

PdM/Pds Masters/semester project proposal

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Project title or topic

“Best carbon foot-print materials: a landscape review”

Context and background

PdM masters project

This project will examine hard to abate classes of materials examining their current CO₂e footprint and the evolving landscape and sustainability initiatives to reduce this versus time.

The material groups to be assessed include: metals (focus on structural metals, aluminum and steel), polymers (focused on durable products and their petro-chemical derivatives), composites, built environment (concrete), and EV battery materials.

This will consider: i) virgin or primary raw materials, ii) bio-mass or bio-attributed mass balanced materials, iii) low carbon “green” metal technologies, iv) circular solutions: recycled post-industrial waste, v) circular solutions: recycled post-consumer waste. This will hence examine the effects of working both upstream in the supply chain and also developing circular economy approaches.

Ashby type plots / custom graphs will be constructed of key constituent technical and industrial properties and technology readiness levels. This includes: CO₂e, MJ, \$, grid-mix assumed, capacity, demand, and TRL. Emerging technologies will be split into 10-50-90 probability bandwidths versus time to 2050 to illustrate a developing strategy towards NetZero scenarios. Consideration will be made on a per kg material basis.

Extensive literature reviews will be required including synthesizing data from LCA studies and reports. Data will be collated and presented using Excel and the project will also use Granta EduPack to build plots illustrating approaches to best carbon footprint materials.

Additionally, industrial sustainability initiatives will reviewed and built into case studies for each material class to illustrate progress underway.

It is anticipated that high quality work will be published and presented accordingly and used in lecture materials.