Design of a Circular Economy:
Some Comments about implementing a successful Concept
(HERAKLION 2019)

StB Prof. Dr. Heinz-Georg Baum

Fulda University of Applied Sciences / Dpt. of Food Technology / Germany
BIFAS – Betriebswirtschaftliches Institut für Abfall- und Umweltstudien, DE
(Economic Institute for Waste and Environmental Studies, Germany)
CEC4Europe – Circular Economy Coalition for Europe, Austria
Outline

1. Circulatory or helical economy: Away from the static-linear economy
2. Finitude vs. Scarcity
3. Recycling is an instrument and not a goal
4. Demand for market-driven and sustainable business models (Disruption!)
5. Summary
1. Circulatory or helical economy: Away from the static-linear economy

Circular economy: Static cycles, i.e., material re-use

Helix economy: Dynamic entanglements, i.e., complex material (re-)use.

Justification or necessity:

• Finiteness of certain resources → limited availability
• Climate protection / emission reduction
• Securing your own raw material base (keyword: urban mining)

Relevant questions: - Are the arguments valid? - Have we taken the right path?
2. Finitude vs. shortage

Finiteness = Quantitative limit of non-renewable resources

→ Fear of production restrictions and thus abandonment of the product.

Concern for benefit and welfare losses

Thesis: Earth is neither a closed nor a static system!

Consistency: Permanent energy supply

Against static: Innovation as a permanent "creative destruction" (Schumpeter)

Finitude does not really trigger an end-time scenario?

(Against hysteria and apocalypse)

Former Saudi energy minister:

"Stone Age did not end with the lack of stones. Nor will the oil age come to an end with a lack of oil. "

Prof. Dr. Heinz-Georg Baum, Hochschule Fulda
Resources are subject to scarcity conditions

→ Scarcity ≠ Deficiency, poverty
→ Scarcity = Manifestation of the competition of usage
→ Scarcity has no threat potential, but is a necessary condition for economic decisions and processes (quasi: conditio sine qua non)

Scarcity level is determined
a. through the stock size: Resources or reserves and
b. by the current size: Consumption or degradation - triggers
c. Market valuations and consequently
d. Adaptation processes!
Reaction chain:
Increasing scarcity → rising prices

Possible consequences:
- Exploration (turning reserves into resources)
- Use of inferior deposits (keyword: shale gas, fracking, ...)
- Substitution (keyword: other commodity, other source of raw material, ...)
- Efficiency (keyword: higher specific yield per input unit)
Distinction between
1. Global vs. political effects

   **Global aspect**: - Circulatory / helical economy
                    - Dynamic adjustments (see above)

   **Political aspect** (here: raw materials as a political weapon):
                    - Long-term contracts
                    - Circulatory / helical economy with political prices for certain recovered materials

2. Long-term vs. short-term effects

   **Long-term aspect**: - Circulatory / helical economy
                        - Dynamic adjustments (see above)

   **Short-term aspect**: - Anticipative resilience strategies
                        (here: warehouse management, long-term contracts)
                        - Substitution measures
                        - Withstand
3. Recycling is an instrument and not a goal

The concept of circular economy is implemented by a variety of instruments:
• Longevity
• Cascade usage meaning re-use (from superior to inferior)
• Reuse
• Recycling (meaning, reuse of certain secondary raw materials)
• ....

Note: Sinks are an elementary part of the circular economy!
Recycling can be ecologically harmful!
Recycling leads to economic and ecological limits!

Especially efficient are systems close to the market. That means recycling activities can be re-financed partly or mainly by revenues of recovered secondary materials.

Source:
Bunge, R.,
HSR-Hochschule für Technik,
Rapperswil, Switzerland
SEBI = Specific Eco Benefit Indicators

\[
SEBI = \frac{Avoided \text{ environmental impact} \ [aEBP]}{Additional \text{ costs} \ [EURO]}
\]

(Recycling instead of incineration)

\(aEBP = \) avoided Environmental Burden Points

\(aEBP = \) avoided CO2-equivalent per Δ Euro

\(\ast\) e.g. avoided CO2-equivalent per Δ Euro

\(\ast\) e.g. avoided CO2-equivalent per Δ Euro

\(\ast\) e.g. Environmental Burden Points: Eco-Balancing: Based on the aspects climate relevant emissions, pollutants into (ground-)water or soil, over fertilization, and so on . . .

\(\ast\) e.g. Environmental Burden Points: Eco-Balancing: Based on the aspects climate relevant emissions, pollutants into (ground-)water or soil, over fertilization, and so on . . .

The results – based on „Avoided CO2-equivalent“ or „Environmental Burden Points“ – are rather the same.

The results – based on „Avoided CO2-equivalent“ or „Environmental Burden Points“ – are rather the same.
**Thesis 1:** Maximizing the use of an instrument is meaningless! Quota specifications in the current form provide only a small constructive input in terms of circulatory / helical economy! Quota system reinforces current business models!

**Thesis 2:** Official recycling rate measures "reconditioning" at a certain point in the "value chain" - but does not document the material re-use!

**Thesis 3:** Without quality requirement, the focus on quantity is “Nonsense” (so-called Müntefering-Lingo) → secondary raw materials without market value counteract the concept of circular economy.

**Thesis 4:** Inferior secondary raw materials lead to inferior products with negligible reusability (static model approach). "Inferior products are pre-sinks and block the concept of circular economy!" Recycling is a dynamic model (keyword: multiple loops)!
4. Call for market-driven and sustainable business models (disruption)

Industrial society generates values and prosperity:
• People (self-determination, economic existence)
• Investments in networks / infrastructure / education / research
• Redistribution (social systems)

Note: Expansion of social systems is based on entrepreneurial success!

Central question: What value and wealth contribution does the circular economy contribute?
• Relevant markets have often been artificially created and are still being largely subsidized!
• Ecological benefits often do not meet the expectations and requirements!

Invitation to disruption
New beginning:

• The generated secondary raw material (srm) is remunerated and not the process.

• Quantity x Market price x Scarcity factor = Reimbursement (srm) (srm) (political rating)

• Reimbursement prices initially binding for a certain time.

• In certain cases (for example, rare earths), the state assumes the role of buyer.

• Innovations in reprocessing / extraction technologies

• Competition between the srm-dealers

• Value chain "Refurbishment" rsp. „Re-Processing“ is financed (partially or completely) via the instrument "Product Responsibility“.

• If necessary, differentiated deposit systems give waste a lasting market value.
5. Summary

- Finitude of certain resources does not end in apocalypse.
- Scarcity is a necessary indicator of adaptation processes
  → Earth is neither a closed nor a static system!
- Current "Recycling Emperor" is often "naked". Dynamic reuse rates tend to be low. Recycling rates in the current form are not expedient (in the sense of designing a circular economy) and thus unnecessary.

- Without quality from srm quantity is „Nonsense“
  Quality can be read off the market price!

- Circular economy must be an integral part of industrial society
  → Call for disruption
  → Development of viable business models
    (View into the so-called powerhouse of economics)
Thank you for your Attention!
4. Packaging disposal as a striking example.

Germany

- Aluminium: 1.1
- Ferrous metals: 9.7
- PCCP and compounds: 5.4
- PP: 8.1
- MP (Recycling): 6.6

Including quantities in deposit system

- Secondary raw material: 30.9
- Secondary raw material: 40.1

- Losses: 13.8
- Losses: 14.8

- Energetic: 55.3
- Energetic: 45.1

Sorting residue: 32.0
MP (Energy): 23.3

Germany

- Aluminium: 1.7
- Ferrous metals: 1.7
- PCCP and compounds: 4.1
- PP: 3.2
- MP (Recycling): 3.1

Including quantities in deposit system

- Secondary raw material: 30.9
- Secondary raw material: 40.1

- Losses: 13.8
- Losses: 14.8

- Energetic: 55.3
- Energetic: 45.1

Sorting residue: 32.0
MP (Energy): 23.3
Reference to adequate economic conditions too imprecise:

**Economics**

- *Macroeconomics (from the overall system view)*
- *Microeconomics (from the point of view of individual cohorts of economic subjects)*

**Business Administration (Operational Economics, Business Administration)**

- *General and Functional Business Administration*
- *Management (Business Management)*

Powerhouse of the individual economic strategies and business models?

Here must the sustainability of the circular economy be anchored.!!!
\[ K = \text{Kosten} \]

\[ U = \text{(ökologischer) Nutzen} \]

\[ E_{\text{max}} \]

\[ E = \text{Erlös} \]

\[ E = K \]

\[ U_{\text{max}} \]

\[ U = \text{Umsatzmaximum} \]

\[ U = (ökologisches) Maximum \]

**Variante 1**
\[ U' = \text{(ökologischer) Grenznutzen} \]

\[ K' = \text{Grenzkosten} \]

\[ E' = \text{Grenzerlös} \]

\[ K' = \text{Grenzkosten} \]

\[ E = \text{Umsatzmaximum} \]

\[ U_{\text{max}} = \text{ökologisches Maximum} \]

Variante 1
\[ K = \text{Kosten} \]

\[ U = (\text{ökologischer}) \quad \text{Nutzen} \]

\[ E = \text{Erlös} \]

\[ U_{\text{max}} = \text{ökologisches Maximum} \]

\[ E_{\text{max}} = \text{Erlösmimum} \]

\[ E = K = \text{Umsatzmaximum} \]

Variante 2
\[ \text{E' = Grenzerlös} \]
\[ \text{U' = (ökologischer) Grenznutzen} \]
\[ \text{K' = Grenzkosten} \]

- E' = K' = (betriebswirtschaftliches) Gewinnmaximum
- U' = K' = volkswirtschaftliches Optimum
- E = K = Umsatzmaximum
- \( U_{\text{max}} \) = ökologisches Maximum