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**Author(s)**

van Hees, Marco; Oskam, Inge

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# Stimulating entrepreneurs to make use of waste streams

Business model tools for the residue-driven business model approach

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Marco van Hees<sup>1,\*</sup>, Inge Oskam<sup>1</sup>

<sup>1</sup>Amsterdam University of Applied Sciences

\* m.l.m.van.hees@hva.nl

## Extended abstract

### Introduction

The transition to a circular economy requires products that are based on circular design principles and on business model strategies, which stimulate efficient and effective resource use and prevent waste (Bocken et al., 2016; Geissdoerfer et al., 2017). In practice however, the products and buildings that are currently in use have not been designed for reuse, repair, refurbishment or remanufacturing. How can sustainable entrepreneurs deal with the challenges and opportunities offered by these waste streams? When recycled, these residues are not considered valuable input materials for mainstream producers, as they often do not comply with standard material requirements. However, they may still contain valuable resources for other purposes (Bocken et al., 2017). With the right business model, these waste streams may be transformed into new products.

### Review of the literature

In the typology of sustainable business model archetypes of Bocken, Short, Rana, & Evans (2014), this can be classified in the category 'Create value from waste', which is defined as eliminating the concept of 'waste' by turning waste streams into useful and valuable input to other production and making better use of under-

utilized capacity (Bocken et al., 2014). In the business models described in this category, the design of waste streams is an integral part of product design. In contrast, we seek to develop business models using 'externally sourced waste', i.e. products at the end of the life cycle of a 'regular' industry. For this purpose, instead of starting from a product idea or a customer or market as conventional business models do, a 'residue-driven business model' uses residual material as starting point (Kraaijenbrink et al., 2018). This business model is related to the typology of circular economy business model patterns, as identified by Geissdoerfer et al. (2018). When the 'residue' is decomposed to the level of the material, the 'residue-driven business model' can be considered as a Recycling business model. When the 'residue' is being reused at the level of the product or its components, but for a different use it was originally designed for, it can be considered a Cascading and Repurposing business model. There is a need for 'new business modelling tools that can be customized to the needs of CE business developers and product and service designers' (Geissdoerfer et al., 2018, p.20).

To guide entrepreneurs who are motivated to take a waste stream as a starting point a 'residue-driven business model approach' was designed by experts from the field of business modelling, combining insights from the circular and sustainable business model literature (e.g. Bocken et al., 2016; Lüdeke-Freund et al., 2016) with insights from 'material driven design' (Karana et al., 2015) and practice. The aim of the residue-driven business model approach is to help sustainable entrepreneurs transform waste, unused products and other forms of residue into products or services that make a positive contribution to society (Kraaijenbrink et al., 2018). This can be viewed as a firm-centric approach for planned business models (Breuer et al., 2018). The main goal is not primarily profit-making, but to 'contribute to economic viability, environmental benefits, social concerns and preparation for long-term challenges of business associated' (Geissdoerfer et al., 2018, p.714). Breuer et al. (2018) propose four guiding principles for any sustainability oriented business model approach: sustainability-orientation, extended value creation, systemic thinking and stakeholder integration. They further provide four process-related criteria: reframing business model components, context-sensitive modelling, collaborative modelling process, and managing impacts and outcomes (Breuer et al., 2018).

### **Aim and research method**

The aim of this paper is to elaborate how the application of the residue-driven business model approach can support sustainable entrepreneurship processes,

creating value from waste, based on the guiding principles and process criteria as developed by Breuer et al., (2018). Our research question is: which existing business model tools can help entrepreneurs to develop a residue-driven business model in each of the four phases of the residue-driven business model approach, and what guidelines can assist entrepreneurs in the business development process?

To answer this question, we present the residue-driven business model approach and explore in an academic setting how teams of university students apply the residue-driven business model approach in 10 company projects in which they take on the viewpoint of entrepreneurs. We use a multi-case study approach (Yin, 2017), analysing for each case which tools were used and what measures were helpful in the process to come from a waste stream to a concept of a residue-driven business model. Next a cross case comparison was conducted through pattern matching to develop insights that are analytically valid for comparable cases and for explanation building (Eisenhardt 1989; Yin 2017). The data we used for this study consisted of observations of the researchers during the business development processes of the teams, and process and reflection reports made by each team. Finally, we relate our findings to the guiding principles and process criteria for sustainability-oriented business model development.

### **Preliminary results**

The residue-driven business model approach consists of four phases (Kraaijenbrink et al., 2018): 1. Defining impact: determining the economic, social or environmental contribution that can be made by transforming a specific residue material. 2. From residue to application: based on the unique characteristics of the residue, one or several modes for application and transformation will be searched. This is based on a combination of market, product idea and technology. 3. Creating a value proposition: the chosen application ideas will be developed into a specific value proposition. 4. Business model generation: The chosen value proposition will be developed into a complete business model. This includes the development of a value system and a revenue model that will at least break-even, and addresses the environmental benefits and social impact. Our preliminary findings in respect to the tools that were considered helpful in these phases are presented in Table 1.

Table 1. Useful tools for each phase of the residue-driven business model approach (based on (Kraaijenbrink et al., 2018).

<i>Phase</i>	<i>Activities</i>	<i>Tools</i>
1. Defining impact	Define purpose and intended impact of the business model	Impact assessment at three levels (mission, stakeholder, society), milestone setting to evaluate social, financial and environmental impact
2. From residue to application	Explore material and identify options for value creation and potential application areas	resource based analyses, brainstorming techniques, feasibility/suitability/acceptability studies
3. Creating a value proposition	Develop value propositions and market position	value proposition canvas, customer validation and storytelling
4. Business model generation	Design the (collaborative/circular) business models	mapping business activities and customer journey, business model canvas, (3P) business case

Based on a cross-case comparison of the case studies we aim to derive several lessons in respect to the business model development process. First of all, the complexity of a circular business case requires advanced project management and coaching skills and short feedback loops (e.g. ‘sprints’), using intermediate deliverables to achieve longer term commitment from stakeholders. Second, commitment of all stakeholders is regarded a key success factor which needs elaborate attention throughout the process. Third, a clear and shared view of potential impact and expected outcome is crucial, hence quantification of (intended) impact should be included both at the start and at the end of the residue-driven business development process.

## Keywords

Circular economy; business modelling; business model tools; sustainable entrepreneurship; waste

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