LCANZ Summit 2023

Putting the circular economy into practice – a role for LCA and LCM?

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Industrial Ecology

FIG. 1. Linear materials flows in type I ecology.

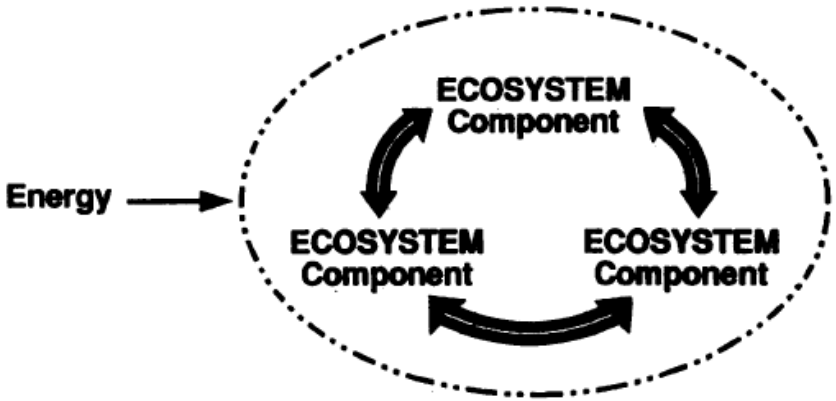
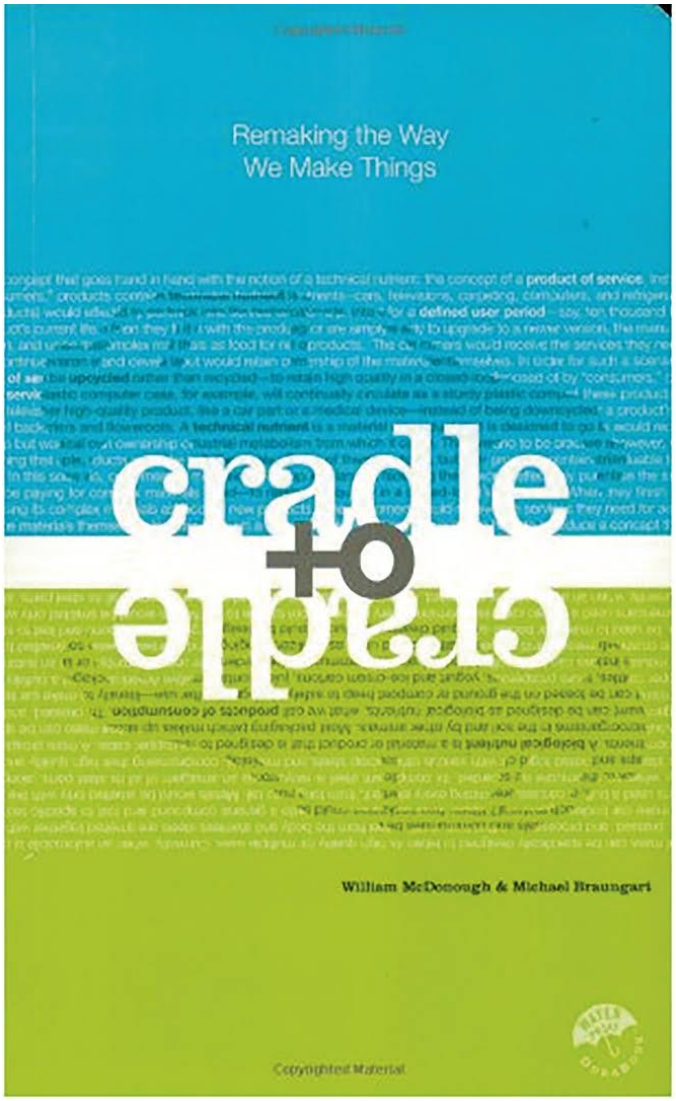
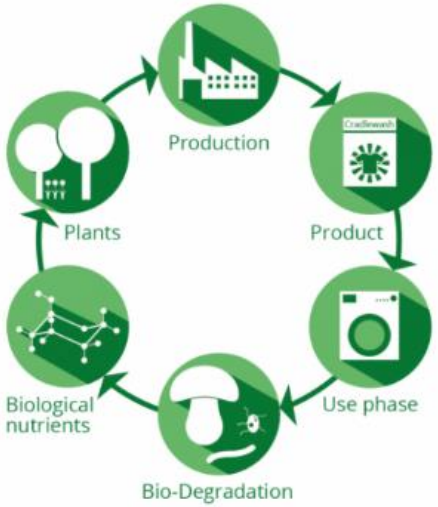


FIG. 3. Cyclic materials flows in type III ecology.

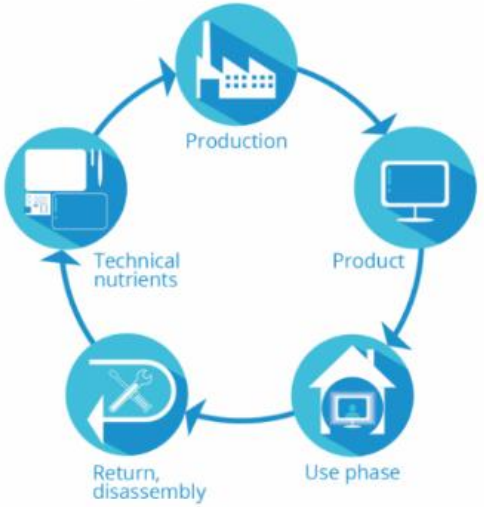
Source: Jelinski et al., 1992

Cradle To Cradle





BIOLOGICAL CYCLE
for products for consumption



TECHNICAL CYCLE
for products for service

EPEA
The Cradle of Cradle to Cradle

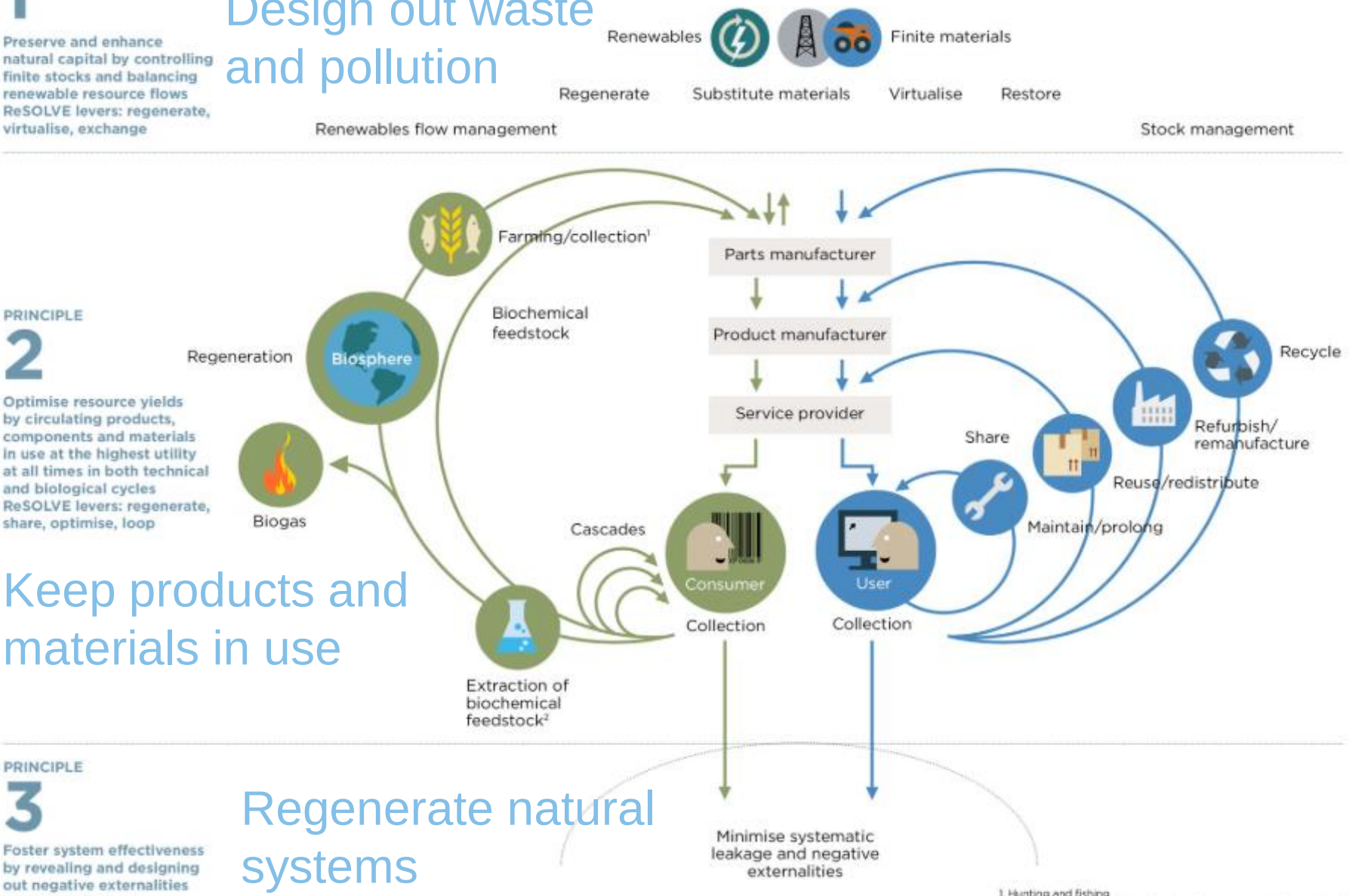
Three principles:

1. Nutrients become nutrients again
2. Use of renewable energies
3. Celebrate diversity

1

Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows
ReSOLVE levers: regenerate, virtualise, exchange

Design out waste and pollution



PRINCIPLE 2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles
ReSOLVE levers: regenerate, share, optimise, loop

Keep products and materials in use

PRINCIPLE 3

Foster system effectiveness by revealing and designing out negative externalities
All ReSOLVE levers

Regenerate natural systems

1. Hunting and fishing
2. Can take both post-harvest and post-consumer waste as an input

Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment; Drawing from Braungart & McDonough, Cradle to Cradle (C2C).

Source: available here

Yet demand for materials growing …

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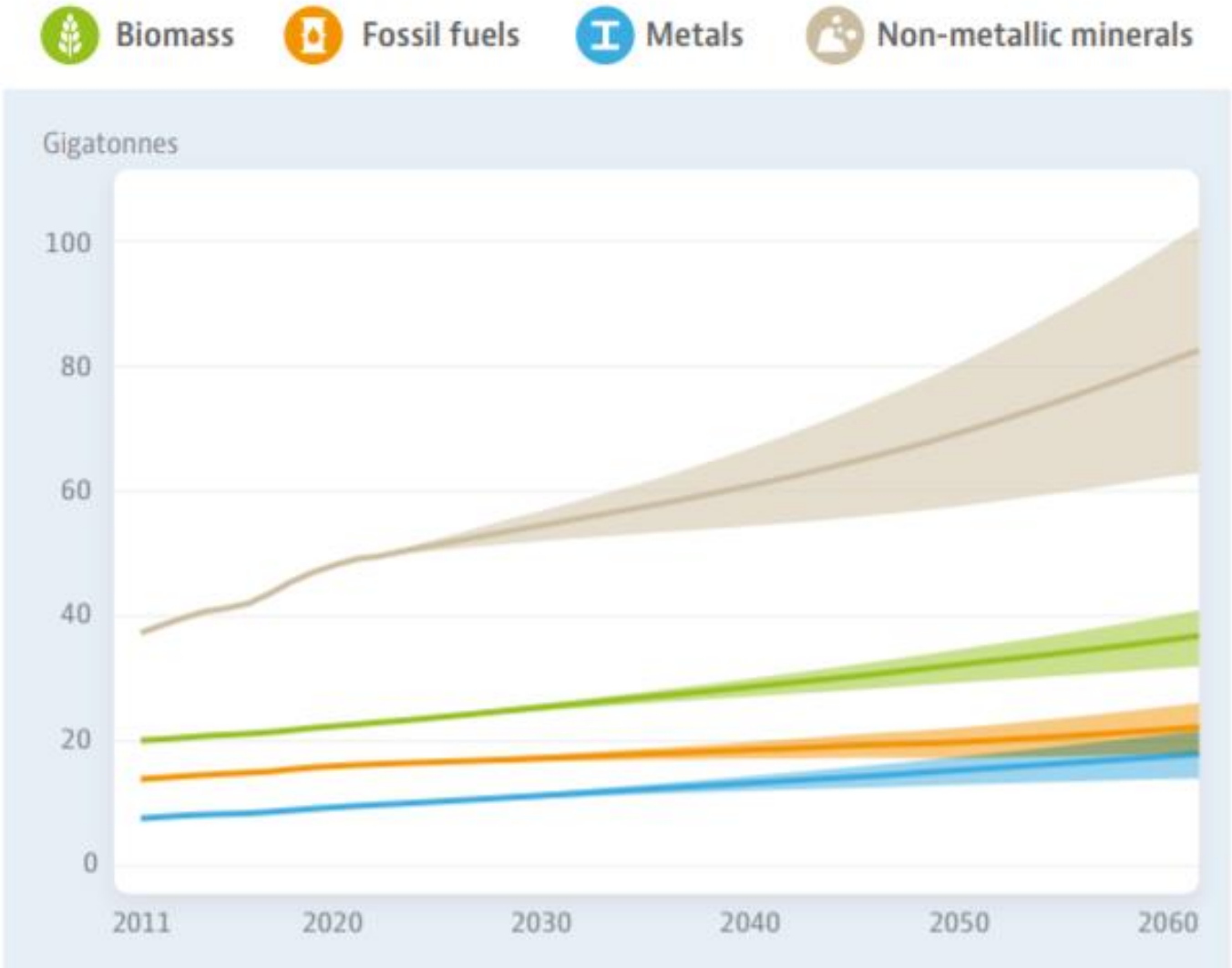
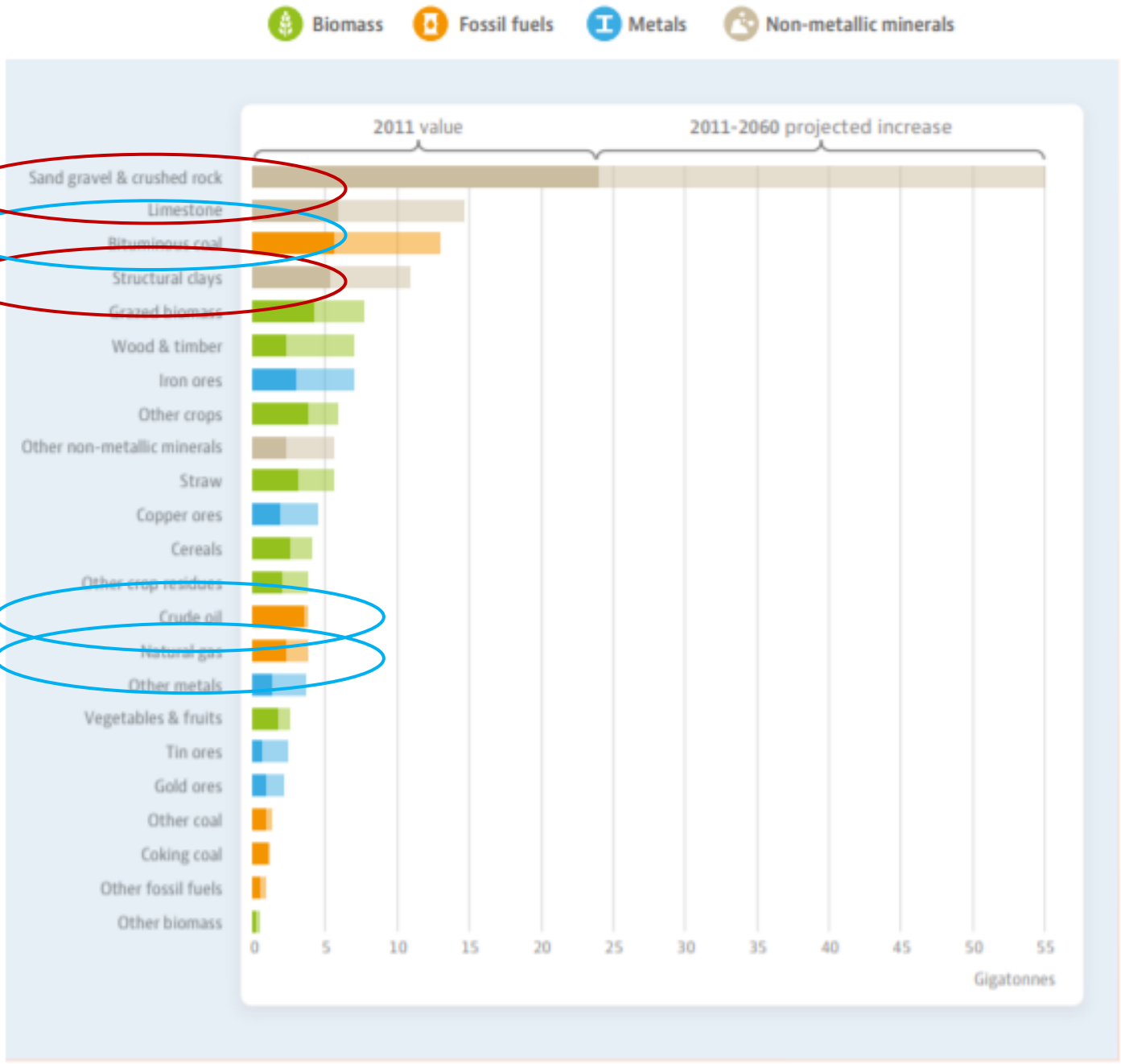
Figure 6. **Growth in materials use depends on population and economic growth assumptions**



Source: OECD, 2018

Figure 10. **Construction materials dominate total materials use in 2011 and 2060**



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Source: OECD, 2018

Muller et al. (2017)

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"Although the laws of conservation of mass and energy indicate that more input eventually must result in more ... en the overall ... tputs—not in ... rms of resourc... acts—is not de... by any thermod... tion is scientifically controversial, since it is based on barely comprehensible logical reasoning and lacks a sound empirical foundation."

What are we trying to achieve?

Trade-offs in the circular economy

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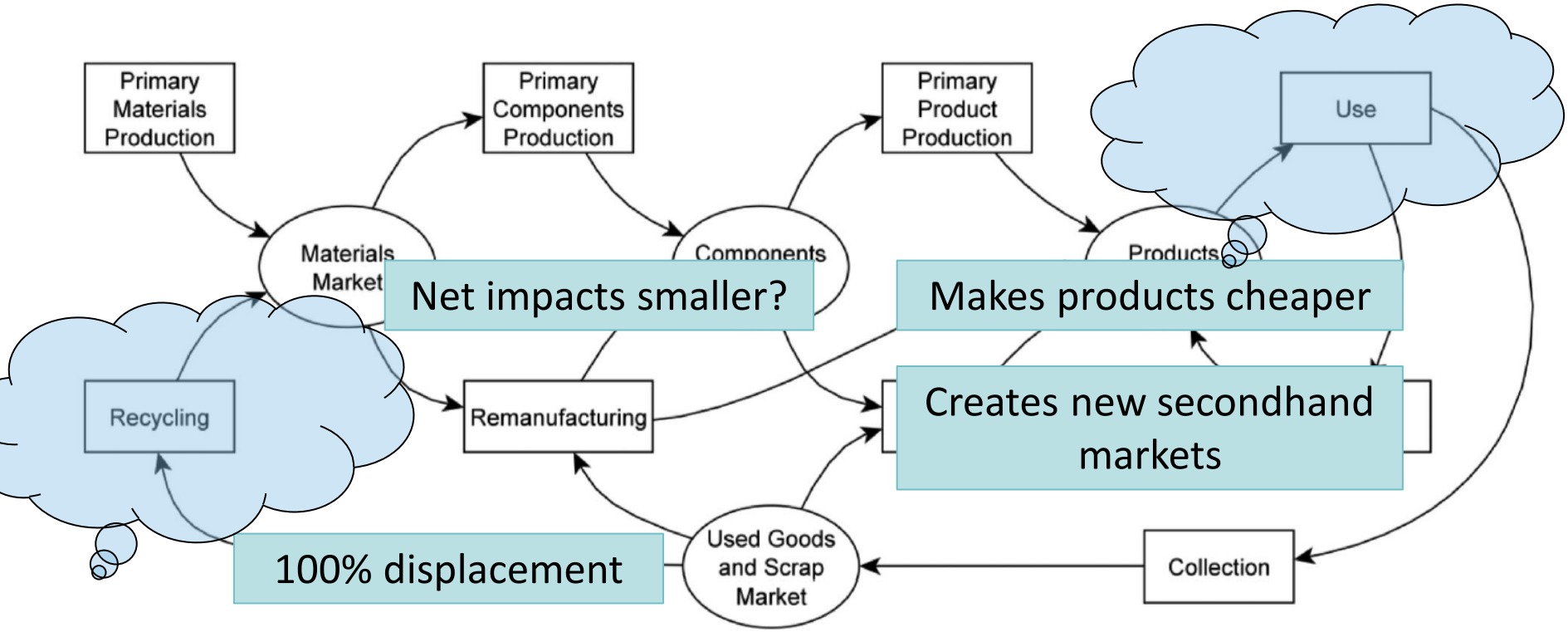

Figure 1 The circular economy as a system of interconnected markets. The diagram is typically drawn without the market ovals and therefore misses the key interactions between economic agents in the circular economy. Including the markets makes the outcomes of the circular economy harder to predict. Adapted from Ellen MacArthur Foundation (2016).

Source: Zink and Geyer, 2017

Role of LCA

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- ✓ Assessment of environmental impacts
- ✓ Scientific basis for assessment
- ✓ Holistic assessment along whole supply chain
- ✓ Shows environmental trade-offs ("burden-shifting") in alternative options

- Status quo versus alternatives (consequential LCA)
- Need for "What if?" scenarios modelling changes in markets (link with socio-economic aspects)
- Time-dependent aspects not represented (⟶ dynamic LCA)