RAIL FREIGHT INTERMODALITY IN BELGIUM: ENERGY RELATED EMISSIONS

Angel L. Merchan, Sandra Belboom and Angélique Léonard

Department of Chemical Engineering – PEPs, Products, Environment, Processes - University of Liège, Allée du six août 11 Bat B6a (Sart-Tilman) 4000 Liège, Belgium. a.merchan@ulg.ac.be

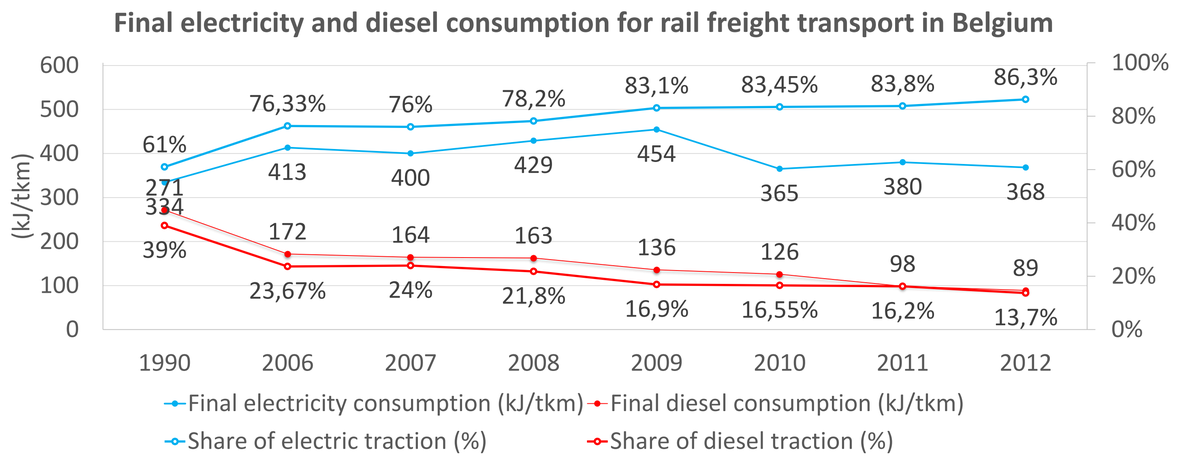
Introduction

BRAIN-TRAINS is a project that deals with the **possible development of rail freight intermodality in Belgium**.

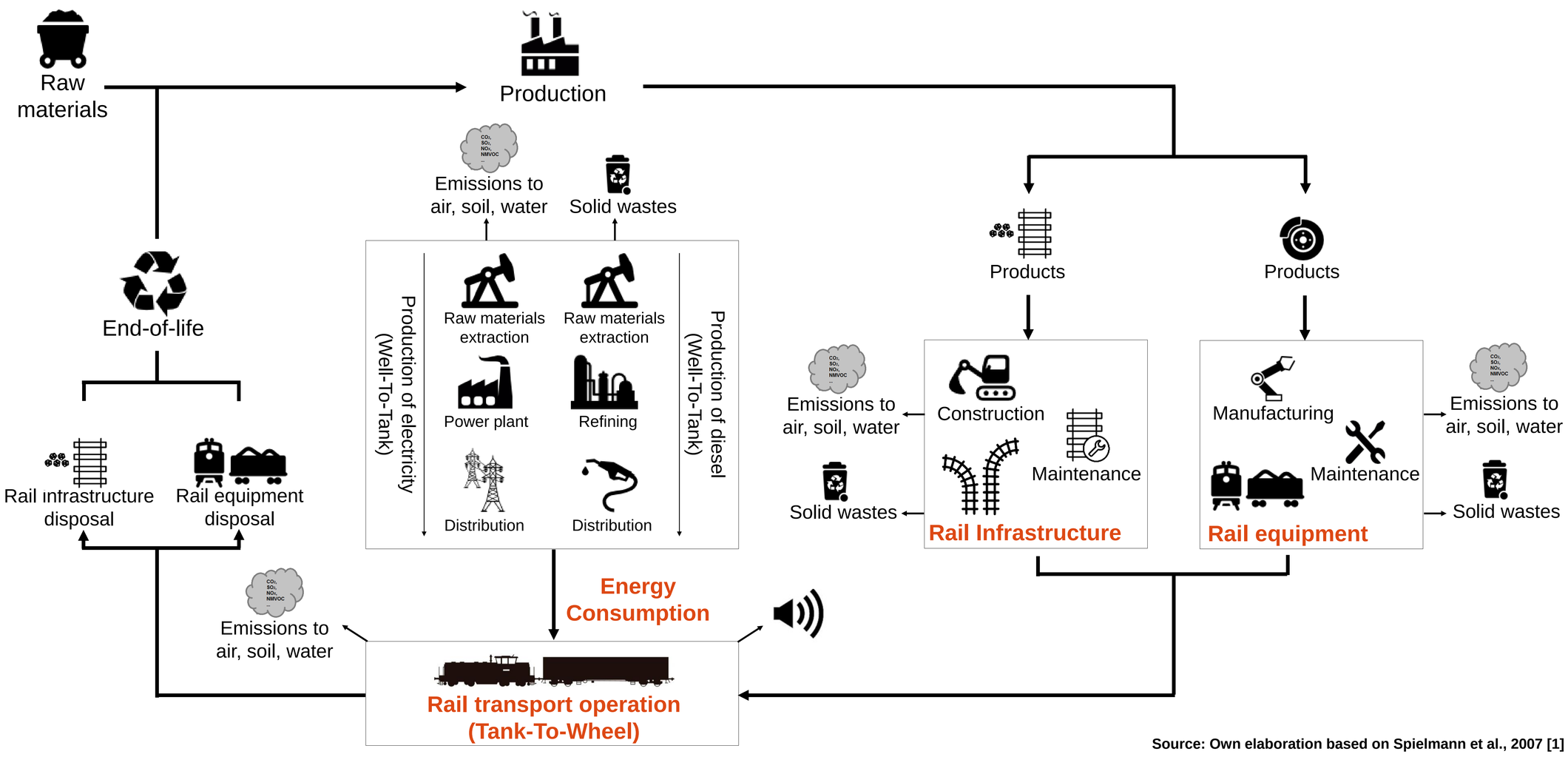
Life Cycle Assessment methodology has been used to analyse the sustainability impact of rail freight intermodality for 3 divergent Belgian scenarios by 2030. This objective is directly linked to the goal of increasing the rail market share by 2030, stated by European Commission's White Paper on transport (2011).

Rail transport operation: energy consumption

- The final energy consumptions have been calculated for electric and diesel traction separately.
- It includes the energy consumed by trains, such as the empty returns, shunting activity, maintenance of trains, as well as electrical losses.
- To move 1 tkm of freight on rail in Belgium in 2012, both consumptions were needed:
  - 368 kJ of electricity
  - 89 kJ of diesel (including 29 kJ of shunting activity)



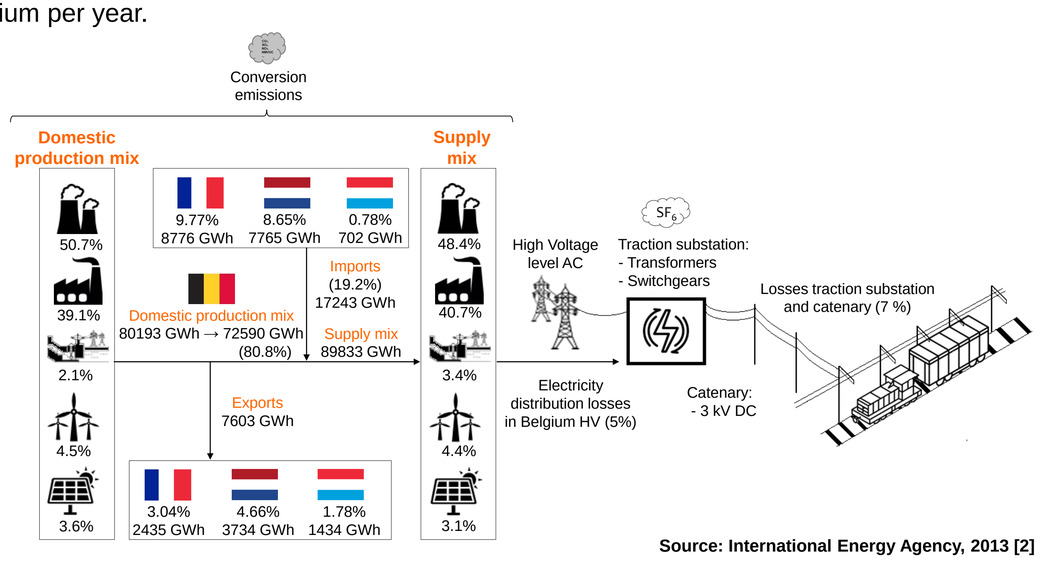
Life Cycle Assessment of the railway system



Source: Own elaboration based on Spielmann et al., 2007 [1]

Electric traction

- For electric traction, emissions have been determined using the electricity supply mix of Belgium per year.
- Determination of SF_6 emitted during conversion at traction substations.

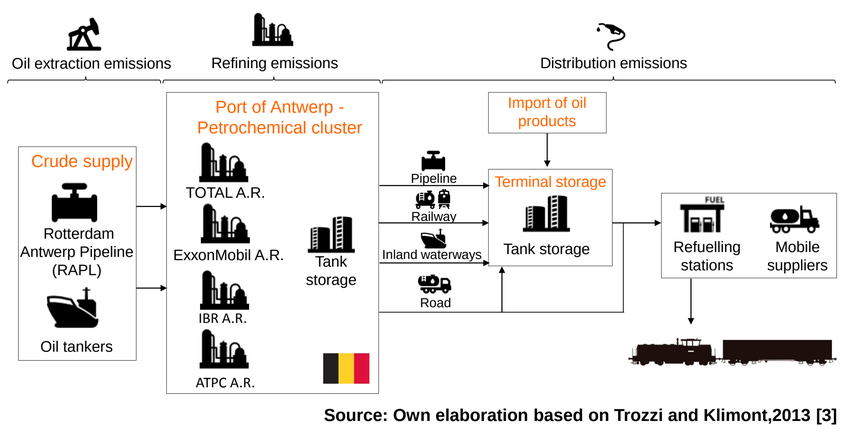


Source: International Energy Agency, 2013 [2]

Diesel traction

- For diesel traction, main emissions are produced at the vehicle operation activity. But, emissions are also produced during oil extraction and refining.
- Determination of exhaust emissions to air from diesel locomotives.
- Determination of direct emissions to soil from the abrasion of brakes, wheels and rails when braking.

Refining and distribution of diesel in Belgium for diesel rail transport



Source: Own elaboration based on Trozzi and Klimont,2013 [3]

Conclusions and perspectives

1. Analysis of the environmental impact related with the sub-systems rail infrastructure and rail equipment.

2. Improvement of the energy efficiency through the weight reduction of locomotives and wagons.

3. Reduction of emissions using cleaner electricity and replacing diesel by other sources of cleaner energy as biodiesel in diesel locomotives.

4. Obtaining of a decision support tool to the development of intermodal transport in Belgium, including environmental aspects and allowing the reduction of emissions.

5. Development of a transport database specific to Belgium to allow a better modelling of the obtained environmental impacts and to improve the specificity of the results.

Bibliographie: [1] Spielmann, M., Bauer, C., Dones, R., Tuchschmid, M. (2007) *Transport Services. Ecoinvent report No. 14*. Swiss Centre for Life Cycle Inventories, Dübendorf, 2007. [2] International Energy Agency (2015) data extracted on November 16, 2015. [3] Trozzi, C and Klimont, Z. (2013) 1.B.2.a.v. Distribution of oil products. Technical chapter of EMEP/EEA air pollutant emission inventory guidebook 2013. Technical guidance to prepare national emission inventories. EEA. Luxembourg.