



A typology of Sustainable Circular Business Models based on a hierarchical model and applications in the Bio-economy

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**RUS  
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Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

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# Introduction

- Important barrier to implementing circular bio-economy: need for business models to outperform the non-circular fossil economy
- However, sustainable circular sustainable business models (SCBMs) focus on the environmental and technological part and insufficiently take into account economic and social (governance) issues
- A holistic typology of SCBMs is missing

# Introduction

- Boons and Lüdeke-Freund (2013) identify three streams of SCBM innovation:
  - technological innovation
  - organizational innovation
  - social innovation
- Bocken et al. (2014) build on these streams of innovation to identify 8 SCBM archetypes, representing groups of innovative business models sharing similar traits.
- However, not separate but interlinked phenomena to adjust this typology to include a decomposition into subsystems and arrive at truly sustainable business models

# Objectives

- Design a holistic typology for sustainable circular business models and consequently pathways for sustainable business model innovation
- Explore the feasibility of this typology for the bio-economy
- Preliminary results: illustrations from literature on biogas digesters
- Final aim: use typology to design pathways for sustainable business model innovation for biofertilisers

# Sustainable Business Model Archetypes

Bocken et al. (2014)

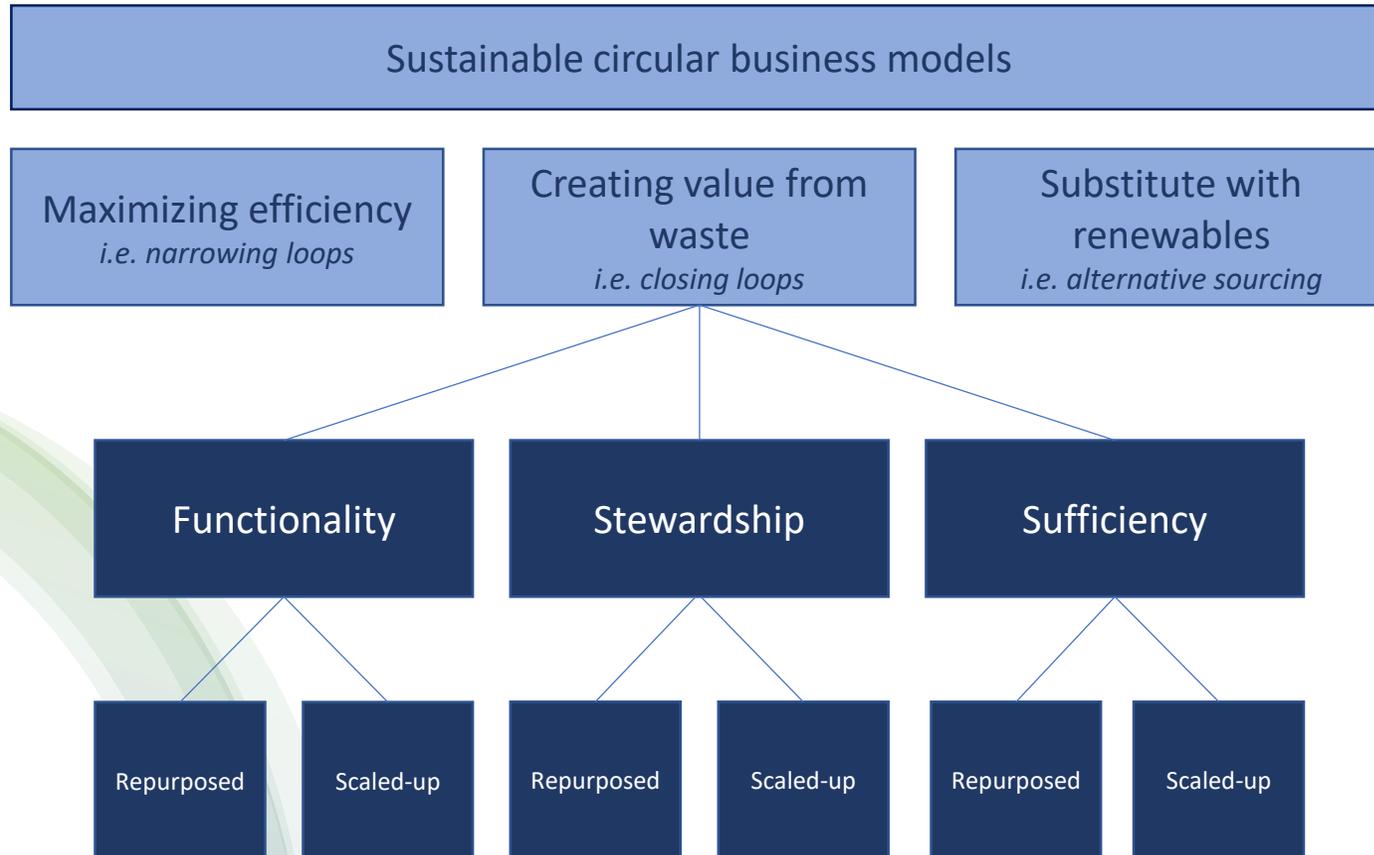
| Groupings | Technological   |                                |   | Social  |  |  | Organisational  |   |
|-----------|---|--------------------------------|---|---|--|--|---|---|
|           | Archetypes  |                                |   | Archetypes  |  |  | Archetypes  |   |
|           | Maximise material and energy efficiency                               | Create value from waste        | Substitute with renewables and natural processes    | Deliver functionality rather than ownership           | Adopt a stewardship role                                   | Encourage sufficiency                                    | Repurpose for society/environment                                 | Develop scale up solutions                                |
| Examples  | Low carbon manufacturing/solutions                                    | Circular economy, closed loop  | Move from non-renewable to renewable energy sources | Product-oriented PSS - maintenance, extended warranty | Biodiversity protection                                    | Consumer Education (models); communication and awareness | Not for profit  | Collaborative approaches (sourcing, production, lobbying) |
|           | Lean manufacturing  | Cradle-2-Cradle                | Solar and wind-power based energy innovations       | Use oriented PSS- Rental, lease, shared               | Consumer care - promote consumer health and well-being     | Demand management (including cap & trade)                | Hybrid businesses, Social enterprise (for profit)                 | Incubators and Entrepreneur support models                |
|           | Additive manufacturing  | Industrial symbiosis           | Zero emissions initiative                           | Result-oriented PSS- Pay per use                      | Ethical trade (fair trade)                                 | Slow fashion   | Alternative ownership: cooperative, mutual, (farmers) collectives | Licensing, Franchising                                    |
|           | De-materialisation (of products/ packaging)                           | Reuse, recycle, re-manufacture | Blue Economy  | Private Finance Initiative (PFI)                      | Choice editing by retailers                                | Product longevity  | Social and biodiversity regeneration initiatives ('net positive') | Open innovation (platforms)                               |
|           | Increased functionality (to reduce total number of products required) | Take back management           | Biomimicry  | Design, Build, Finance, Operate (DBFO)                | Radical transparency about environmental/ societal impacts | Premium branding/ limited availability                   | Base of pyramid solutions   | Crowd sourcing/ funding                                   |
|           | Use excess capacity   | The Natural Step               | Chemical Management Services (CMS)                  | Resource stewardship                                  | Frugal business  | Localisation   | "Patient / slow capital" collaborations                           |   |
|           | Sharing assets (shared ownership and collaborative consumption)       | Slow manufacturing             |   |   | Responsible product distribution/ promotion                | Home based, flexible working                             |   |   |
|           | Extended producer responsibility                                      | Green chemistry                |   |   |  |  |   |   |

Fig. 3. The sustainable business model archetypes.

# A new typology based on a hierarchical model

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Technological - Planet

Social - People

Organizational – Profit/Prosperity

**Pathways for Sustainable Business Model Innovation**

# Business model components

- How do we create value?
- Who do we create value for?
- What is our source of competence?
- How do we competitively position ourselves?
- How do we make money?
- What are our time, scope and size ambitions?



# FUNCTIONALITY

|   |                                 | Definition   | Application: BMs for biogas digester owners  | Case studies  |
|---|---------------------------------|--|--|---|
| 1 | <b>Purposeful functionality</b> | Provide <b>services</b> that satisfy user needs without users having to own products while prioritising delivery of <b>social and environmental benefits</b> rather than economic profit | Firm that owns and services installations located at individual farms/households/firms   | Porto Amazonas (Brazil): Renting biodigesters to the municipality (monthly payment) that are installed in citizen's houses who deposit their organic waste and are provided with energy. Fertilizer is sold to farmers (Catapan & Borsato, 2020).         |
| 2 | <b>Scaled-up functionality</b>  | Provide <b>services</b> that satisfy user needs without users having to own products while <b>scaling</b> sustainability solutions   | Firm owning one or more large plants and providing services to individual farms/households/firms, benefiting from economies of scale | A&S (Italy) orchestrates a network of actors involved in waste recycling in agriculture. They sell a service (waste collection) to their suppliers for a fee and offer the product (fertilizer) to their customers for free (Zucchella & Previtali, 2018) |

|   | Purposeful functionality   | Scaled-up functionality  |
|---|--|--|
| <i>How do we create value?</i>                      | Primarily services   | Primarily services   |
| <i>Who do we create value for?</i>                  | Relational   | Transactional  |
| <i>What is our source of competence?</i>            | Intellectual capability & technology   | Intellectual capability & technology<br>Selling/marketing                    |
| <i>How do we competitively position ourselves?</i>  | Intimate relationship<br>Service quality<br>Innovation                           | Low cost & efficiency<br>Service quality<br>Innovation                       |
| <i>How do we make money?</i>                        | Fixed revenue source, high operating leverage, low/high volumes, low/high margin | Fixed revenue source, high operating leverage, high volumes, low/high margin |
| <i>What are our time, scope and size ambitions?</i> | Subsistence or income model  | Income or growth model   |

# STEWARDSHIP

|   |                               | Definition   | Application: BMs for biogas digester owners  | Case studies   |
|---|-------------------------------|--|--|--|
| 3 | <b>Purposeful stewardship</b> | Manufacture and provision of products/services intended to <b>proactively engage with stakeholders</b> to ensure their long-term health and wellbeing while prioritizing delivery of social and environmental benefits rather than economic profit | Cooperation of farmers/stakeholders owning the technology together for their own benefit, e.g. achieving cost-savings  | Sigma (Sweden): is a farm-based biogas production cooperative with 36 farmers. Most value is sold to external customers but the biogas and –fertilizer is used within the boundaries of the cooperative. (Karlsson et al., 2018) |
| 4 | <b>Scaled-up stewardship</b>  | Manufacture and provision of products/services intended to <b>proactively engage with stakeholders</b> to ensure their long-term health and wellbeing while scaling sustainability solutions   | Cooperation of farmers/stakeholders owning the technology together and using the end-product for their own benefit as well as selling fertilizer or biogas as a new product line | Graskraft Steindorf (Germany): cooperative with 54 farmers running a sustainable biogas project since 2010, selling 70% of the methane produced and returning digestate to biomass suppliers.                                    |

|   | Purposeful stewardship  | Scaled-up stewardship  |
|---|---|--|
| <i>How do we create value?</i>                      | Heavy mix   | Heavy mix  |
| <i>Who do we create value for?</i>                  | Relational  | Relational and Transactional   |
| <i>What is our source of competence?</i>            | Networking/resource leveraging<br>Supply chain management                           | Networking/resource leveraging<br>Supply chain management<br>Selling/marketing |
| <i>How do we competitively position ourselves?</i>  | Intimate relationship<br>Operational excellence<br>Innovation                       | Low cost & efficiency<br>Operational excellence<br>Innovation                  |
| <i>How do we make money?</i>                        | Flexible revenue sources, low operating leverage, low/high volumes, low/high margin | Mixed revenue sources, low operating leverage, high volumes, low/high margin   |
| <i>What are our time, scope and size ambitions?</i> | Subsistence or income model   | Income or growth model   |

# SUFFICIENCY

|   |                               | Definition  | Application: BMs for biogas digester owners  | Case studies   |
|---|-------------------------------|---|--|--|
| 5 | <b>Purposeful sufficiency</b> | Provide high-quality <b>durable products</b> while prioritising delivery of social and environmental benefits rather than economic profit | Farmers/households/firms owning the technology and using the high quality end-product for their own benefit, e.g. achieving cost-savings | Vietnam Biogas Programme (Vietnam): manure collected to use for bio-digestion, digestate used as nutrients for crops and the main purpose of the gas is cooking and heating. (Thien Thu et al., 2012). |
| 6 | <b>Scaled-up sufficiency</b>  | Provide high-quality <b>durable products</b> while scaling sustainability solutions to maximize benefits for society and the environment  | Farmers/firms owning the biogas technology and selling the high quality end-products (fertilizer and/or biogas) as a new product line    | Po (Italy): electricity production via anaerobic digestion of manure provides both greenhouse gas savings and profit for economic operators at the current feed-in tariffs (Agostini et al., 2016).    |

|   | Purposeful sufficiency  | Scaled-up sufficiency   |
|---|---|---|
| <i>How do we create value?</i>                      | Primarily products  | Primarily products  |
| <i>Who do we create value for?</i>                  | Relational  | Transactional   |
| <i>What is our source of competence?</i>            | Production  | Production<br>Selling/marketing   |
| <i>How do we competitively position ourselves?</i>  | Intimate relationship<br>Product quality<br>Innovation                            | Product quality<br>Innovation   |
| <i>How do we make money?</i>                        | Fixed revenue sources, high operating leverage, low/high volumes, low/high margin | Fixed revenue sources, high operating leverage, high volumes, low/high margin |
| <i>What are our time, scope and size ambitions?</i> | Subsistence or income model   | Income or growth model  |

|   | Purposeful functionality   | Scaled-up functionality  | Purposeful stewardship  | Scaled-up stewardship  | Purposeful sufficiency  | Scaled-up sufficiency   |
|---|--|--|---|--|---|---|
| <i>How do we create value?</i>                      | Primarily services   | Primarily services   | Heavy mix   | Heavy mix  | Primarily products  | Primarily products  |
| <i>Who do we create value for?</i>                  | Relational   | Transactional  | Relational  | Relational and Transactional   | Relational  | Transactional   |
| <i>What is our source of competence?</i>            | Intellectual capability & technology   | Intellectual capability & technology<br>Selling/marketing                    | Networking/resource leveraging<br>Supply chain management                           | Networking/resource leveraging<br>Supply chain management<br>Selling/marketing | Production  | Production<br>Selling/marketing   |
| <i>How do we competitively position ourselves?</i>  | Intimate relationship<br>Service quality<br>Innovation                           | Low cost & efficiency<br>Service quality<br>Innovation                       | Intimate relationship<br>Operational excellence<br>Innovation                       | Low cost & efficiency<br>Operational excellence<br>Innovation                  | Intimate relationship<br>Product quality<br>Innovation                            | Product quality<br>Innovation   |
| <i>How do we make money?</i>                        | Fixed revenue source, high operating leverage, low/high volumes, low/high margin | Fixed revenue source, high operating leverage, high volumes, low/high margin | Flexible revenue sources, low operating leverage, low/high volumes, low/high margin | Mixed revenue sources, low operating leverage, high volumes, low/high margin   | Fixed revenue sources, high operating leverage, low/high volumes, low/high margin | Fixed revenue sources, high operating leverage, high volumes, low/high margin |
| <i>What are our time, scope and size ambitions?</i> | Subsistence or income model  | Income or growth model   | Subsistence or income model   | Income or growth model   | Subsistence or income model   | Income or growth model  |

# Concluding remarks

- **Sustainability.** Applying a SCBMs does not mean “100% sustainable” (e.g., environmental goals achieved, but not social ones) → by using a holistic approach → pathway towards more sustainable business model
- **Sufficiency.** Fertilizers and other bio-based products organically break down → encouraging sufficiency = provision of high-quality products improving **durability** of the wider production system (organic fertilizers improve soil quality → reduce need for pesticides and mineral fertilizers)
- **Hybrid forms** of these archetypes are possible
- **Relevant** for other sectors (zero carbon technologies, short supply chains, energy sector). Huijben and Verbong (2013) distinguish three types of PV business models:
  - customer-owned PV business models = sufficiency focus,
  - community solar PV business models = stewardship focus
  - third party business models = functionality focus



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## Rustica Project Consortium

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(OWS) Organic Waste Systems NV

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(BIO) BioSabor, S.A.T.

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(TEC) Fundacion para las Tecnologias Auxiliares de la Agricultura

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(IDC) IDConsortium SL

(CROP) Stichting CropEye

(EVILVO) Eigen Vermogen van het Instituut voor Landbouw, Visserij en Voedingsonderzoek

(TNO) The Netherland's Organisation of Applied Scientific Research

(UGENT) Universiteit Gent

(CIAT) Centro Internacional de Agricultura Tropical

