

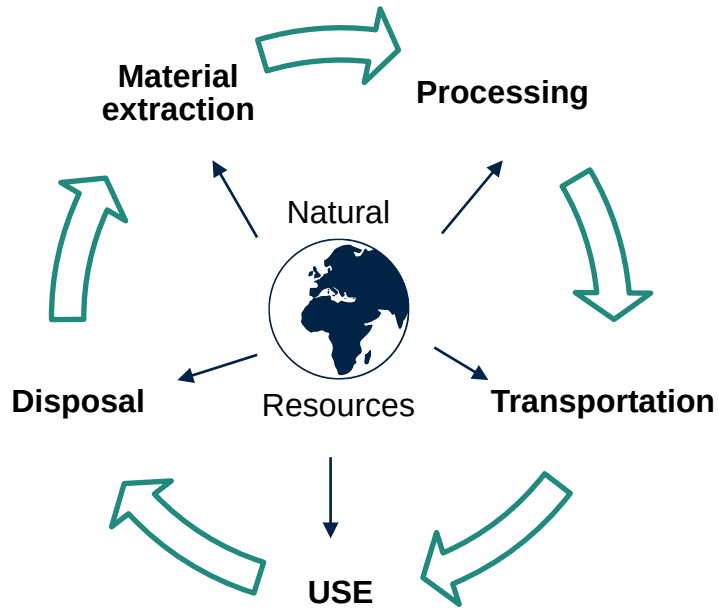
Lubricant Life Cycle Assessment Comparisons – Comparing Petroleum, Bio-based, Synthetic and Re-Refined Lubricants

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Session 2: 11.10am

Life cycle thinking



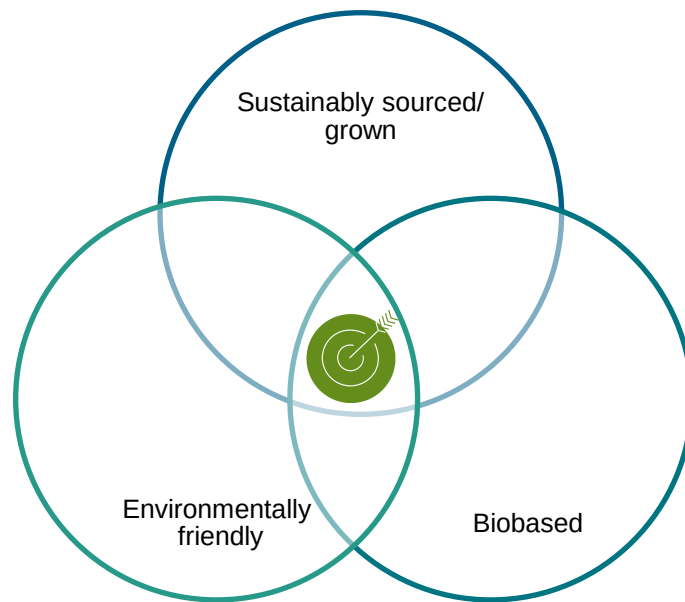
- **Inventory of energy** and material inputs and environmental releases
- **Identifies impacts** associated with inputs and releases
- Interprets results to make more informed decisions, **identifies 'hot spots'**
- LCA is **not** PCF cradle-to-gate
- LCA **goes beyond** and is more complex to assess
- The **use-phase benefits** (handprint) will often out-weigh the carbon embedded in the raw materials and the formulated lubricant (footprint)

Cargill approach to designing innovative new products

Safety, sustainability, performance



Sustainability elements

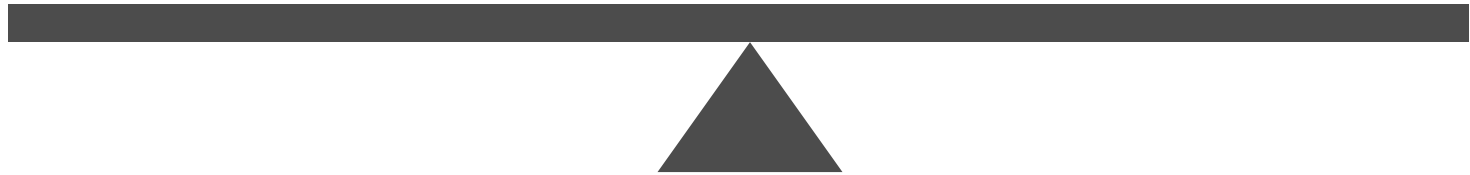


Value adding

Human hazards
Environmental hazards
Biodegradability
Bioaccumulation
Product carbon footprint

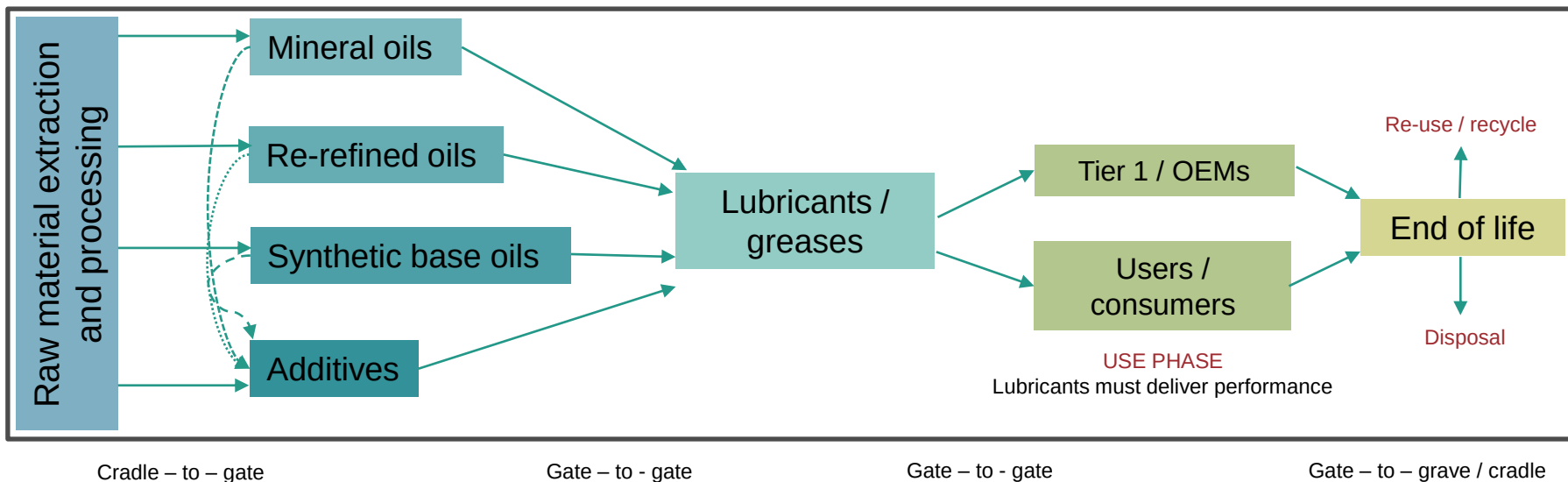
Improved energy efficiency
Reduced CO₂ emissions
Minimise raw material use
Extend durability of oil and equipment
Enable increasing:

- **Recyclability**
- **Re-use**
- **Regeneration**



Design to meet the needs of the customer

Product carbon footprint through the value chain



Lubricants must deliver **performance**



Deliver the **performance**

BUT

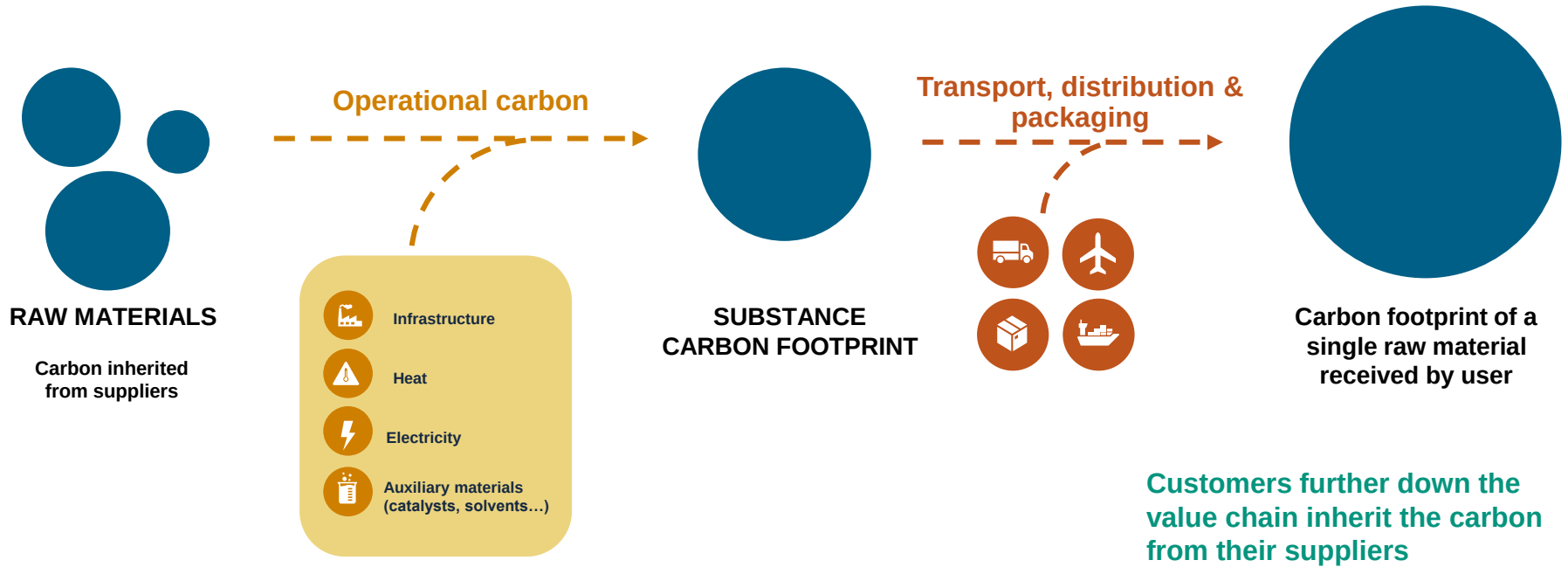


They also bring an associated **product carbon footprint (PCF)**

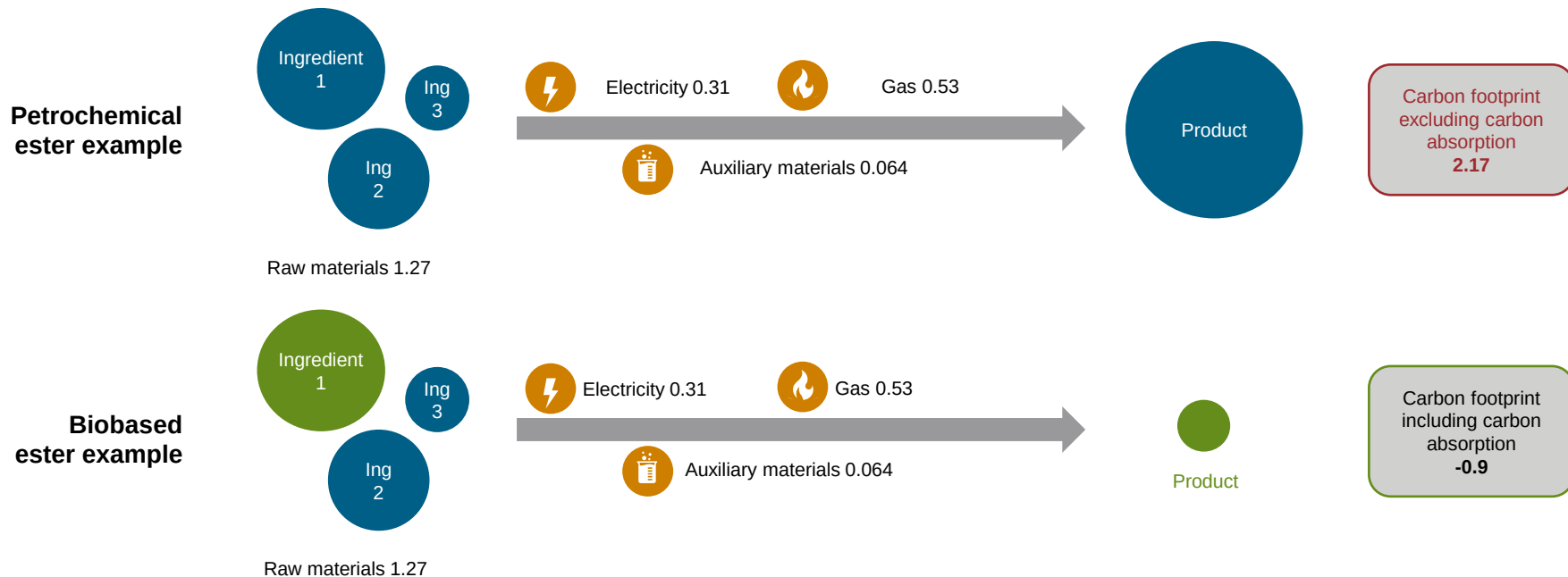
Ideally, the size of the trailer would be **zero** or even **carbon negative**...

Where does carbon come from?

Consider the manufacture of a **biobased or synthetic lubricant base oil**:

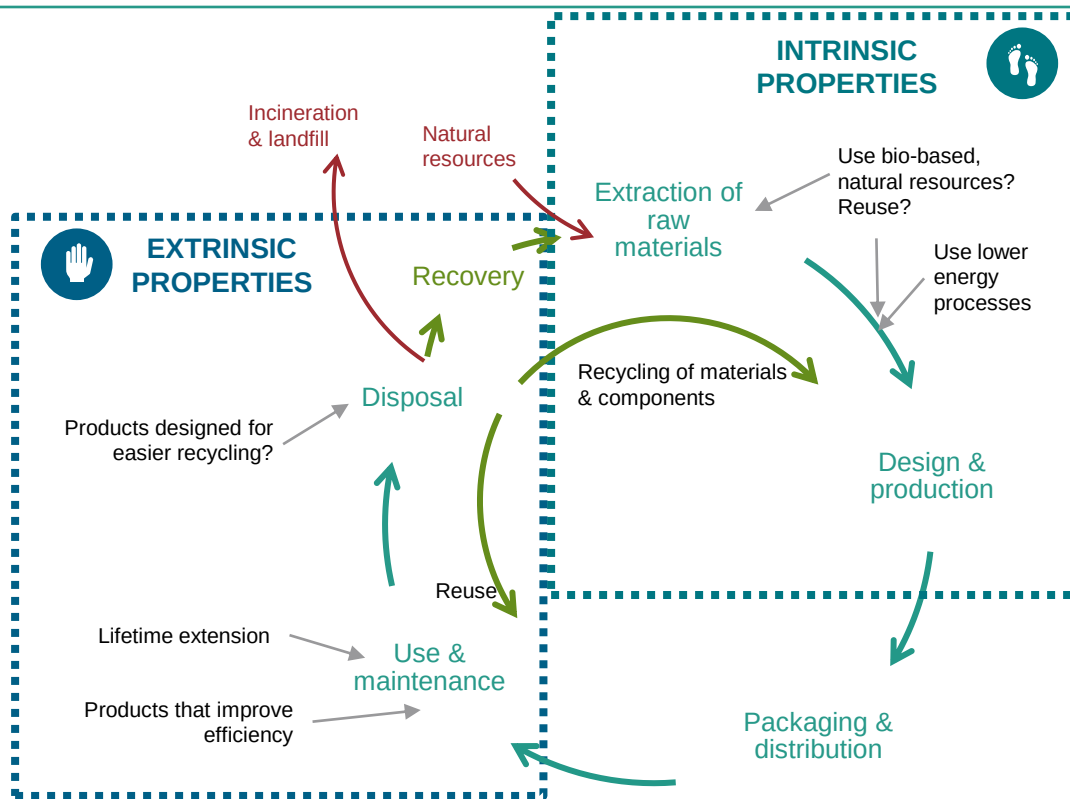


Biobased raw materials can significantly, positively impact product carbon footprint (cradle to gate)



Lifecycle thinking

- Look at the whole life cycle of the product, including the use and disposal phases
- Take a considered view of PCF, avoided carbon in use, and other LCA markers
- **PCF may not be the hot-spot**
- Balance safety, sustainability and product performance
- Create ingredients that are *safe & sustainable by design*





Helping the world *thrive*