

Circular business strategies and supply chain finance in the Aruba waste sector: A case study of a small island jurisdiction.

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Abstract: This paper focuses on possibilities and obstacles for a circular economy in the waste management sector in Aruba. The authors describe the Aruban economy and the consequences of its SIDS characteristics. The article defines concepts in the field of circular economy and presents a conceptual model for research in this area. Based on multimethod research, the paper argues that small and medium-sized firms (SMEs) in the waste sector in Aruba determine their financial needs partly on the opportunities offered by the international market and price developments. Financing often takes place from own resources or via a local bank. No examples of circular chain financing were identified. Chain cooperation takes place with partners within the existing holding or with international partners, whereby performance and hedging contracts are concluded to guarantee quality and delivery and to mitigate business risks such as price fluctuations on the world market. During the research, it became obvious that limitations resulting from Aruba's small scale and 'islandness' – such as the limited goods flow, limited quantities of feed waste materials and financing facilities offered by the local banking sector, as well as insufficiently stimulating legislation and regulations, coupled with faltering knowledge circulation and social awareness – seriously hamper the development of circular entrepreneurship in Aruba. The article offers policy recommendations to mitigate the bottlenecks for sustainable development in Aruba.

Keywords: Aruba, circular chain financing, circular economy, SIDS, SMEs, sustainable development

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Introduction

Both the global population and living standards are rising rapidly, precipitating increased levels of consumption all over the world. Consequently, waste has become a significant issue. With 2 billion tons of waste being produced yearly, the Earth has reached a tipping point. This waste crisis has garnered attention from media worldwide. China shut itself off to waste from wealthy countries, effective January 2018, and a growing number of developing countries refuse to import trash from the West (Bloomberg, 2019). The pollution of oceans has reached alarming levels, especially due to plastic waste that has created a gigantic 'plastic soup ocean'

(The World Counts, 2019). Most economically developed countries hope to solve their waste problem by incinerating waste. However, this causes carbon dioxide (CO₂) emissions and further warms the planet. This is the outcome of linear economical practices of take, make and waste. The circular economy offers an alternative for the linear economy and a solution for the waste crisis. The circular economy seeks to reduce waste by recovering resources at the end of products' life cycle, channelling these resources back into the production chain and thus reducing the accumulation of waste and relieving some of the pressure on available natural resources (Towards Zero Waste, 2019).

Since waste has become a global problem, it should be solved globally, regionally and locally. In this paper, we present a case study conducted in Aruba, an autonomous country within the Kingdom of the Netherlands, located in the southern Caribbean. For small island jurisdictions with a strong tourist industry, such as Aruba, waste is a real and urgent economic, political and social problem. Local entrepreneurs aiming to implement a circular economy also face financial challenges. Financial institutions are not keen on investing in circular initiatives. Hence, our key research question: *How do small and medium sized firms (SMEs) in the waste management sector in Aruba apply circular business strategies and (supply chain) finance aspects?*

Waste issues in an island context

Various studies on waste management in a regional and island context have been published recently. Camilleri-Fenech et al. (2018) and Fuldauer et al. (2019) refer to a number of issues that affect waste management in small, densely populated and tourism dependent island contexts: space availability; limitations in recycling and resale opportunities due to economies of scale; under-developed infrastructure; lack of regulations and poor enforcement; barriers to moving waste from one country to another; and impacts on the local environment. Camilleri-Fenech et al. (2018, p. 1610) explains these difficulties, as follows:

On islands, issues with disposal and treatment are intensified by the definitive space challenges which reduce the possibility to landfill waste by a large extent, isolated geographies and limitations to outsource some of the waste streams making recycling and recovery of materials problematic due to both the absence of a market for recycled materials and the distance from larger markets.

Considering waste management in the Republic of Malta, researchers note that this archipelago is confronted with many challenges. The high population density, in combination with an intensive tourism industry, leads to a relatively high average rate of municipal waste, partly caused by stay-over tourists generating high amounts of waste. "These factors, coupled with a small, physically separated, land area, leave very little space for landfilling, whilst making the siting of other waste facilities difficult" (Camilleri-Fenech et al., 2018, p. 1611).

In case study research from Trinidad & Tobago, Farley et al. (2018, p. 63) states that the Republic is "... facing problems caused by its high rate of generation of municipal solid waste." The Solid Waste Management Company of Trinidad & Tobago faced various difficulties in operating the plant, due to the small quantities of feed waste material caused by the fact that only small fraction of the waste is being sorted. Moreover,

... exportation of captured material has not proven to be economically viable due to exorbitant operational costs that have been higher than revenues earned from the sale of the recycled items in foreign markets (Farley et al., 2018, p. 63).

The study argued that the distribution of household income levels plays an important role in designing effective policies for waste management in order to scale-up waste recycling in the Caribbean region.

Aruba, a small Caribbean island

Like Malta and Trinidad & Tobago, Aruba is a small island jurisdiction facing challenges in sustainable development related to small size, geographical isolation, the limited presence of raw materials, vulnerability to external shocks and excessive dependence on imports of resources and consumer goods. Thanks to tourism, Aruba has one of the strongest economies in the Caribbean region. In 2018, around 1.9 million tourists visited Aruba (Central Bank of Aruba, 2019). Trade and transport are important tourism-related economic sectors. Due to its location, Aruba is a potential hub in the movement of people and goods between Europe, North and South America.

In 2015, Aruba had 109,028 inhabitants with 97 nationalities from 133 different countries. By 2030, 132,000 people are projected to live on the island. Aruba measures 183 km² of land area and has a population density of 564 inhabitants per km². This puts the island jurisdiction in 16th place on world rankings in terms of population density (Central Bureau of Statistics Aruba, 2016). Aruba's 2018 GDP per capita was US\$23,630 and the unemployment rate for 2017 reached 8.9 percent. This relatively high income per capita in combination with the spending power of tourists leads to a strong consumption base and, as a result, high waste volumes (Central Bureau of Statistics Aruba, 2016; World Bank, 2019).

Waste issues in Aruba

Aruba's economy is at the back-end of the value chain. Ecological circumstances are partly the reason that Aruba has almost no local production and imports almost all of its material needs. This means that recycling is often one of the few options for maintaining products and materials in the value cycle. The island's economies of scale results in small volumes, short value chains and relatively powerful positions for private companies. Partly due to the high costs of recycling, only an estimated 2.4 per cent of residential waste, as of early 2018, was being recycled (researchers' estimates). Also, only very small fractions of the residential waste are being sorted, mostly due to efficiency matters, such as the routing of the waste collection and investment decisions related to the technical lay-out and capabilities of Aruba's, privately managed, waste plant.

In 2012, the Working Group on Illegal Dumps mapped out Aruba's waste problem. It described the drastic increase in illegal dumping practices for waste from 2003 onwards, in particular after the introduction of the tipping fee at the official waste disposal site, called Parkietenbos, in 2005. In addition, illegal dumping became more and more frequent. This concerned in particular the dumping of waste at private dump sites for which no permit has been issued. In 2012, 62 excavations – most of them formerly used for sand extraction – were known, at least half of which were being used as illegal dumping sites. The report indicates that between 2003 and 2010, Aruba produced 80 to 130 kilotons of waste on an annual basis, 30 to 80 kilotons of which was dumped illegally (Werkgroep, 2012). To establish an integral

solution, the Government of Aruba submitted a so-called Request for Information (RFI) to companies in 2017. The purpose of the RFI is to arrive at a sustainable waste management system, in line with the ideas of the circular economy. “The amount of solid waste generated on Aruba is estimated at 130 to 150 kilotons per year” (RFI, 2018). Compared to the figures in the *Cero Tolerancia* report (Werkgroep, 2012), this is an increase of at least 15 percent in seven years.

Since 2010, Aruba has been investing in a green future. The government aimed to annihilate fossil fuel dependency for the generation of electricity and potable water through the introduction of wind and solar parks, promoting electric vehicles and smart communities. The establishment of a (corporate owned) waste-to-energy plant would reduce both waste management issues and fossil fuel dependency (Robertson, 2018).

The Socioeconomic Council (2017) of Aruba published an advisory report regarding the circular economy, which presented recommendations focused on awareness, adaptation of laws and regulations, the implementation of market incentives and the stimulation of financing for sustainable development. The final recommendations emphasize the need for knowledge-building, innovation and cooperation.

In the government program of the Wever-Croes Cabinet (Kabinet Wever-Croes; 2017; Minister di Enseñansa, Ciencia y Desaroyo Sostenibel, 2019), sustainability has been designated as a top priority. Sustainable agriculture and waste management in particular receive special attention. Regarded as an important environmental issue, the program seeks to pursue an efficient and effective waste policy, whereby waste can be recycled into valuable products that can be sold on the international market.

Research question

This paper is based on the outcome of inter-university research that brought together knowledge and experience about the circular economy and supply chain finance issues in the Netherlands and Aruba to support SMEs in both countries. In order to promote effective waste management from a circular economy perspective, the central research question was formulated as follows:

How do SMEs in the waste management sector in Aruba apply circular business strategies and (supply chain) finance aspects?

To answer this question, the following sub-questions were prepared:

- What strategies do companies use to generate added value from residual products and to what extent are these strategies circular?
- How do companies determine financial opportunities and risks in a circular supply chain, when they conclude contracts with customers or other chain partners?
- How can companies identify, develop and utilise financing opportunities if they undertake a circular supply chain?

Circular economy, business strategies and waste management

The concept of circular economy is a fascinating one, and especially as applied to small island states and territories (Bertram & Poirine, 2018). As mentioned in the previous section,

different island contexts share similar characteristics that make this a valuable issue to study. In this section we discuss how the circular economy can foster businesses and mitigate waste issues.

We start off with defining the concept of the circular economy. Next, different circular business models are discussed. We close this section by distinguishing between circularity in production and material chains.

Definitions of the Circular Economy

A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (Ellen McArthur Foundation, 2015, 2019). In this research, we have chosen the definition of a circular economy by Geissdoerfer et al. (2017), with its emphasis on value retention of products, product components and materials. Geissdoerfer et al. argue that the materials and energy used in the supply chain need to be restored as effectively as possible in the circular economy and that there are various ways of achieving this. According to their definition, the circular economy is

a regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing and recycling (Geissdoerfer et al., 2017, p. 763).

This definition emphasizes three important issues that companies must deal with, namely: 1. optimum reuse of products and product components; 2. high-quality recycling of materials; and 3. the prevention of polluting residual material and energy flows (emissions, waste, or low-value recycling).

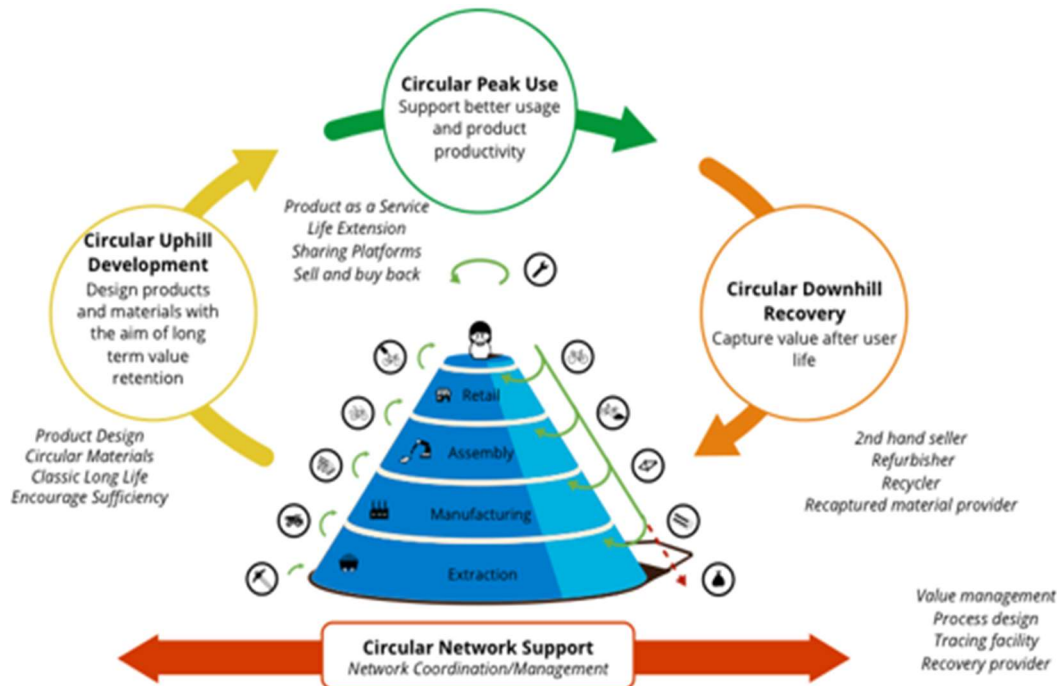
Circular business strategies

A widely used business model categorisation is that proposed by Accenture (2014). Based on a research study of some 120 companies with circular strategies, it identifies five main strategies: 1. circular supplies; 2. resource recovery; 3. product life extension; 4. sharing platforms; and 5. product-as-a-service. Given that Aruba is in an early stage of becoming a circular economy and is at the end of the value chain, ‘resource recovery’ and ‘product life extension’ are the most relevant strategies. *Resource recovery* aims to not only minimize resource output but also maximise the value of products by taking the materials or product components back, to re-use them. *Strategies extending the life of products* are focusing on repairing, upgrading, reassembling and marketing of products (e.g. service logistics).

In addition to Accenture, the so-called ‘Value Hill’ of the Sustainable Finance Lab is of interest (Achterberg et al., 2016). This model was developed by the Finance Working Group in 2016 while examining financial barriers to entrepreneurs with circular business strategies. The Value Hill distinguishes four different types of circular strategies: circular design models, optimal use models, value recovery models and circular support models (see [Figure 1](#)). The strategies are related to the different stages of the life cycle of a product: the pre-use phase (extraction, manufacturing, assembly and retail), the use-phase (on top of the mountain) and the after use phase.

The figure demonstrates that Accenture's circular strategies 3, 4 and 5 are mainly applied when the product is used extensively and the focus is on value creation. This occurs whilst resource recovery takes place more "downhill" in the value cycle, whereby efforts are made to achieve value retention.

Figure 1: The Value Hill.



Source: Achterberg, Hinfelaar & Bocken, 2016.

The Value Hill provides insight into how the value of products works. The value of circular uphill development yields the highest value, while there is limited value left in the stage of circular downhill recovery. This implies that the earlier businesses interfere in the supply chain, the more value will be maintained.

To preserve value added and optimise the residual value of products after use, collaboration within the value network is essential. Therefore, the Value Hill distinguishes circular support models that are engaged in the management and coordination of circular value networks (Achterberg et al., 2016). So-called performance-based contracts (PBCs) are interesting in this respect because they offer,

[a] contractual approach of tying at least a portion of supplier payment to performance ... The key characteristic of PBC is an emphasis on specification and evaluation of outputs or outcomes rather than required inputs, activities or processes (Selviaridis & Wynstra, 2015, p. 3505).

Circularity in product chains

So far, the circular economy has been merely presented as an economic system in which products and product components are reused, materials are being recycled, and natural resources are being conserved, while pursuing the creation of added value in every link of the system. In this system, products and materials flow back and forth through the supply chain,

from extraction to recycling and recovery. In a research study by Utrecht University commissioned by the Dutch Government (Potting et al., 2017), the target was on product chains, rather than material chains. In their policy report, the product chain is defined as follows,

A product chain tracks products from the extraction of natural resources to waste treatment after they have been discarded ... In a circular economy, the materials recycled from a discarded product ideally retain their original quality so that they can be applied again in a similar product. As a result, no additional natural resources are needed to produce materials, and discarded products no longer become waste. This *ultimate circularity*, in which a product chain is closed because the materials can be applied over and over again, is probably not feasible in practice. It is, however, the ideal situation which circular economy transitions aspire to bring about (Potting et al., 2017, p. 4).

Moreover, several circularity strategies can be distinguished, based on this variety in reduction of the consumption of natural resources and materials, and minimising the production of waste.

Smarter product manufacturing and use, for example by product sharing, are generally preferred over extending the lifetime of products, because this product is being used for the same product function or more users are being served by one product (strategy with high circularity). Lifetime extension is the next option and is followed by recycling of materials through recovery. Incineration from which energy is recovered has the lowest priority in a circular economy, because it means the materials are no longer available to be applied in other products (*low-circularity* strategy). As a rule of thumb, more circularity equals more environmental benefits (Potting et al., 2017, p. 4).

This priority of circularity within the production chain is closely related to the so called ‘waste hierarchy’. Originally coined by a Dutch politician, this ‘ladder’ evaluates and places the various ways companies handles their waste materials. This ranges from most beneficial to most unproductive: reduce, reuse, recycling, energy creation, incineration and landfill (Lansink, 1979). The ‘ladder’ establishes a hierarchy of waste management in hopes of adopting newer and cleaner ways of taking care of waste. It evaluates which methods would be more efficient and environmentally-friendly for the surrounding area (Dabian, 2018). This way of prioritizing or to establish a hierarchy in circularity strategies can be effective for evaluating circularity strategies in waste management and designing and evaluating policy making in this area.

Conceptual model

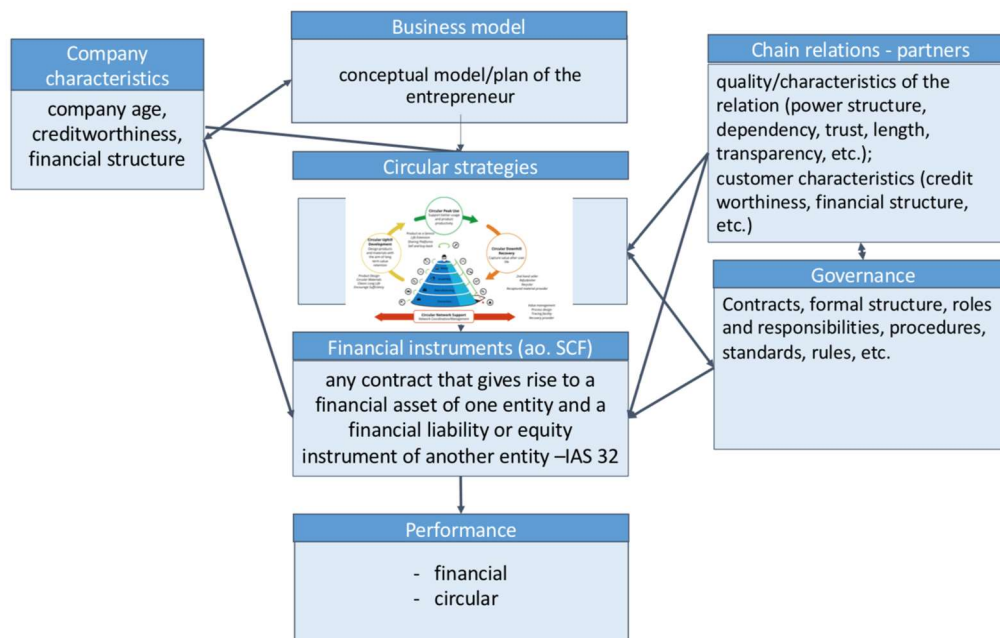
The previous section served as a select literature review on the concept of the circular economy in relation to business models and waste management. In this section, we focus on the conceptual model of the research, building further on the conceptual framework. The key concepts containing the elements of the conceptual model are introduced first, followed by the conceptual model.

Key concepts

The conceptual model (see Figure 2) consists of the following key concepts: business model, circular strategies, financial instruments, circular performance, financial performance, chain relations and governance. These conceptual elements are defined below.

The *business model* of a company describes the way a business creates value by bringing its products and services to the market, in collaboration with whom, for whom and with what motives (Osterwalder, 2010). As part of the business or value proposition, a company (or multiple companies within a supply chain) can use *financial instruments* to remove risks from customers, guarantee functionality, enable payment in installments (consumption based on income instead of capital or debt), or relieve customers from financial and administrative burdens. These and other advantages and disadvantages of financial instruments can be found in the ‘supply chain finance’ literature that has been recently published (Feenstra, Engbers & Steeman, 2017). A circular business model also applies one or more circularity strategies.

Figure 2: Conceptual Model for Circular Business.



Source: Olthaar, Roetman & Vegter (Eds.) (2019, p. 12).

The extent to which a company is circular, however, does not depend so much on the chosen strategies and whether financial instruments are being used, but mainly on the core activities and the performance achieved. To this end, in addition to financial performance, circular performance in particular is an important benchmark. *Circular performance* reflects the extent to which circular strategies are successfully and sustainably implemented, whereas *financial performance* can be defined as the extent to which the circular strategy’s application results in sustainable value creation/social profit. Finally, to achieve circular business in the value chain, there is a need for coordination of activities, flows of resources and services. Therefore, the circular economy requires a chain perspective in which companies need to collaborate to seek new business opportunities and share risks. To this end, *chain relations* need to be institutionalised in partnerships; and various forms of *governance*, such as contracts, procedures, standards and rules should be integrated in the circular strategies.

Conceptual model

The conceptual model shows the relationships between the different concepts and variables. For example, an arrow is visible in the model between ‘financial instruments’ and ‘performance’. When financing solutions are an instrument for realising value creation, it is important that this relationship is demonstrated. Furthermore, the conceptual model provides a structure for the multi-case analysis as presented below, where the same concepts and relationships of the model will be used.

Methodology

This section discusses the methodological design of the research. First, the selection of participating companies is justified. This is followed by an explanation of the methods used for data collection. Finally, attention is paid to the validity and reliability of the research.

Sampling and data collection

This project involved an investigation of Aruban SMEs with a concept, company or business unit focused on the circular economy in waste management. Based on the sampling method, four companies were selected, two of them being the only privately owned waste collecting company and manufacturing company including a waste-to-energy production facility. The two other companies are local SMEs, with resource recovery and recycling as business strategies. All participating companies were informed about the purpose of the study and the conditions for participation. Agreements were also made about confidentiality.

In the spring semester of 2018, student studies were conducted under the supervision of the main researchers. Windesheim Honours College students explored the possibilities of the circular economy in Aruba (Hildemann et al., 2018), and best practices for the tourism sector to solve issues in this context. Also, three students of the University of Aruba conducted case study research at the companies that were involved. The research at Antilla Energy (Thiel, 2018) focused on identifying financing options for circular entrepreneurship in Aruba. Research at Daltra (Henriquez, 2018) focused on the role of the government in creating conditions for circular entrepreneurship in commodity trading and in waste products. The Ecotech/Ecogas study (Dabian, 2018) discussed circular principles within waste management and evaluated the energy transition by means of gasification as ‘greener’ methods of waste management. The research techniques varied from document research to business research, interviews and observations. Based on the results of these studies, researchers conducted interviews with the management of participating companies in the presence of the students. The purpose of the interviews was to collect data about the business model, business activities and processes, the company’s vision on the circular economy and how the circular economy is applied to business operations. In addition, specific topics were discussed, such as the financing of the company, the relationship with customers and chain partners and how these relationships are converted into business contracts to reduce risks. Semi-structured interviews were conducted, based on a topic list shared with the companies prior to interviews. Based on transcripts and notes, reports were prepared and sent to interviewees for approval. After the interview reports were approved, a multi-case analysis took place. First, the data was analysed deductively (based on the theoretical model) and then inductively (based on the data). The preliminary analyses were discussed with experts from the business community, the government and the University of Aruba in two focus group sessions.

Reliability and validity

Various measures have been taken to ensure reliability. Firstly, the research design came about through collaboration between different researchers and different disciplines and universities, each with their own relevant experience and knowledge. Secondly, under the supervision of the researchers, students then interviewed the participating companies in the project. The companies acknowledged that they were satisfied with the results and the relevance of the conclusions and recommendations. Thirdly, an iterative process was chosen: companies were visited several times, if necessary, to check the data collection and to supplement it further. Because of these measures, the risk of measurement errors was reduced as much as possible.

Various measures have been taken to ensure validity. For example, the theoretical framework and the questionnaire were based on relevant scientific sources. In addition, fieldwork was carefully compared with desk research to identify any inconsistencies. A protocol was used to ensure that data collection at the various companies took place in an identical manner. The researchers analysed the data of the individual companies and the results were critically examined during a stakeholder meeting. Finally, the findings were tested and deepened during focus group discussions with participating companies and stakeholders from the government and academia, totalling up to 17 focus group participants.

Data analysis

Research results are next discussed. First, to get acquainted with the core business of the companies involved in this study, their characteristics will be compared, highlighting the main similarities and differences. Next, based on the conceptual model, the circularity of the business and finance constraints will be analyzed, including the extent to which the business models of the companies contain circular aspects and how financing and governance structures are related to circular strategies.

Company characteristics

Antilla Energy is a trading company buying edible oils from abroad and selling these to the hotel industry. In its business operations, Antilla Energy includes return logistics of waste oil and for that reason it is being considered in this case study as a waste company. Both Ecotech and Ecogas are doing business in the local waste sector. The activities and processes of both companies are closely aligned within the waste supply chain. Ecogas is a manufacturing company including a waste-to-energy production facility, with Ecotech as its most important supplier. Therefore, both companies are treated as one case study. Daltra is a scrap and demolition company that covers its own niche within the waste management sector. Table 1 lists the differences and similarities of these companies.

In general, the companies have the same financing structure, with retained earnings as a main source of financing the growth of the company. All four companies were founded as family businesses. Currently, ownership and management differ per company. In 2013, Antilla Energy was merged with an existing local entity and turned into an NV¹ to attract international capital and investment. Daltra has been run, from its establishment in 1973 until now, as a

¹NV is the equivalent of a corporation, according to Aruban law (Chamber of Commerce and Industry Aruba, 2020).

family business wherein management and ownership largely coincide. Both companies have a simple management structure. Ecotech and Ecogas are affiliates of the Metacorp holding, where decision-making takes place.

Table 1: Company characteristics.

Firm	Antilla Energy	Daltra	Ecotech	Ecogas
Financed By	Local owners /international investors	Ownership by majority shareholder	Holding	Holding
Year of Establishment	2014	1974	1999	2014
Established by	Owner	Owner	Purchased	Holding company
Labour/ Capital Ratio	Labour intensive	Labour/capital intensive	Labour/capital intensive	Capital intensive
Reporting to	Directors/ owners	Directors/owners	Management board	Management board
Products/ Components/ Materials	Edible oils, motor oils	Non-ferro, ferro metals	General waste, construction and demolition waste, sand, paper and carton	General waste, bio waste

Multiple case analysis

Table 2 summarises the results of the case studies, from which some conclusions can be drawn. First, only two of the four companies have a business model that can be linked to a circular strategy as described in the literature: Antilla Energy and Ecogas. Antilla Energy has a clear circular business model, entailing a so-called closing-the-loop or circular supply strategy whereby residual products are reused as raw material for a new production chain. In terms of the study by Accenture (2014), it is a Resource Recovery strategy: minimising residual flows in the material chain and maximising the value of products that end up in return flows (return logistics). Also, Ecogas is a company with a clear circular business concept focused on waste-to-energy production. The other two companies, Ecotech and Daltra, are doing business that includes circular elements, but without a clear circular strategy or focus. Ecotech applies circular elements in its business strategy by reusing waste as a raw material to produce construction products (concrete and bricks) or reusing auxiliary material (water) and other eco-efficiency strategies. Daltra capitalises on residual values of waste products by offering these for recycling.

Secondly, when it comes to financing methods, such as supply chain finance arrangements and using financial instruments, none of the cases offered concrete examples. This can be seen as an outcome of market conditions prevalent within the sector. Originally, the government handled waste management through Serlimar, a government-owned company heavily dependent on subsidies. In 1999, Ecotech entered the waste market and introduced a business model focused on high-quality service, in order to serve its clients in a different way.

Since then, and due to these oligopolistic market conditions in Aruba, the waste sector is still dominated by these two companies. Ecotech, as a subsidiary company within the Metacorp concern, has a strong, autonomous corporate culture, resulting in limited cooperation with external parties.

Table 2: Summary multiple case study analysis.

Analysis aspect	Antilla Energy	Daltra	Ecotech	Ecogas
Circular strategy?	Yes	No	Partly	Yes
Type	Closed loop / resource recovery	Recycling	NA	Resource recovery
Market developments related to the business model	Biofuel > oils: new business opportunities.	Large demolition projects: scrap metals.	NA	Waste to energy: New fee structure for commercial clients.
Financing based on circular strategy?	No	No	No	No
Chain finance applicable	No	No	No	No
Financial instruments?	No	No	No	No
Contracts with chain partners	Yes	Yes	No	No

Daltra is also a major player in its market segment, but serves a niche market. The competition between these companies is low and cooperation is limited. With respect to Antilla Energy, local financial providers were very conservative in their financing methods at the time of the merger and were skeptical about innovative, but risky, projects. Among seven financial providers, only one offered a green banking product for local companies with a circular business model (Thiel, 2018). It is therefore not surprising that business loans are the most common form of credit in Aruba. This means that the financing options for companies active in the circular economy are practically identical to those for companies operating in the linear economy. Moreover, a majority of the financial service-providers surveyed estimated the risk of investing in a company with a circular business model from medium to high. Hence, financial service-providers in Aruba still opt for conventional forms of credit and financing (Thiel, 2018).

Looking at governance and chain relations only, Antilla Energy offers performance-based contracts as a modality for collaboration with buyers and/or suppliers in the field of return logistics for the benefit of product quality and supply certainty. This also helps to mitigate business risks and provide (financial) incentives to suppliers for the reliability of supply and/or guarantees of product quality. For example, contracts with suppliers specify delivery efforts and quality characteristics that products require in order to comply with the terms of the delivery contract. The other companies did not show specific governance

characteristics in that sense. This might lead to the conclusion that there is a connection between the circular strategy of the company and the extent to which contracts are being used as part of the chain relationship. Antilla Energy has a circular business strategy, which also has very specific governance characteristics. This can be illustrated in the conceptual model by the arrows between the chain relation and both governance and circular strategies (see [Figure 2](#)). Daltra operates in a high trade market where margins are small and trust between chain partners is a condition for doing business. To mitigate price risks, hedging contracts are used for trading in non-ferrous metals.

Research results

In this section, research results are discussed. The results are illustrated by various examples collected during the case studies. Despite the limitations of validity that arise with this way of presenting the results, such case study material nevertheless enriches the research data and improves the readability and understanding of the subject matter. Scale, business strategies and circular strategies turn out to be intertwined.

Circular business strategies

The first research sub-question relates to the extent to which circular strategies are being used by participating companies to generate value out of waste. Within the small island economy context, participating companies are operating in the local context, whilst international market developments – characterised by the small size of good flows, import and export taxes and international freight and transport costs – are carefully considered. Where circular chains cannot be closed locally – as is often the case – the international market is explored. The chosen circular strategies differ per company. Two downhill recovery strategies that capture value after usage life were identified: resource recovery and waste-to-energy.

Resource Recovery

Antilla Energy uses the resource recovery strategy by collecting used virgin oils, cleaning and re-selling the oils to international customers. Before setting up return logistics, the company ensures sufficient sales from the edible oils business. This generates a fixed income stream that is used to maintain the return logistics of the oils. This strategy is combined with financial incentives to collect waste oils, such as sales discounts and a free weekly collection service. Antilla Energy is the owner of the waste bins and containers and takes care of their maintenance. The company wants to create awareness about the residual value of used cooking oil.

As a recycling company, Daltra makes value out of waste by recycling all kinds of scrap metals. Before introducing a new product line, Daltra ensures sufficient waste volume and tests whether a certain waste stream is sufficiently large. For example, car wrecks have been added to the core business of Daltra since 2010. Before investing in a large shredding machine, the company collected old used cars to find out whether the supply of car wrecks was sufficient to have a guaranteed waste stream. Both examples are showing that volume is an important factor to run a circular business, especially in a small-sized economy like Aruba.

Finally, Ecotech, its sister company Ecogas and other subsidiaries of Metacorp are applying resource recovery strategies by reusing waste as a raw material (concrete waste) for producing bricks and auxiliary material such as waste water for cleaning company vehicles. At almost all business units, residual products and waste are reused as much as possible. Ecotech

also applies a policy of eco-efficiency. Examples include: hybrid company cars, efficient power supply and responsible use of air-conditioning.

Waste to Energy

Ecogas processes (as per 2018, before the contract with Serlimar was signed), about 20 to 24 tons of waste per hour. In the processing, it focuses on waste-to-energy production. Ecogas has installed a gasification plant that is not yet running, but operational. Ecogas recently entered into a partnership with an international consortium. The aim is to participate in a government tender for an integrated solution to the waste problem (the so-called RFI). Waste-to-energy can be part of waste processing, with Ecogas providing the gasification installation.

Financial potential and risks

The second sub-question concerns the way financial possibilities and risks are being identified in a circular logistic chain. Two examples are used to illustrate this. The first relates to Ecogas, which processes the waste that comes in from Ecotech and has a gasification installation to transform the waste into energy. The main competitor on the island, Serlimar, is a *sui generis* company owned by the government. Both companies serve two market segments that can be split into residential and business clients. Ecotech serves 40% of the residential market but is very strong in the B2B market. In 2018, Serlimar signed a contract with Ecogas to handle Serlimar's total waste stream, to confront the large pollution problem caused by the landfill, Parkietenbos. Part of the deal specified that the fee structure for business clients should be adapted both for Serlimar and Ecotech, leading to higher fees. In this example, a changing client base led to three-fold higher fees.

The second example relates to Antilla Energy. Besides various incentives such as sales discounts, free collection services and regular maintenance, Antilla Energy secures multi-year contracts with its clients, which include training conditions and quality agreements. This is in order to ascertain the quality of the residual products that clients are collecting to ensure good product quality. This, in turn, provides a reliable waste stream and seeks to maintain a long-lasting relationship with their clients. This also lowers the market risks for Antilla Energy when it comes to dealing with price fluctuations on international commodity markets and ensures the certainty of on-time deliveries to their international client base.

Financial constraints

The third and last research question deals with financial opportunities when doing business in a circular supply chain. Given that local financial institutions are conservative in corporate banking, it is not surprising that companies are having difficulties when it comes to accessing financing for their circular business or projects. Our research results suggest that the companies involved are solving this issue by either internal financing or seeking international investors or mergers. As an example of the latter, in 2013, the former company named Biofuel managed to engage an international group of investors, leading to a merger of the company into what is now called Antilla Energy. This was necessary because the merging local company faced many difficulties in convincing local banks to invest in its operations.

Answering the main research question will consider the characteristics of the investigated SME companies in the waste sector in Aruba, which determine their financial needs partly on the opportunities offered by the international market and price developments. As mentioned, financing often stems from their own resources or is acquired from local banks. No examples

of circular chain financing were identified. Chain cooperation takes place with partners within the existing holding, with local companies or partners within the supply chain, or with international partners, whereby performance and hedging contracts are forged to guarantee quality and delivery and to mitigate business risks such as price fluctuations on the world market.

Small economies: Stakeholder recommendations and discussion

Research results show that limitations resulting from Aruba’s small scale and its ‘islandness’ – such as the limited flow of goods due to the small scale, very limited quantities of feed waste materials and financing facilities offered by the local banking sector – seriously hamper the development of circular business in the island’s waste management sector. This begs the question: what interventions could contribute to the further implementation of circular economy practices in the waste management sector in Aruba?

Stakeholder recommendations

To a significant degree, bottlenecks hindering the development of circular business models in Aruba’s waste processing sector stem from the structural – both financial and non-financial – characteristics of Aruba as a small island economy. The following recurring bottlenecks were identified during two focus group meetings: the small scale and consequently limited waste volume of the island; the financing limitations due to conservative financial institutions; inadequate legislation and policies and the lack of sanctioning; and finally the lack of circular economy knowledge, awareness and behaviour in the business environment in general. Box 1 recaps the bottlenecks due to the small island context.

Box 1: Small island context and circular economy bottlenecks.

Context: structural characteristics		Bottlenecks Aruba
Small scale and island context	Financial structural characteristics	Scale and waste volumes
Conservative financial institutions		Limited finance possibilities
Conservative governance policies	Non-financial structural characteristics	Legislation and sanctioning
Lacking knowledge economy		Knowledge, awareness and behaviour

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These issues were discussed with a total of 17 stakeholders who came up with various possible solutions as summarised in Box 2. Scale and waste volumes and limited finance possibilities were evident from the case studies. During the focus group sessions, stakeholders confirmed that specific legislation to stimulate a circular economy is lacking and that sanctioning systems – for instance, to avoid illegal dumping or enforce the single-use plastic ban – are not in place. Also, there is little knowledge and awareness within the community

about environmental issues and how Aruba can take better care of its natural resources, resulting in a lack of rigorous behaviour and collective action to change consumption patterns and business practices in Aruba.

Box 2: Focus group meeting recommendations.

Session	Topic
<i>Session 1</i>	<i>Finding financing solutions for small- and medium-sized Circular Economy companies: banking, subsidies and private financing.</i>
Small scale and island context	<p>Recommendations</p> <p>Scale size and waste volume:</p> <ul style="list-style-type: none"> ➤ Limit imports of products, in particular packaging materials to reduce waste volume, ➤ Promote use of outgoing shipping. <p>Scale and re-use:</p> <ul style="list-style-type: none"> ➤ Incentives for local upcycling and pooling, such as joint waste collection with neighboring islands, ➤ Re-use of more items, such as car parts.
Financial institutions	<p>Recommendations</p> <ul style="list-style-type: none"> ➤ Inform local financial institutions about circular economy best practices and involve them in the local and regional circular movement, ➤ Tap into modern financial methods, such as crowd-sourced funding and (international) grants, ➤ Apply financial incentives such as refunds, ➤ Make use of joint office spaces (in vacant buildings).
<i>Session 2</i>	<i>Non-direct financial incentives for the development of a Circular Economy (CE) and stimulation and regulation for companies and consumers.</i>
Government policies	<p>Recommendations</p> <ul style="list-style-type: none"> ➤ Laws and regulations: Promote CE regulations in combination with financial incentives, ➤ Investment policy: set conditions for hotels and oblige other investors to invest in ‘green projects’.
Knowledge economy	<p>Recommendations</p> <p>Knowledge and capacity-building:</p> <ul style="list-style-type: none"> ➤ Start local and regional knowledge-sharing CE platforms, ➤ Organize triple-helix think-tanks to initiate CE projects with the participation of the business community, government and universities/colleges. <p>Create awareness:</p> <ul style="list-style-type: none"> ➤ Promote public information via marketing campaigns, ➤ Certification programs based on international criteria (such as B-corp) for circular entrepreneurship. <p>Behaviour and responsibility:</p> <ul style="list-style-type: none"> ➤ The circular economy starts with responsible citizenship and consumer behaviour. ➤ Lifestyle adjustment can be achieved through public (consumer) events with sponsorship from local and international companies.

Discussion

This research demonstrates that, in Aruba, logistics and transport costs to, from and even within islands are relatively high. Infrastructures tend to be weak while local governments and business environments often lack laws, policies, (financing) tools and knowledge to promote circular entrepreneurship. These issues, due to specific socio-economic, environmental, governance related characteristics are quite similar to those of other small island states and territories, including Malta, and Trinidad & Tobago, and they hamper the development of the circular economy. It seems also that these issues are intensifying, leading to more structural problems when it comes to waste management; this hinders these island jurisdictions in moving towards a more sustainable (hence: circular) path way. The research also suggests that in Aruba waste management is not yet based on circular principles. Nevertheless, a few companies have managed to implement circular strategies (Antilla Energy and Ecogas). The island is taking its first steps in implementing (some of) the principles of the circular economy.

The stakeholder meeting recommendations revealed that the road to a more developed circular economy in Aruba must be coordinated: taken together by the business community, the government, social (knowledge) institutions and citizens. Collaboration between entrepreneurs, researchers, legislators and policymakers can create and increase opportunities for sustainable and circular entrepreneurship. It is up to the business community, and to some extent the academic community, to come up with innovative solutions for extending product life, reducing the use of raw materials and applying circular principles such as re-using, recycling and refurbishing. However, the financial sector can support these innovations by offering other modern financing products that are based on criteria other than conventional financing methods.

The government has the task of providing adequate conditions and a healthy investment climate for companies with a circular business model, concept or project. The University of Aruba and other knowledge institutions can contribute through research, knowledge-sharing, increasing public awareness and by introducing environmental education in their curricula. And last, customers are responsible for making smart and sustainable choices when buying goods and services. Together, all such actions can make a difference by setting a good example through citizen-driven initiatives and activities, making wise choices with regard to the ownership and use of products and, critically, through purchase and leasing decisions regarding ecologically responsible products.

The literature suggests that implementing circular economy principles does not only create more value to the disposed products and materials – making the business case more feasible – but would also lead to fewer waste streams and hence: more environmental benefits, which is in favour of the entire island community. Furthermore, implementing circularity strategies, like product sharing, life-time product extension and recycling as well as waste management strategies according to the waste hierarchy (Lansink's ladder) can be effective in slowing, closing, and narrowing material and energy loops, less waste streams and less consumption of products.

Given the exploratory nature of this research on circular waste management in Aruba, it is not our ambition to make general statements about opportunities for circular entrepreneurship in Aruba. We believe that the internal validity of this research is sufficiently guaranteed by the careful way in which data were collected, analyzed and fed back to the stakeholders in Aruba and the experts in both the Netherlands and Aruba. The findings also tie

in with those of the Socioeconomic Council (SER, 2017) and more recently Aruba's strategic vision of the Minister of Education, Science and Sustainable Development (2019), as well as with international literature. Furthermore, we believe that many of the bottlenecks mentioned in this paper also hamper the development of the circular economy in other sectors of the Aruban economy and, consequently, the recommendations discussed with the stakeholders would also be beneficial to the implementation of circular economy in other economic sectors.

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