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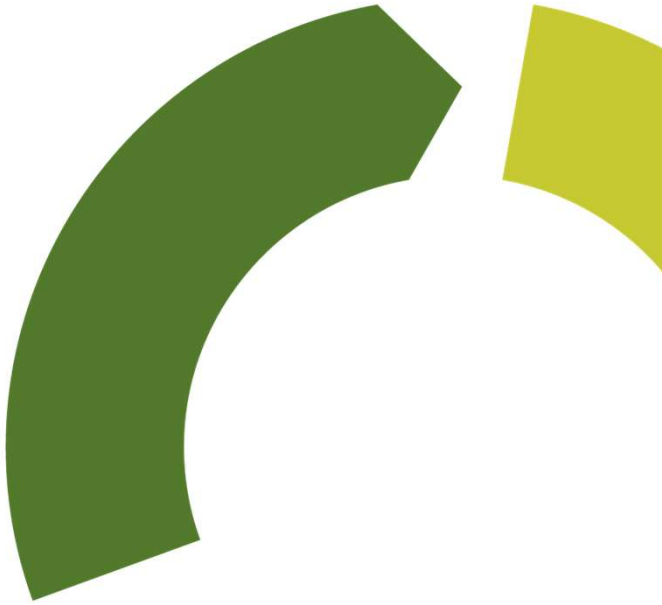
Capturing the real environmental benefits of product reuse

John Baxter

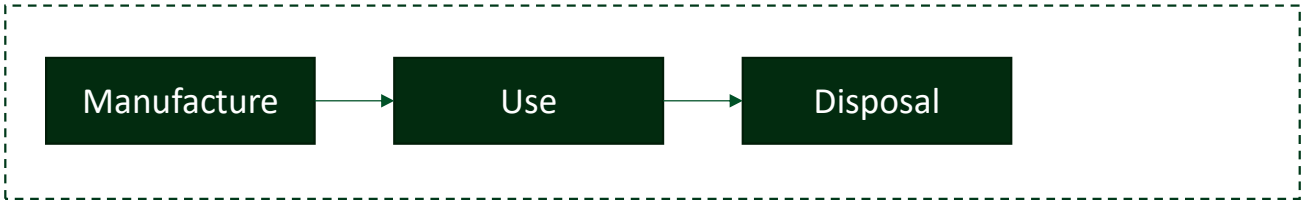


Overview

- Product reuse widely regarded as a good idea
  - but what are the actual benefits thereof?
- Reuse doesn’t affect manufacturing and only delays disposal
  - those phases represent the bulk of the LC burdens for most products
- Modelling reuse using LCA and related approaches often seems unsatisfactory
  - primary/secondary replacement problem (like material recycling)
  - rebounds / indirect effects
- A different approach is needed

Comparing burdens along different pathways

Make-use-dispose pathway



Total burden B1

Make-use-reuse pathway

Total burden B2

- B2 > B1; reuse does not deliver reduced burdens

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Modelling reuse

- Reuse does not deliver reduced burdens as such
  - it effectively extends product life-span
- Burdens associated with manufacture (and disposal) are ‘baked-in’
  - they are essentially unaffected by the reuse pattern of the product
- Modelling reuse concerns the effective allocation of these fixed burdens

Common approaches to modelling reuse

Reuse is often modelled as a quasi-recycling process

Reuse assumed to offset / replace manufacture of new products

1:1 offset

partial offset

Modelling reuse

- Modelling offset / replacement of production known to be problematic
  - rebound effects (consequences on markets)
  - more generally, (full) offset or replacement just doesn't happen
- Common approach is to compute partial offset / replacement
  - difficult both in principle and in practice
  - relevant data, if available at all, may be indirect at best
- Need a more direct formulation for what reuse actually achieves

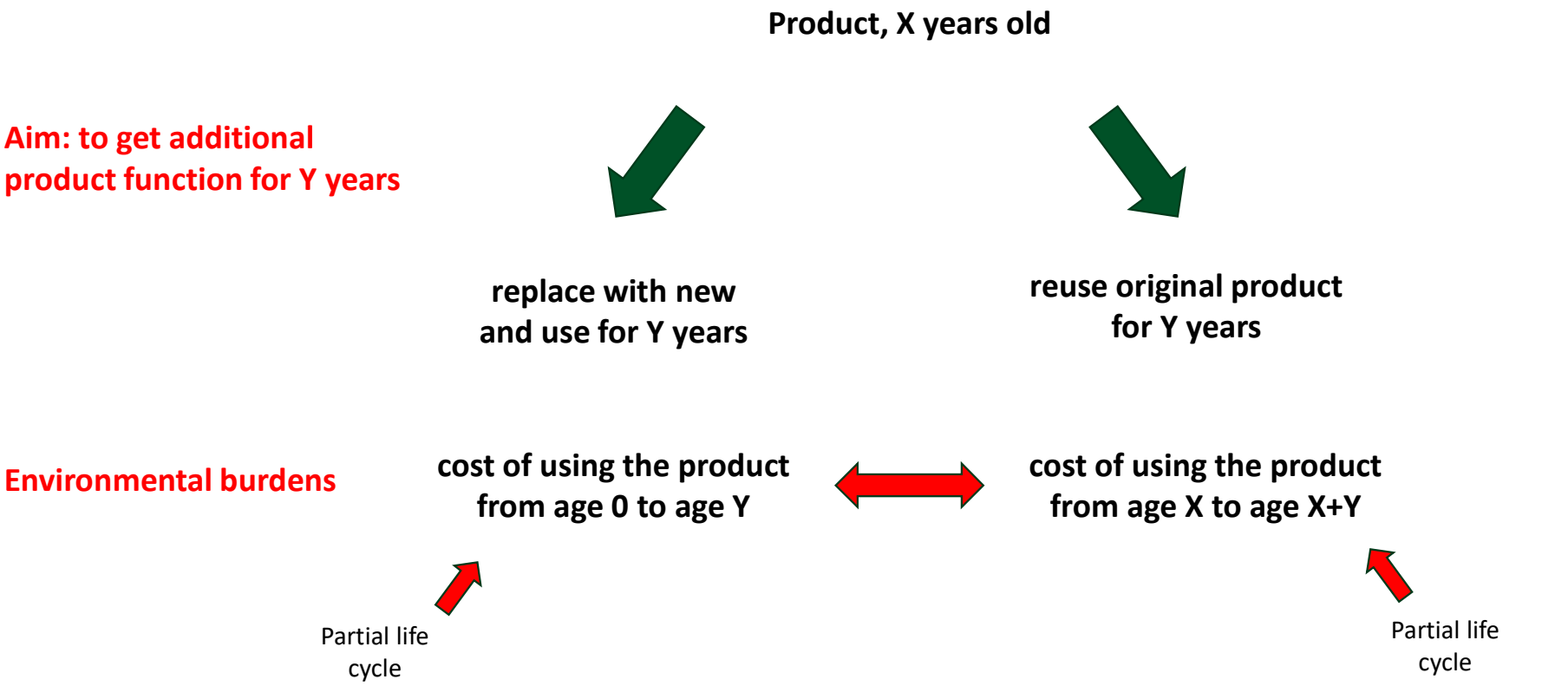
Reuse: the direct approach

- Effectively drawing system boundaries around the life cycle of the product is the problem with common approaches

- Reuse involves replacing provision of function: this should be the focus
  - comparing environmental costs of using products in different scenarios

- Comparing different (partial and full) life cycles
  - reuse involves full replacement of a partial life cycle NOT partial replacement of a full life cycle

Reuse: what is actually replaced?



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Reuse: what is actually replaced?

- Reuse replaces environmentally expensive product function (provided by newer products) with environmentally cheaper function provided by older products

- Cost of using a product has two elements
  - ‘direct’ cost of burdens in use (cleaning, maintenance, power)
  - ‘indirect’ cost: allocation of fixed life cycle burdens (manufacture, disposal) to partial life cycle

- Allocating the indirect cost is key to modelling reuse

Limitations and complications

- Approach is suitable for products with essentially unchanging function
  - reasonable for many products (clothing, furniture, refrigerators)
  - dubious for others (computing, mobile telephony)

- Approach is suitable for specific type of reuse (‘relocation’)
  - where product is reused intact and essentially unchanged
  - could be modified for ‘remanufacturing’

- Burdens in the use phase are a possible complicating factor
  - can be game-changing in some cases (energy efficiency of refrigerators)

Conclusions

- Modelling of product reuse is mostly unsatisfactory
- Reframing of problem in terms of providing function is crucial
- Reuse involves replacing expensive provision of function with cheaper equivalent
- Allocating fixed life cycle burdens over partial life cycles is central to the approach
- Applications across many sectors (clothing, textiles, furniture, electronics) with some limitations