How to specify the environmental footprint of electricity? A methodological approach

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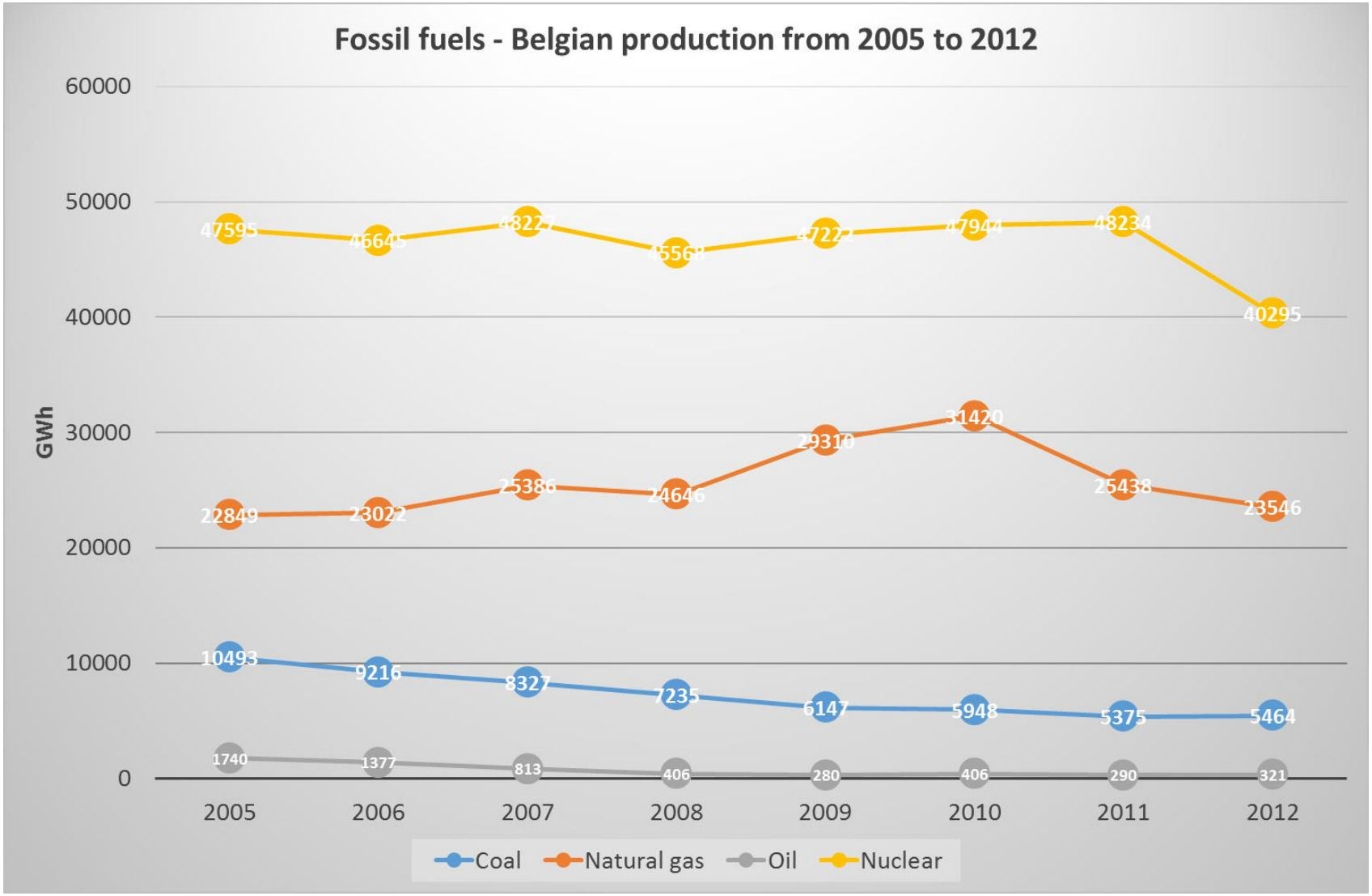
CHEMICAL ENGINEERING

Context

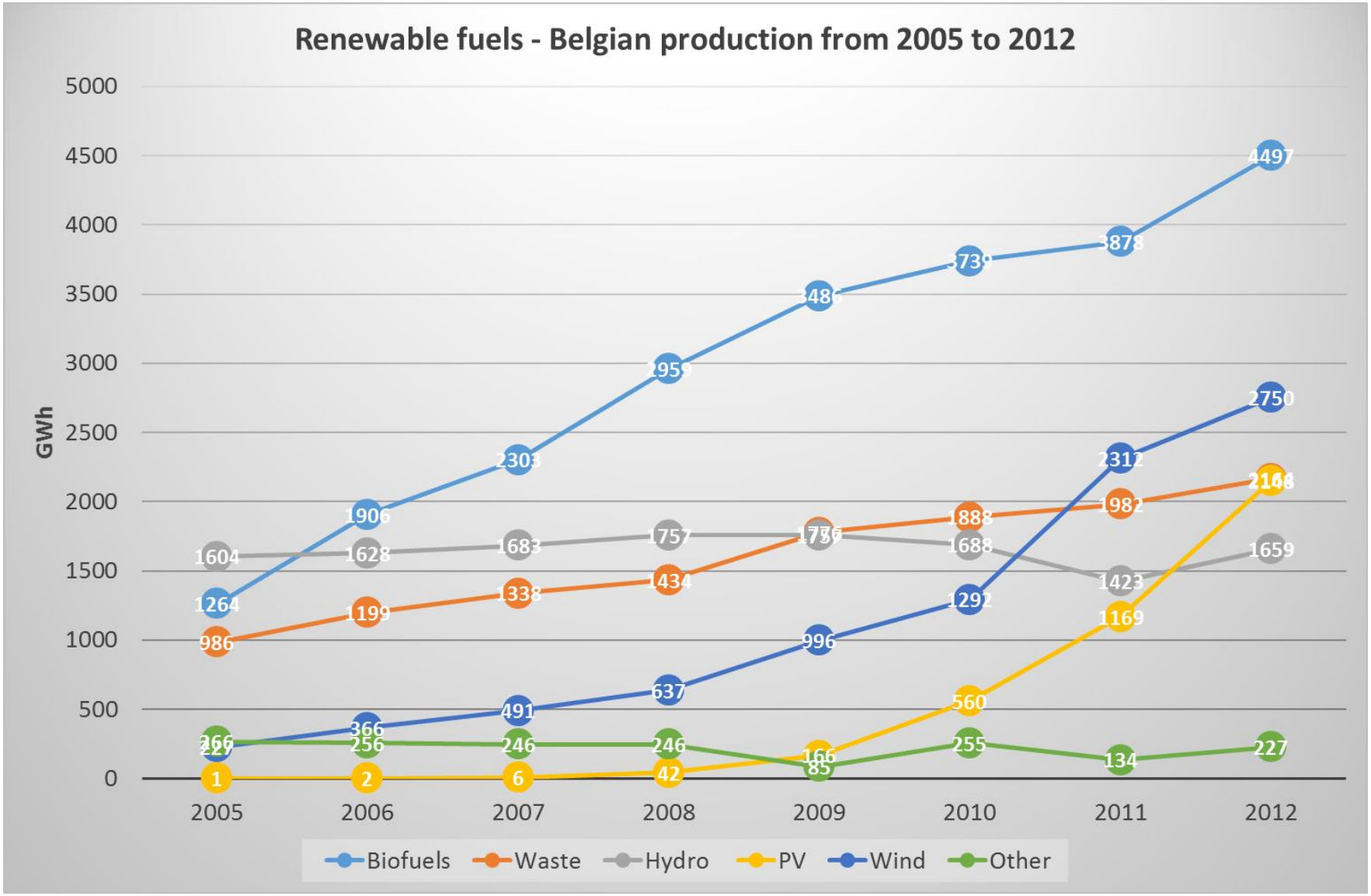
- Electricity
  - = high part of operational costs
  - = important contributor to environmental impacts

- Electricity and LCA?
  - Average yearly-based energy mix
  - Average of production technologies
  - Outdated information

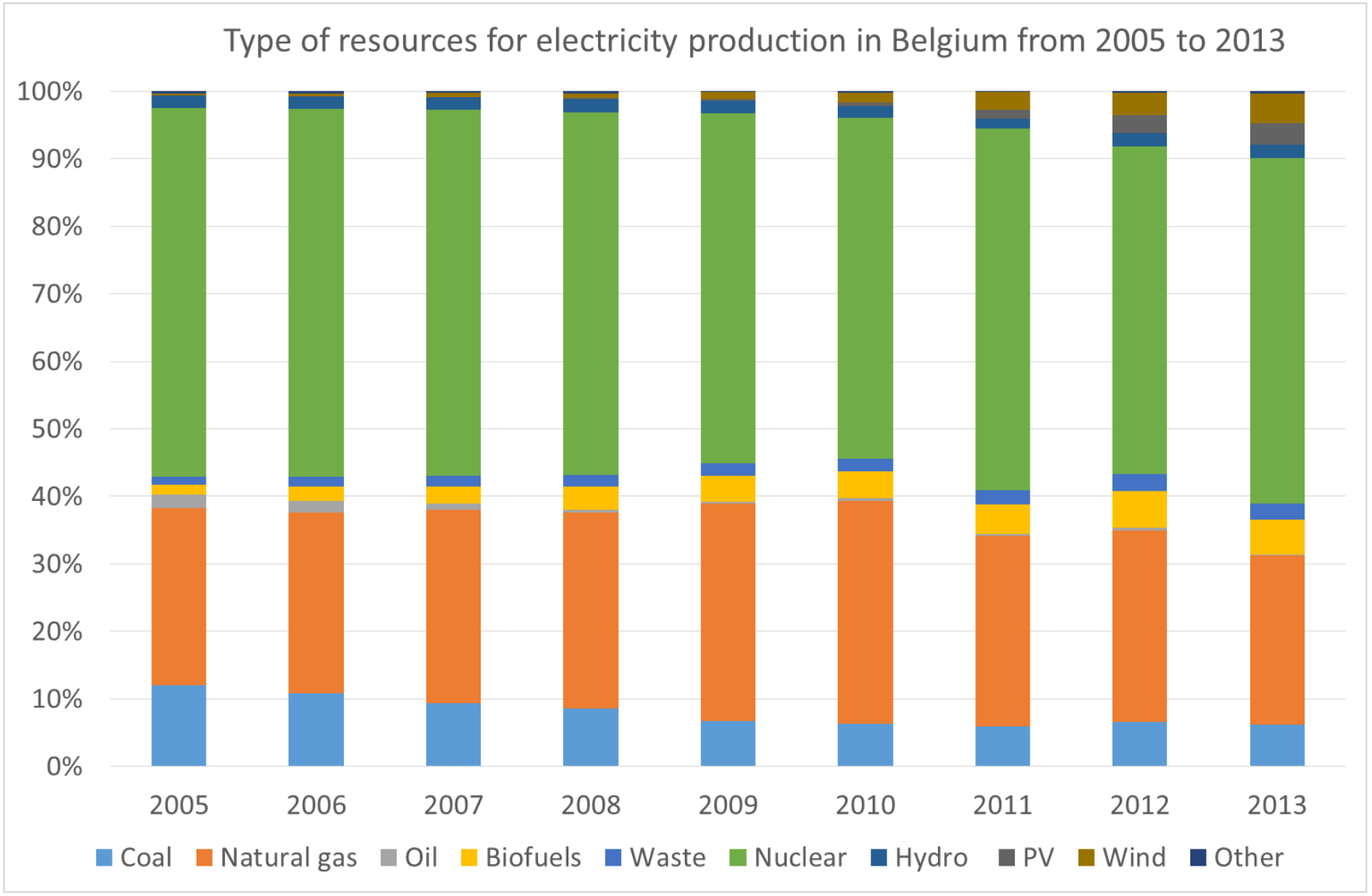
Belgian statistics



Belgian statistics



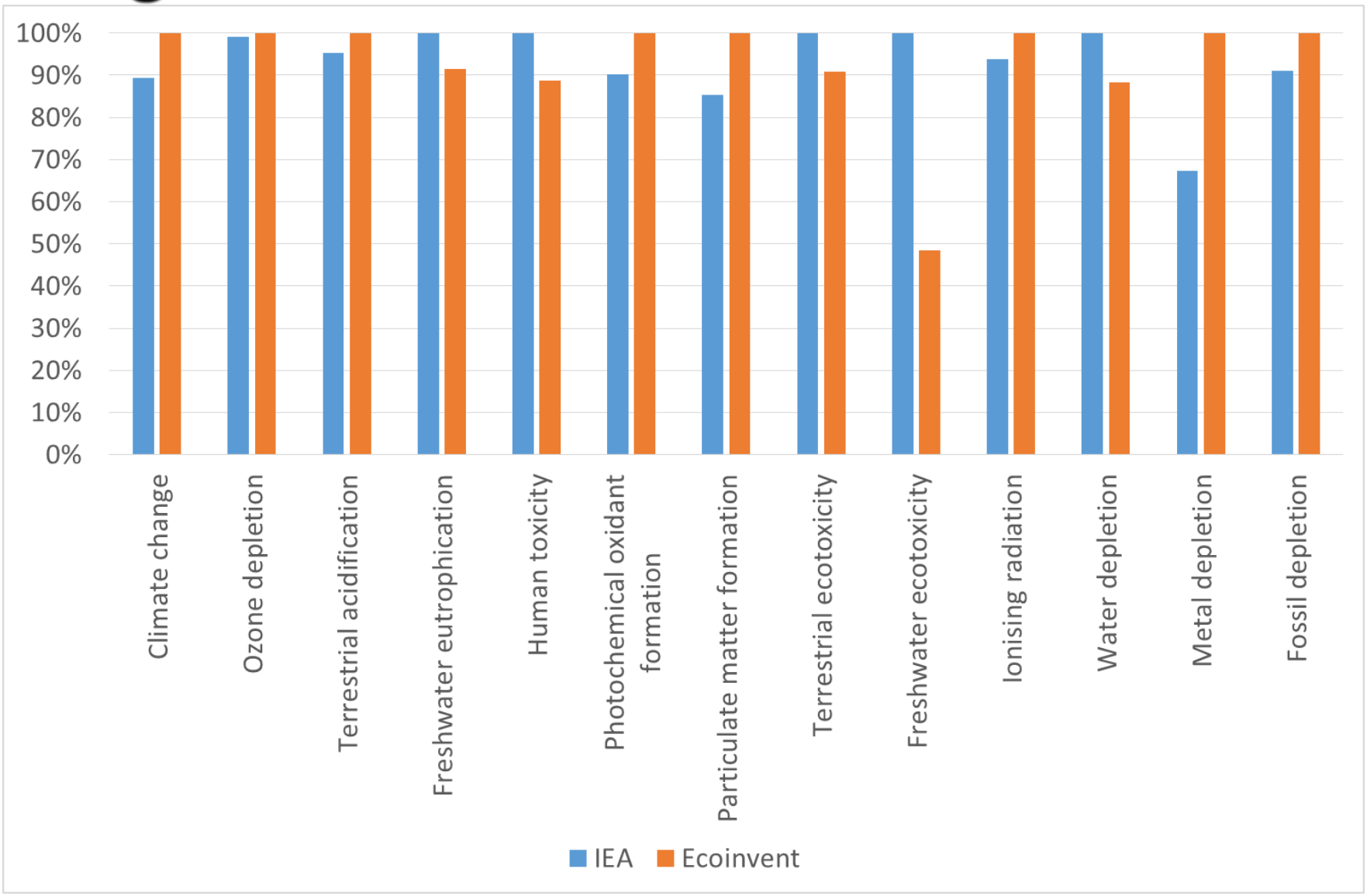
Belgian statistics



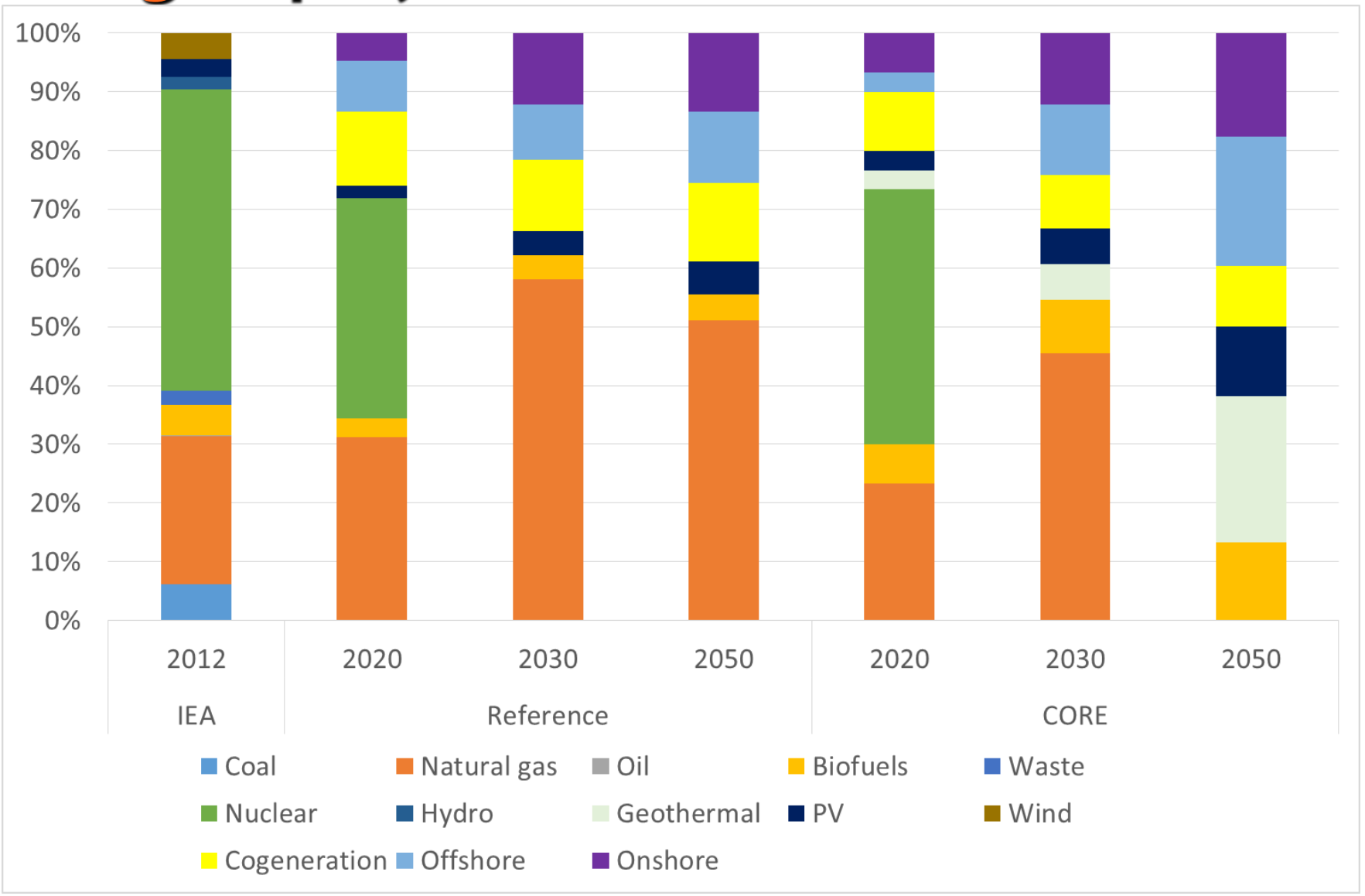
Belgian statistics and LCA

Source	IEA – 2013	Ecoinvent V3 - 2013	Difference
Coal	6.19 %	6.38 %	0.19 %
Oil	0.19 %	0.47 %	0.28 %
Gas	25.06 %	28.35 %	3.29 %
Biomass/biogas	5.10 %	3.40 %	-1.7 %
Waste	2.41 %	1.65 %	-0.76 %
Nuclear	51.10 %	54.71 %	3.61 %
Hydro	2.06 %	2.23 %	0.17 %
PV	3.16 %	0.07 %	-3.09 %
Wind	4.36 %	0.80 %	-3.56 %
Other	0.38 %	1.94 %	1.56 %

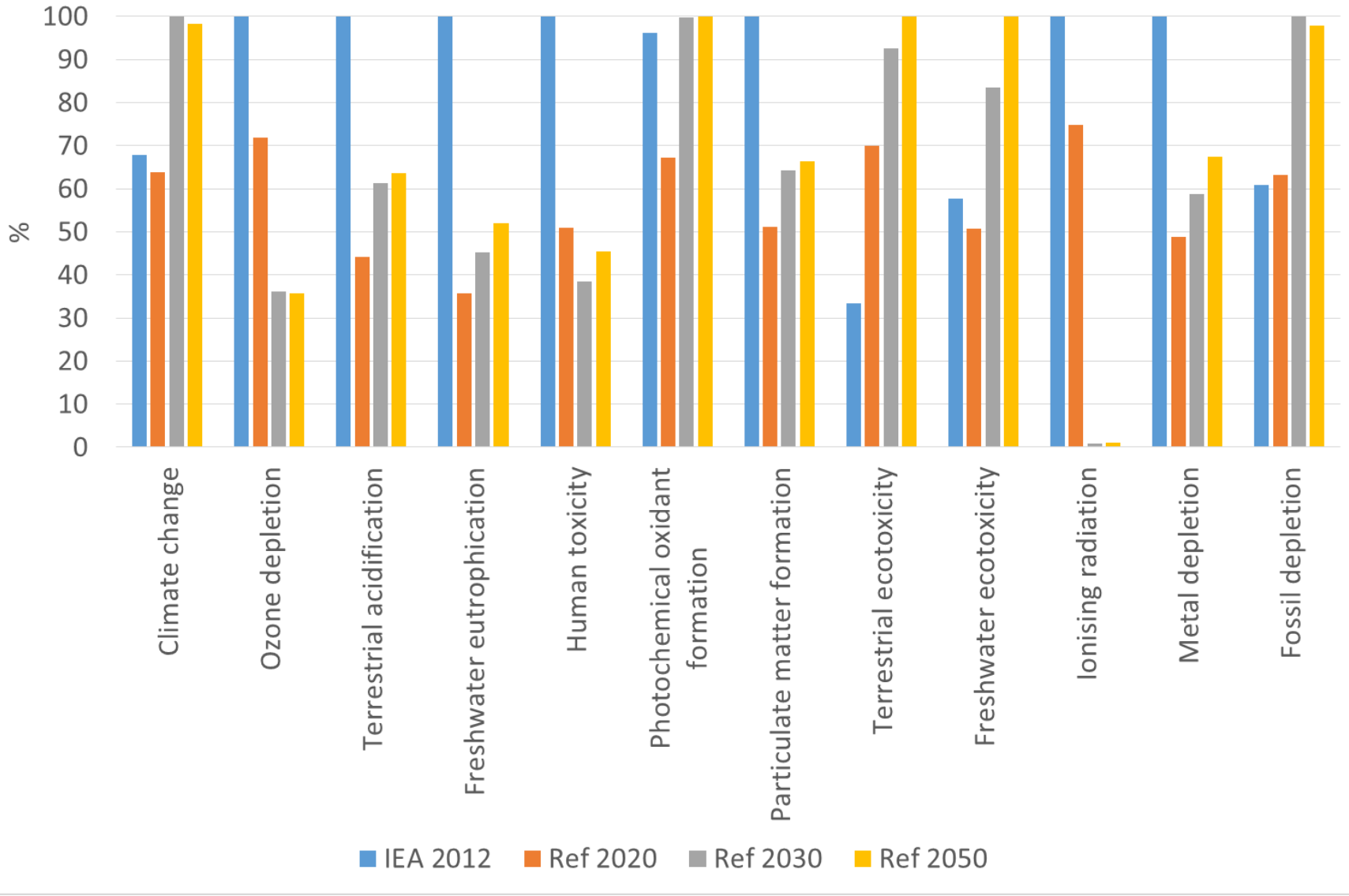
Belgian statistics and LCA



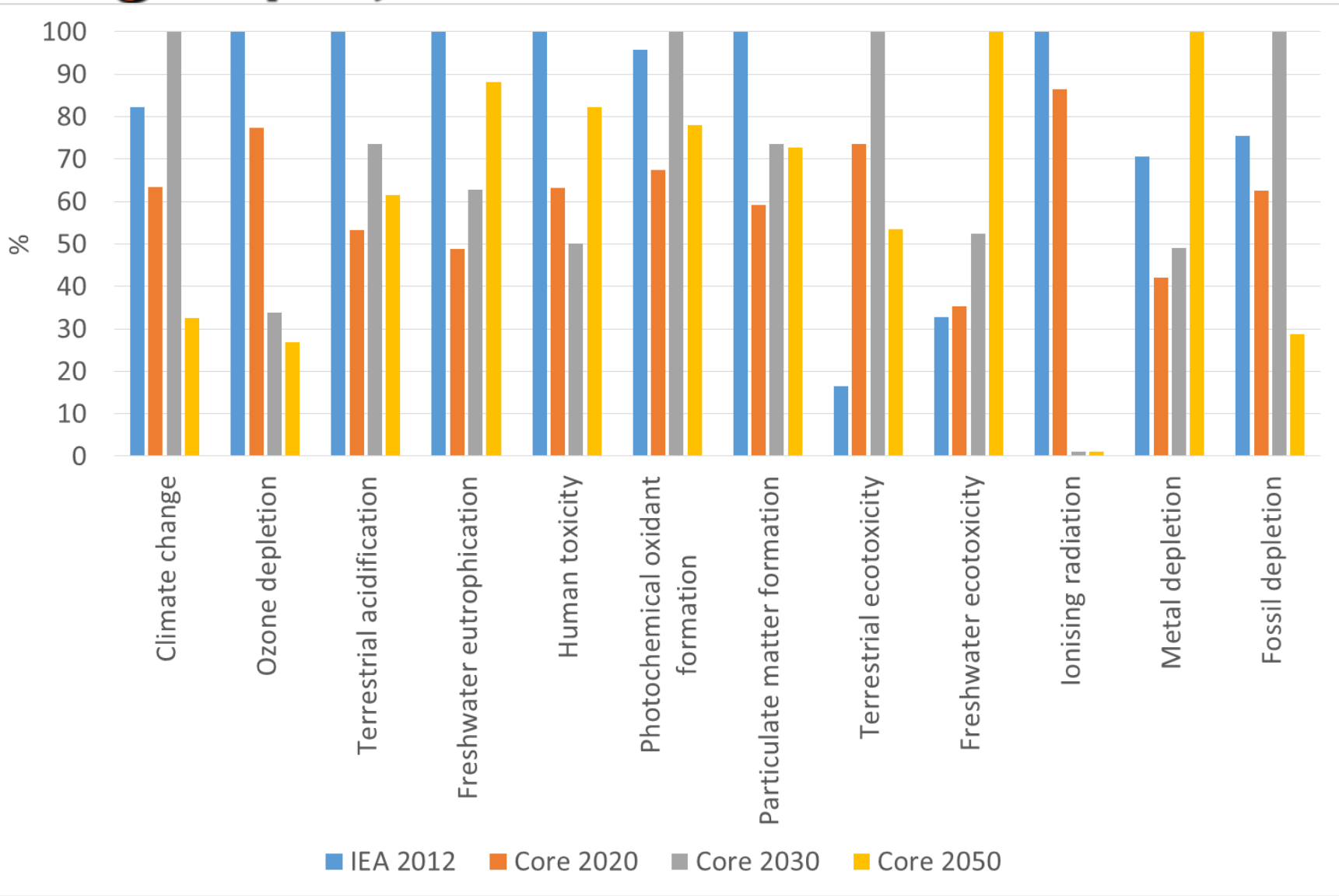
Belgian projections and LCA



Belgian projections and LCA



Belgian projections and LCA



Belgian projections and LCA

- Impact of electricity depends on :
  - Mix of primary energy
  - Technology of production

- How to increase accuracy in electricity mix?
  - Use the most accurate value of energy mix
  - Find the most important factors for technology production ➔ use of meta-analysis
  - Find how are usually modelled energy production technologies

Meta-analysis and LCA

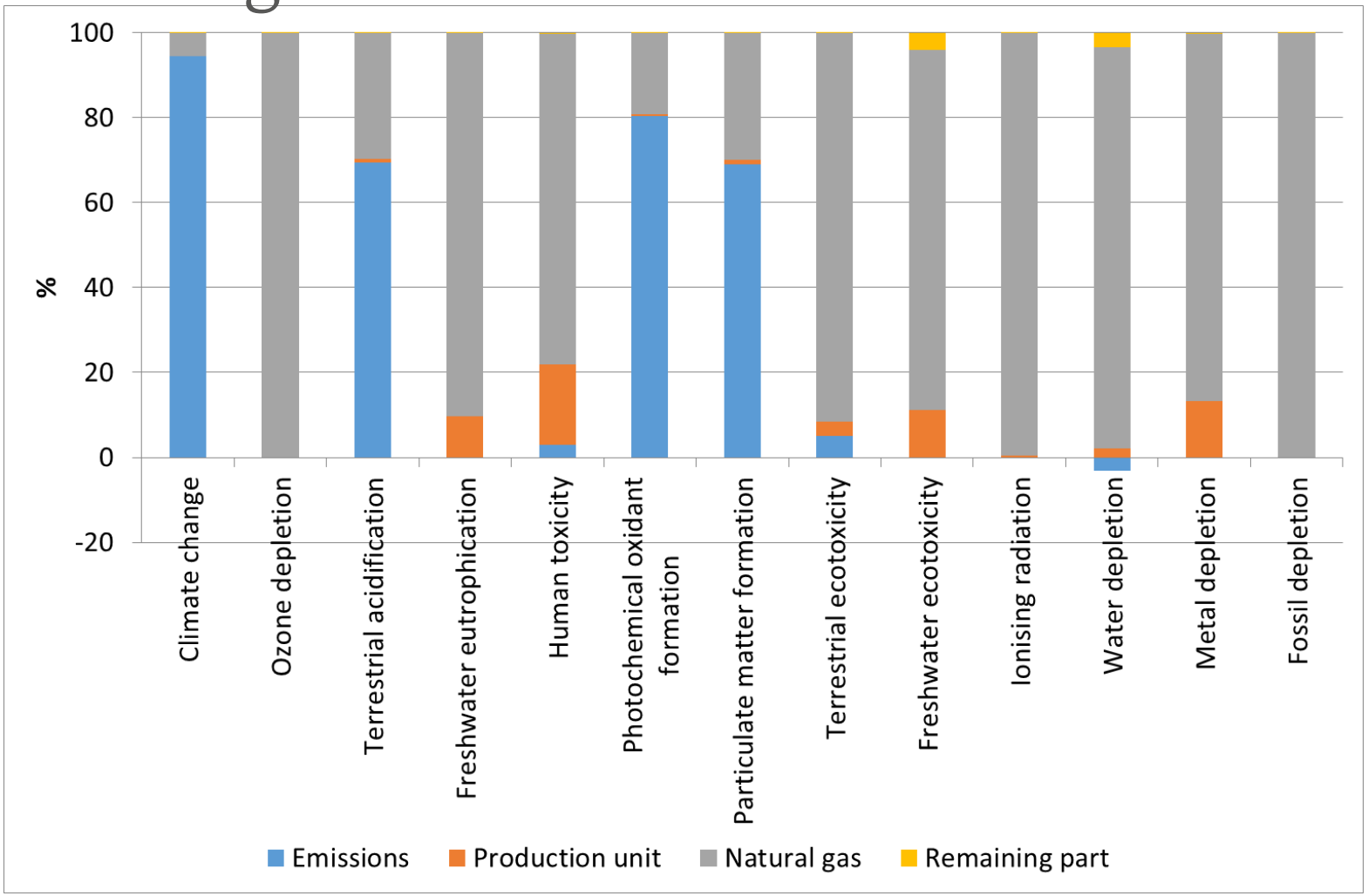
- Highlight of main factors
  - For fossil fuels
    - Type of power plant
    - Thermal yield
    - Origin of fuel with LHV or HHV
    - Extraction of fuel
  - For nuclear
    - Uraniun beneficiation method due to primary energy

Meta-analysis and LCA

- Highlight of main factors
  - For renewable
    - Type of power plant
    - Origin of « biofuel »

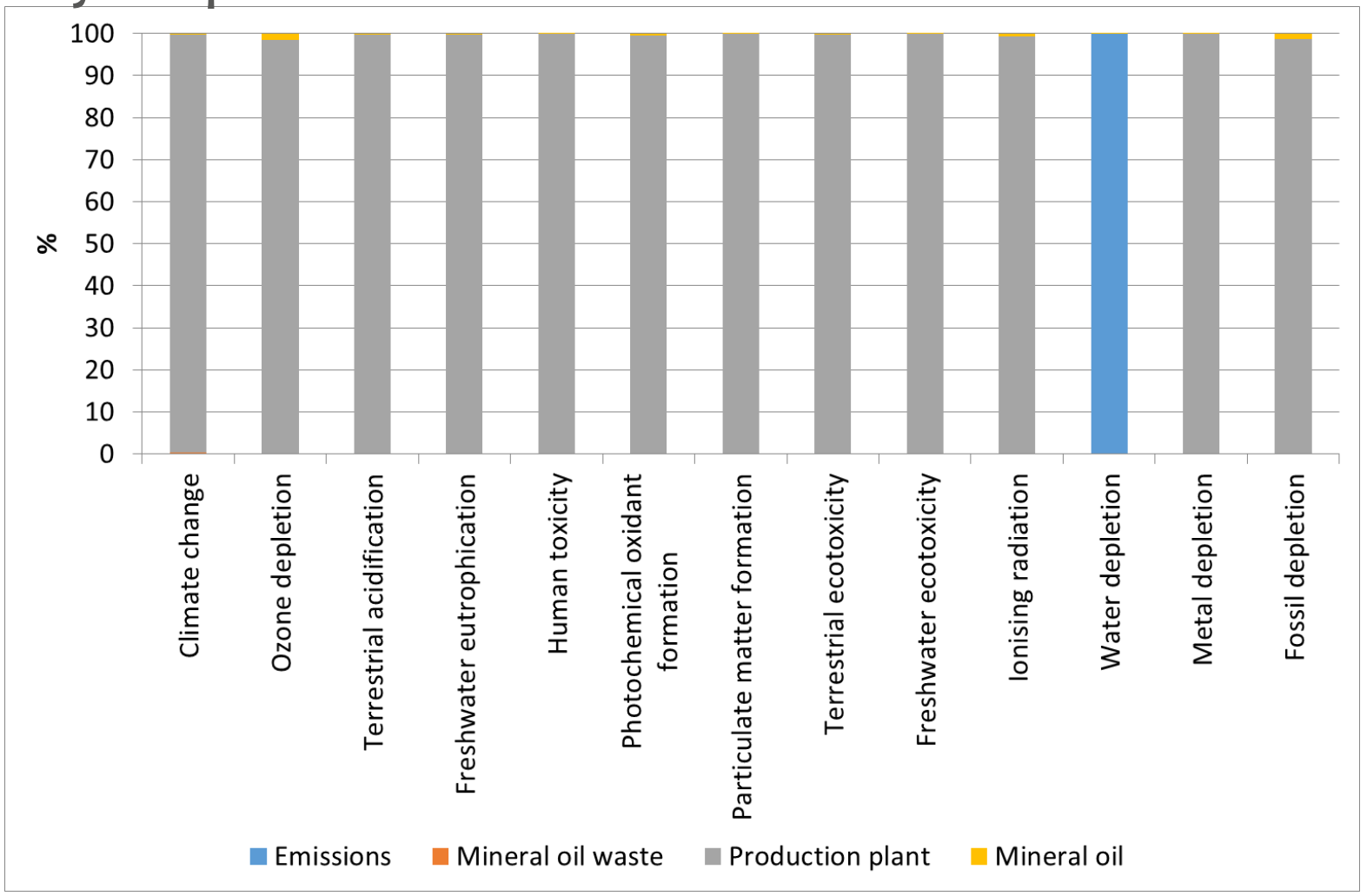
Meta-analysis and LCA

- Natural gas



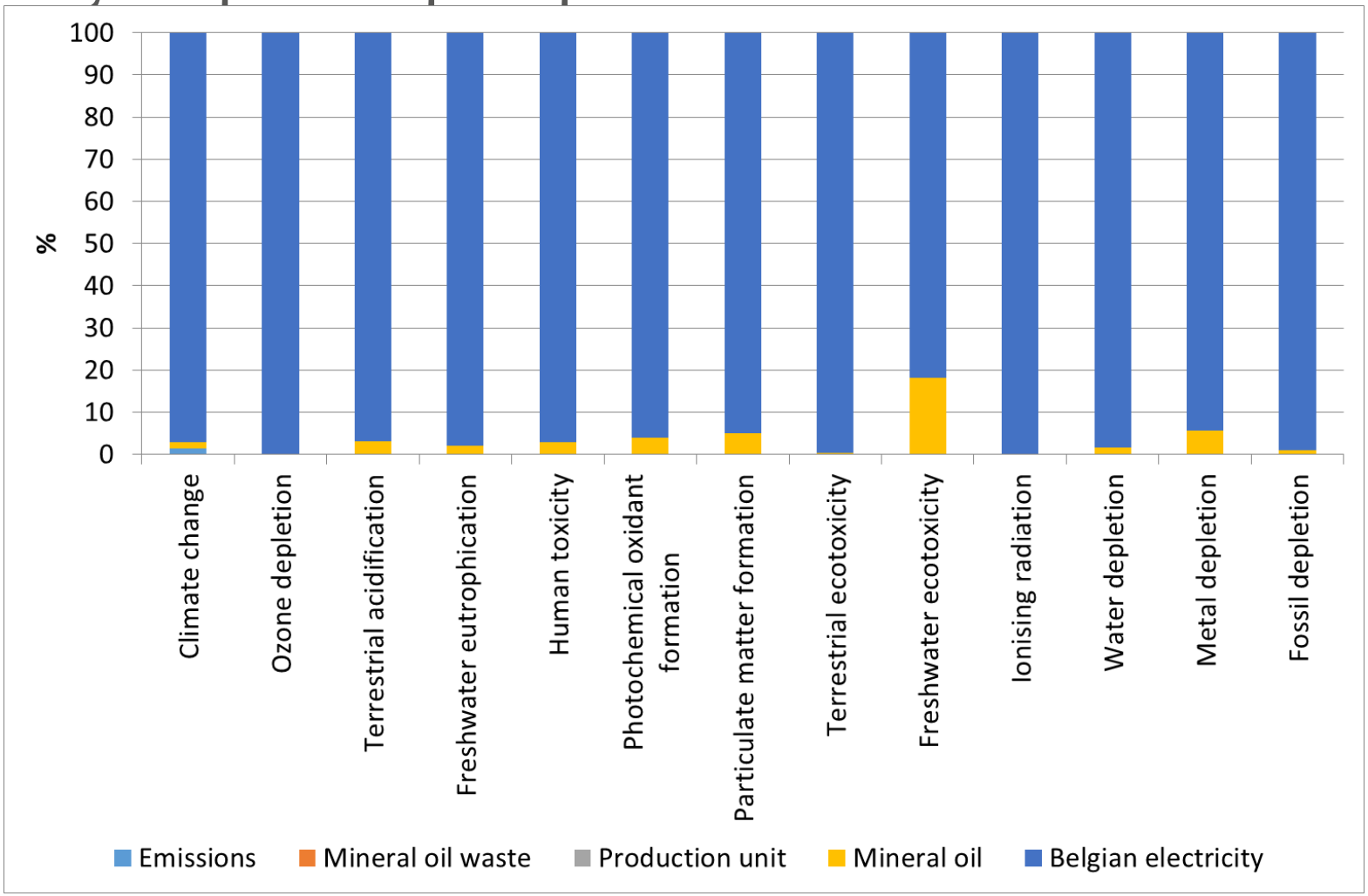
Meta-analysis and LCA

- Hydropower runoff



Meta-analysis and LCA

- Hydropower pump



Meta-analysis and LCA

- Modify important factors from meta-analysis with specific data
  - Allow the need of only few information per type of power plant
    - Yield
    - Origin of fuel
    - Type of technology

Conclusions and perspectives

- Modelling of electricity = important
- Based on new knowledge
  - Production of an Excel datasheet to obtain impacts
  - Using few criteria
- Apply CEENE method

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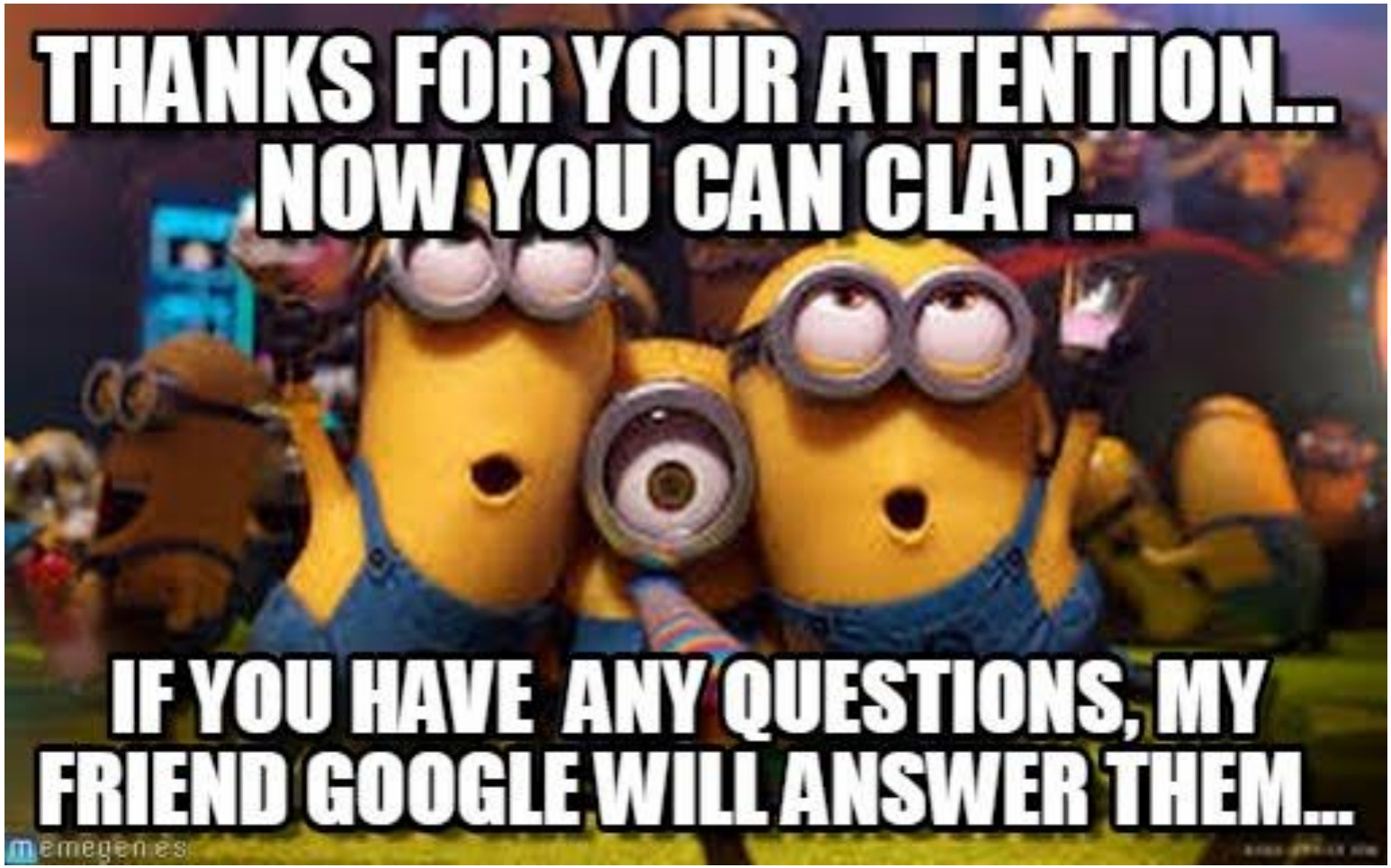

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