EIO-LCA of writing utensils

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Life cycle assessment comparing mechanical and wooden pencils
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Research objective: To compare the life cycle analyses of mechanical and wooden pencils so that the more sustainable option can be determined.

Introduction/Motivation
- Determining which type of pencil is more sustainable so the University of Dayton can make a recommendation to its students on which type of pencil is the best to purchase for classes.
- The University of British Columbia conducted a study that concluded the wooden pencils were more sustainable than mechanical pencils. However, they tested multiple types of pencils and studied different metrics.

Methodology
- The costs of gathering raw materials and producing one billion of each type of pencil was input into an EIO-LCA. From these inputs, energy consumption, GHG emissions, and water withdrawal were found. Mechanical pencils had inputs of oil production and plastic manufacturing. Wooden Pencils had inputs of lumber production and wooden tool manufacturing.

Results
- Top right graph – total energy for process (TJ)
- Bottom left graph – greenhouse emissions (total tonnes CO2 equivalent emissions)
- Bottom right graph – water consumption (kgal)
- Blue – mechanical pencils
- Red – wooden pencils

Conclusions
- Wooden pencils are more environmentally friendly.
- Reusing mechanical pencils four times would offset the water consumption and greenhouse emissions.
- Mechanical pencils would have to be reused 24 times to offset total energy.

Recommendations
- Determining the actual usage rate of mechanical pencils per wooden pencil would provide more definitive results.
- Some economic inputs are estimated. More research would improve accuracy of results.
- Test many types of pencils in order to produce more holistic data that allows for a more specific conclusion.