



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

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

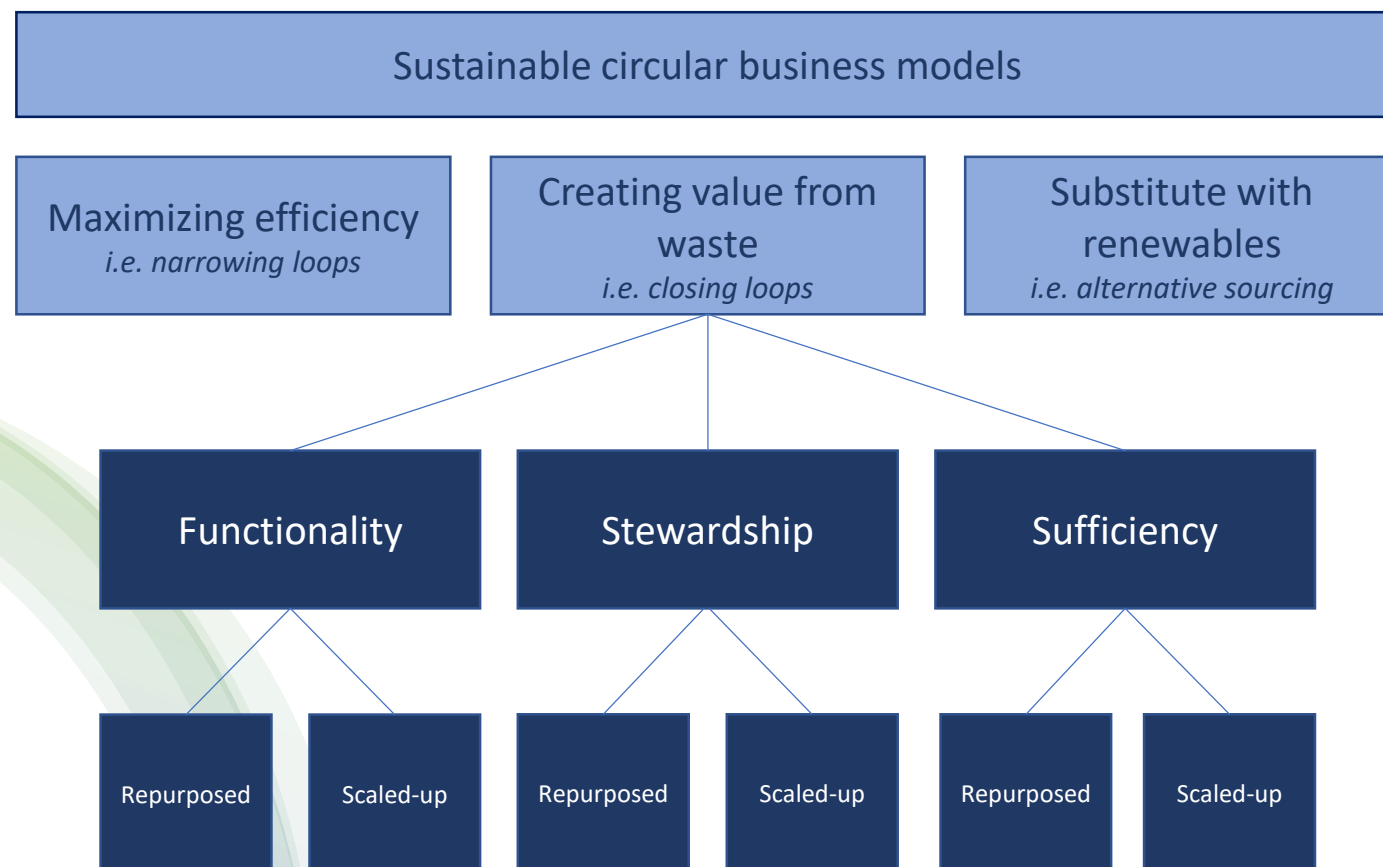
Fig. 3. The sustainable business model archetypes.

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	Purposeful functionality	Provide services that satisfy user needs without users having to own products while prioritising delivery of social and environmental benefits 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	Scaled-up functionality	Provide services that satisfy user needs without users having to own products while scaling 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 Selling/marketing
<i>How do we competitively position ourselves?</i>	Intimate relationship Service quality Innovation	Low cost & efficiency Service quality 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	Purposeful stewardship	Manufacture and provision of products/services intended to proactively engage with stakeholders 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	Scaled-up stewardship	Manufacture and provision of products/services intended to proactively engage with stakeholders 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 Supply chain management	Networking/resource leveraging Supply chain management Selling/marketing
<i>How do we competitively position ourselves?</i>	Intimate relationship Operational excellence Innovation	Low cost & efficiency Operational excellence 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	Purposeful sufficiency	Provide high-quality durable products 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	Scaled-up sufficiency	Provide high-quality durable products 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 Selling/marketing
<i>How do we competitively position ourselves?</i>	Intimate relationship Product quality Innovation	Product quality 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 Selling/marketing	Networking/resource leveraging Supply chain management	Networking/resource leveraging Supply chain management Selling/marketing	Production	Production Selling/marketing
<i>How do we competitively position ourselves?</i>	Intimate relationship Service quality Innovation	Low cost & efficiency Service quality Innovation	Intimate relationship Operational excellence Innovation	Low cost & efficiency Operational excellence Innovation	Intimate relationship Product quality Innovation	Product quality Innovation
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<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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(CREA) Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria

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