

# Integrate high volume products (e.g., cement) based on LCA data

- First off
  - I would try and draw/visualize the system that I want to add to South Africa, just to see what I am dealing with.
- Add new (material) commodities and related supply and demand technologies
  - I can add the commodity (cement) manually with python interface or add it in the excel sheet for South Africa.
  - Add one extra technology called “cement\_factory” on the secondary level. Output of this technology creates the commodity cement with an input commodity of electricity. I can then play around with the conversion rate of electricity to cement. The demand would be to construct buildings, this could be related to population or GDP – something similar is done in the Westeros baseline example, I don’t know if I can do it like that?
- Possibly modify GAMS code to allow triggering commodity flows by construction/decommissioning
  - I would probably skip this, I have no idea what it would take to do it – I have never used GAMS before.
- Quantify energy consumption and emissions connected to material use
  - Emissions are mostly from the calcination process happening in the cement factory and from energy consumption needed for heating in the calcination process. Therefore, an emission factor is assigned directly to the cement\_factory as well in units MtCO<sub>2</sub>eq/MtCement.
- Analyze substitution of products (via scenario analysis), incl. the impact on decarbonization
  - This I have no idea how to include with MESSAGE. I could put a lower activity bound to a new technology and see how far up it is feasible to take it maybe?
- “Extra”: Compare scenarios of low CO<sub>2</sub>-eq scenarios (constrains on emissions) by inserting results from the IAM and see how the scenarios look on other impact categories.