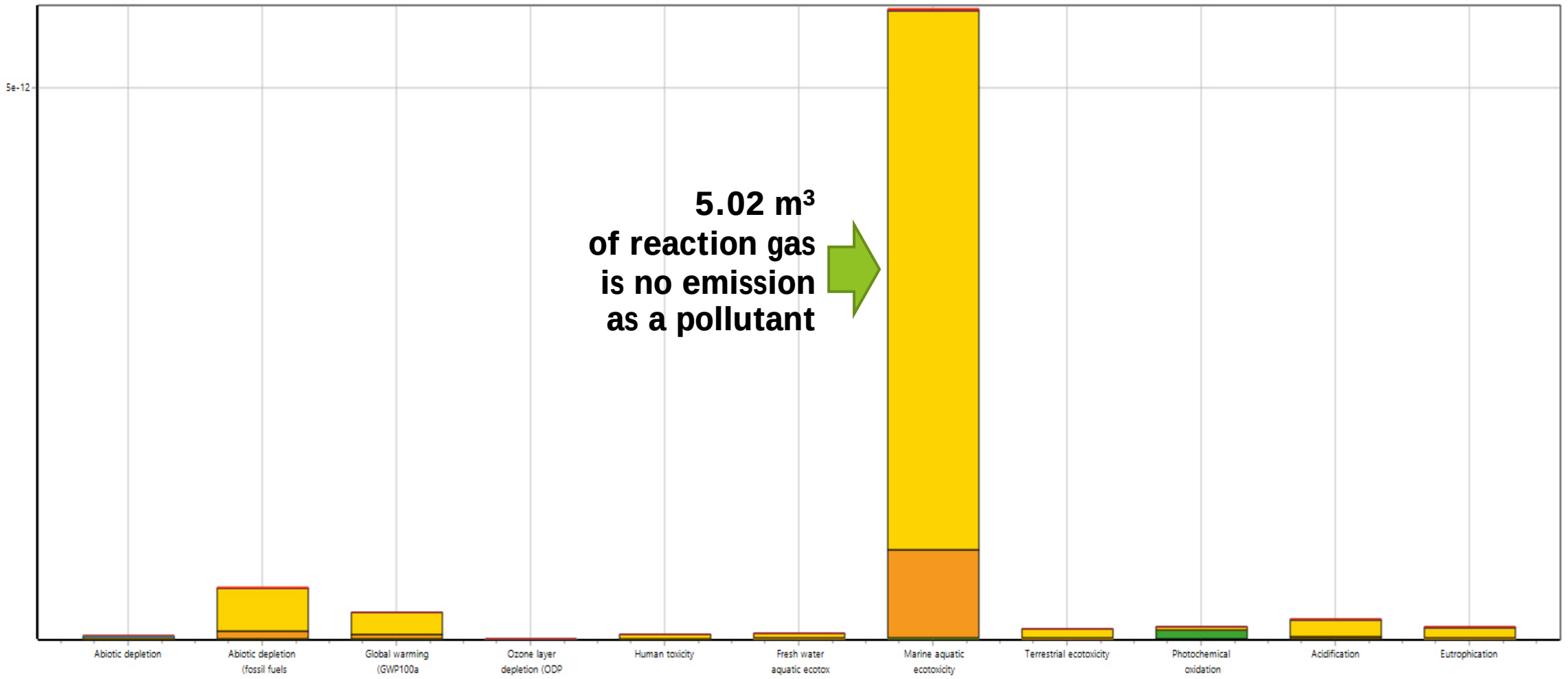
The previous study: The promotion of solid biomass fuels in the industrials programme Ministry of Industry and CU (2017)

Lab test from University of Toyama

LCA of FT-methanol

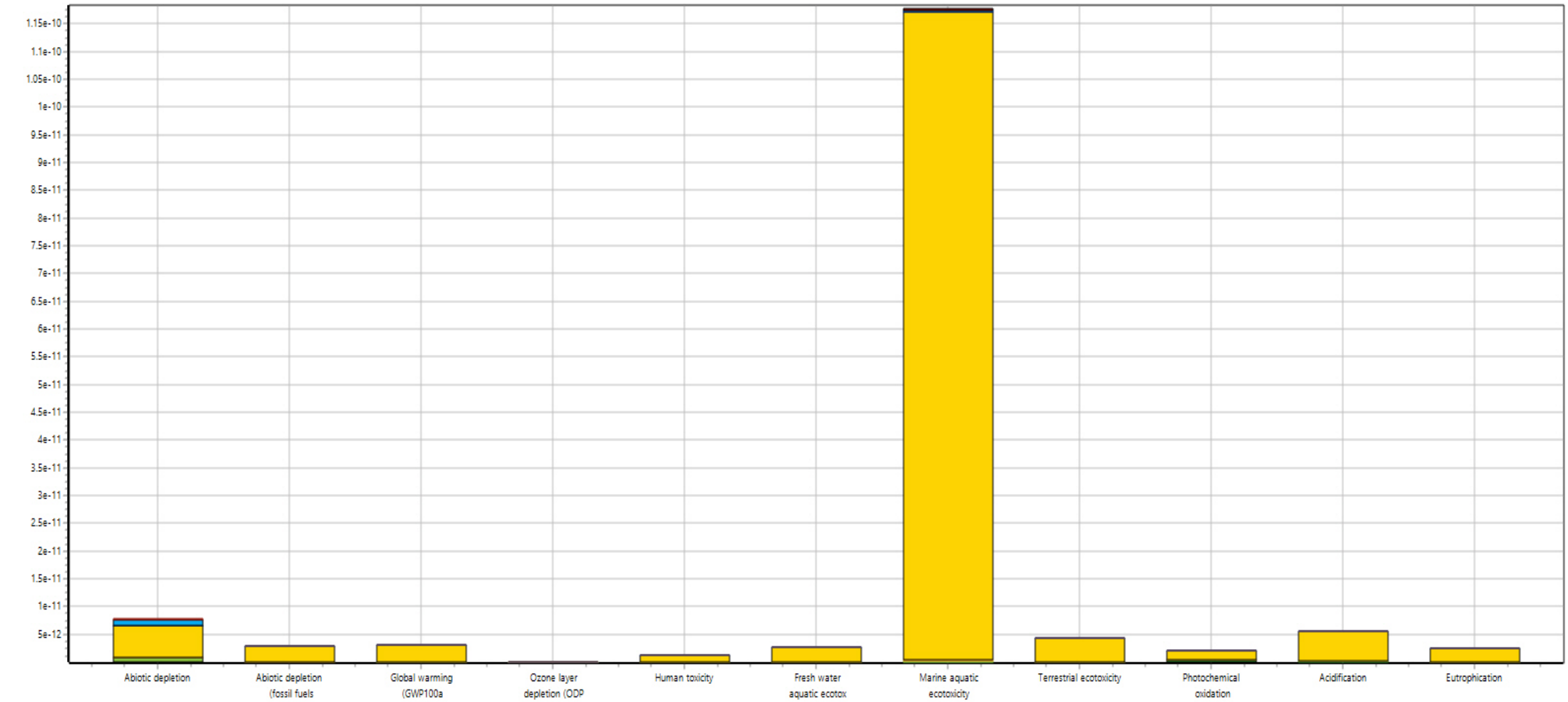


GWP of FT-methanol from wood pellet



Method: CML-IA baseline V3.05 / EU25 / Normalization / Excluding long-term emissions
Analyzing 1 kg 'Methanol, from biomass {TH}| methanol production, from synthetic gas | APOS, U';

GWP of FT-methanol from wood chip



Method: CML-IA baseline V3.05 / the Netherlands, 1997 / Normalization / Excluding long-term emissions
Analyzing 1 kg 'Methanol, from biomass {TH}, methanol production, from synthetic gas';