## SUSTAINABLE PRODUCT DEVELOPMENT GUIDE



Kaleidoscope is your expert in Design for Environment (DfE). Here is a glimpse at our process.

- Identify estimate what aspects of product will have the highest impact on sustainability.
  - Consider the full product lifecycle (below).
  - · Consider energy consumption, CO2e emissions, resource depletion, pollution, etc. during each stage.
  - Prioritize minimizing areas of high impact throughout design and development.

Raw Material Extract & process raw materials Production Create components

**Distribution**Transport goods to consumer

Use Resources are consumed during use End of Life Consumer is done using product. Landfill, recycle, re-use, etc.

- Brainstorm include prompts related to you key aspects of sustainability. I.e.:
  - How might we reduce plastic usage in this component?
  - How might we make this assembly easier to repair?
  - How might we reduce energy consumption?
- Concept Generation & Selection intentionally include and call out features with sustainability benefits. Include environmental impact (qualitative or quantitative) in concept selection.
- Define Requirements set quantifiable requirements that affect key environmental impacts such as allowable materials, max weight, recyclability, etc.
- Prototype & Design focus on areas of high impact. Utilize these 9 principles where appropriate:

**Longevity**Design products to last.



Repairability
Accessible
hardware. Avoid
adhesive.



Increase Efficiency & Use Renewable Energy



Materiality
Seek low-energy,
recycled,
recyclable\*,
compostable



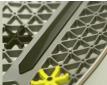
Modularity
Allow modules to
be swapped in
and out



**Disassembly**Assembly must separate for recycling\*



**Dematerialize**Minimize material usage



Component Reduction Less parts, tools, & scrap



Remanufacture Re-use containers and old product



\*Don't assume your product will be recycled by the average user.

**Test** — simulate where appropriate. Use worst-case scenarios and engineering rationale to reduce sample size. Re-use test samples where appropriate.

