

# Frugal Innovation and Circular Economy at the Local Level

A case study in the Colombian coast

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## Abstract

Frugal innovation (FI) and circular economy (CE) have been recently considered similar and complementary. Taking a micro-level perspective, this short paper explores the idea that FI might function as a means to define and operationalize what CE entails at the local level in the Global South. For this purpose, it studies the case of the Colombian non-profit organization Fundación amigos del mar.

## Keywords

Frugal innovation, Circular economy, Plastic waste, Latin America, Base of the pyramid

## Introduction

Interest on the circular economy (CE) has recently gained traction among policy makers, academics and practitioners alike, seeing it as an alternative to the take-make-waste approach of the linear economy (Bocken *et al.*, 2017). This new way of thinking contests the lineal view of economic processes by suggesting that waste can be utilized as a useful resource, creating business opportunities, reducing costs and protecting the environment. Although definitional discrepancy still exists, frugal innovation (FI) is generally understood as an innovation approach in resource-scarce environments that provides simple, affordable and functional solutions for poor and middle-class users. Recently, interested

scholars have proposed that FI may serve as a vehicle to define and operationalize what CE can mean at the local level, further developing circularity in low-income contexts (Levänen, Rosca & Park, 2023; Levänen & Lindeman, 2016).

Focusing attention on the micro level, this short paper presents a single case study to explore how FI can implement a circular approach at the local level in resource-constrained base of the pyramid (BoP) contexts in the Global South. Using a qualitative research design, it studies the case of the Colombian non-profit organization Fundación amigos del mar. This foundation has been recognized as an innovative response for the circular management of coastal plastic waste while improving the quality of life of vulnerable youth.

## Circular economy

Given its cyclical flow, CE has been advocated as an approach to economic growth that is better aligned with the aims of sustainable development (Korhonen, Honkasalo and Seppälä, 2018). However, as is common occurrence with concepts within the sustainability realm, definitional agreement is lacking, and a wide range of propositions exist on what CE entails conceptually and practically (Corvellec *et al.*, 2020). Kirchherr *et al.* (2017) conducted a systematic review of the literature studying 114 CE definitions from peer reviewed and non-peer reviewed sources. Their findings indicate that CE is most frequently depicted as a combination of the 3R framework of reuse, reduce, and recycle activities. CE is seen to have arisen from the field of industrial ecology where the idea of circular resource flow is central given the ecosystem view that lays at its core (Bocken *et al.*, 2017). Its origins have also been related to the cradle-to-cradle principle pioneered by McDonough and Braungart (2009) describing it as the continual circulation of viable materials within closed-loop production cycles.

At the micro level, which is the focus of this short paper, CE has been particularly conceptualized as a business model. Following Stahel (2016) it could be argued that CE business models may be categorized into two broad groups: “those that foster reuse and extend service life through repair, remanufacture, upgrades and retrofits; and those that turn old goods into as-new resources by recycling the materials” (p. 435). After conducting a careful examination of the existing taxonomies on CE business models, Moreno *et al.* (2016) propose five circular business model archetypes that include circular supplies –using residual outputs as feedstock for other processes-, resource value –recovering value of materials and resources-, product life extension –extending working life-, extending product value –offering access and retaining ownership-, and sharing platforms –enabling shared use/access/ownership. Adding to these earlier works, Lüdeke-Freund *et al.* (2019) present a typology that differentiates between six types of CE business models based on common patterns: repair and maintenance, reuse and redistribution, refurbishment and remanufacturing, recycling, cascading and repurposing, and organic feedstock.

From a sustainability viewpoint Ghisellini and her colleagues (2016) argue that CE should enable the transition towards new and differentiated business models that decouple wellbeing from resource consumption and in so doing favour a transition towards a degrowth path in which a lower level of resource use generates increasing levels of wellbeing. In addition, with a triple bottom line approach, authors have noted that CE discourse exhibits a greater focus on economic aspects of circularity, followed by environmental issues and seldom touching upon the social dimension of sustainability (Kirchherr, Reike and Hekkert, 2017; Murray, Skene and Haynes, 2017; Inigo and Blok, 2019). The inclusion of social aspects is relevant as it helps for a better understanding of the positive and negative externalities created by a CE model. It is necessary to elucidate the various social impacts that circularity may have on different stakeholder groups, including issues like employment and gender equity, but also poverty eradication, food security, and overall wellbeing (Padilla-rivera, Russo-garrido and Merveille, 2020).

## Frugal Innovation and circularity

From a theoretical perspective FI and circularity have been found to share similarities and be complementary. CE discourses have been perceived as a contemporary translation of the notion of frugality, particularly when looking to the call for a frugal life style, which is primarily driven by environmental ideals and concerns (Leliveld and Knorringa, 2018). In this same line, it has been argued that including the topic of FI into the discussions on CE might derive in an increased awareness of frugality in choices by individuals in Western societies like the German (Tiwari, Fischer and Kalogerakis, 2017). Brem (2017) has suggested that given the principles of minimal resource use, core functionalities and optimal performance, close linkages exist between FI and CE, alluding to a high potential of the former for offering sustainable solutions with a significant socio-economic impact.

When looking to the firm at the micro level, it has been suggested that the implementation of a frugal approach to the operation of supply chains can be related to broader CE patterns. Therefore, scholars see a need for opening the discussion on the managerial implications of linking frugality and circularity in supply chain management (Fulconis, Pache and Reynaud, 2019). Similarly, Albert (2019) suggests that the study of CE issues has relevant research implications regarding the environmental sustainability of FI. The author argues that CE principles might be particularly appropriate to address sustainability threats found in FI, such as the unsustainable extraction of raw materials, or the inadequate disposal of end products.

With a focus on BoP markets, it has been argued that to advance CE efforts at the local level it is fundamental to understand what resource constraints mean contextually, for which FI gains particular relevance. As the practical implementation of CE business models might

manifest in varied ways across the world, it is believed that FI can help in defining what CE entails locally under resource scarcity conditions in the Global South (Levänen et al., 2023).

This short paper makes an initial exploratory contribution to the understanding of this relation, by developing a qualitative case study to analyse how FI and CE manifest and interact at the local level in the BoP context of an emerging Latin American country, Colombia.

## The challenge of plastic waste

Plastics, a broad range of materials having polymers as basic component, are a versatile and widely employed element covering an ample range of applications in everyday life (Dhawan *et al.*, 2019; Baran, 2020). It is estimated that since the second half of the XX<sup>th</sup> century, plastic production has outpaced that of nearly every other material; by 2030, 619 million tons of plastic may be produced globally every year (UNEP, 2018). Plastics have also become a severe waste pollution problem of major concern across the world, with adverse socio and environmental impacts like blockage of waterways, valuable resource loss, soil and water contamination, wildlife destruction, and biodiversity loss, among others (Ghosh and P, 2019; Chen *et al.*, 2021). The situation is such that plastic has come to be considered a symbol of both, human ingenuity and absurdity (Chidepatil *et al.*, 2020). From a circularity viewpoint, single use plastics are easily and repeatedly criticized because of their very limited duration in terms of functionality and value to the economy, which, once they are discarded, is completely lost (Calleja, 2019).

Scholars identify three areas that concentrate the major environmental externalities of plastic waste: impacts from microplastics and additives, greenhouse gas emissions from global plastic production and after-use incineration; and degradation of natural systems, especially the marine environment, as a result of leakage (Baran, 2020). In particular, the scale and impact of plastic pollution in world oceans has attracted increased attention by the general public, as well as by development practitioners, policy makers and scientists alike. Multiple publications note alarming statistics, including the widely repeated argument that if the world continues in its current state of affairs, by 2050 there will be more plastic than fish in the ocean (Calleja, 2019).

An additional challenge for developing countries is the generalized lack of proper waste management systems, which enhances the littering problem, particularly among their poorest populations at the BoP. Inadequate collection systems, recurrent uncontrolled dumping, poor waste management, and precarious or inexistent attempts for reusing, recycling or recovering materials, are frequent occurrences in municipalities in the developing world (Diaz, 2017; Ferronato and Torretta, 2019; Godfrey, 2019). Globally, the average of total plastic becoming waste and been sent to landfills is about 60%, and this percentage is much higher when considering only developing and less developed countries

(Chidepatil *et al.*, 2020). More than 80% of plastic packaging worldwide is dumped as litter and only 14% is recycled (World Economic Forum, 2016). Other studies suggest that the damages caused by plastic pollution to the world's marine ecosystem represent a total economic cost of at least \$13 billion per year (Ghosh and P, 2019).

## The Case of Fundación Amigos del Mar

Lack of proper waste management, remarkably plastics, is a major problem in the small island of Tierra Bomba, an impoverished island with about 12.000 inhabitants located 6km off the coast of Cartagena, Colombia. Poverty levels are high, proper energy and sanitation services are lacking, and youth are particularly at risk without access to opportunities to improve their quality of life. School dropout is a major problem within children and teenagers in Tierra Bomba as they lack economic resources to attend, or their parents don't see it useful for the family and don't send them to school. Teenage pregnancy is common, same as alcohol or drug issues.

In response to these local conditions, fundación Amigos del Mar was established by two professional surfers as a non-profit organization that seeks to implement social development projects in Tierra Bomba by working jointly with environmental awareness, education and water sports. Their initial motivation was finding a way to reduce the high levels of school dropouts and contributing to a better quality of life for vulnerable youth. To do so and seeing the cheerful interest of local children around the sea, they decided to focus on water sports, encouraging self-discipline among the youth and teaching them valuable life skills through sports like surfing, windsurfing, kitesurfing and paddle boarding. The foundation sponsors kids to remain at school via a donor program that pays fees and provides school materials. If the kids show commitment with their education and remain at school, they are allowed to receive free water sports training and additional soft skills and cultural activities. These extracurricular activities provide local teens with a valuable experience learning how to make proper use of leisure time.

In addition, the foundation is implementing a circular recovering and recycling model that responds to the dual challenge of handling plastic waste and having surf fins available. During training sessions, the youngsters can often break many surfing fins and it is difficult and expensive to buy them in Cartagena and Colombia. To solve this issue and improve waste management in the island, they use simple machinery to transform recycled plastic into sports and recreational accessories (such as surfboard fins), using plastics recovered from beach clean-ups in Tierra Bomba and other areas in the Caribbean coast. The machines are low cost, operate on solar energy and are developed under the open source of precious plastic. By taking part in this program, young people are enriching their education and strengthening their environmental awareness, changing the concept of waste to usable waste and understanding the importance of not polluting the ocean.

## Discussion and Conclusion

From a micro-level perspective, this short paper has made an explorative approximation to the belief that FI might function as a means to define and operationalize the transition towards CE at the local level in the Global South. Using a qualitative single case study, this exploration shows that there can be ways of implementing a frugal and circular strategy to respond to local environmental problems, like plastic waste, while improving the living conditions of vulnerable communities. The adequacy, adaptability, and responsiveness of the proposed solution to the particularities and constraints of the local context is fundamental for its acceptability and effectiveness.

The working model of Amigos del mar combines nautical sports, education and environmental awareness in a way that is well aligned with the local idiosyncrasy and responds to the contextual constraints. It is appropriate to the local conditions and uses children's innate proximity to the sea to develop a project adapted to their particular needs and capacities.

Its organizational model has found a simple, affordable, and environmentally sound way to reduce costs of surf equipment and accessories, such as fins, by producing them from reused and recycled plastic, and in so doing it is providing one mechanism to start tackling the local challenge of improper waste handling. Its strategy is not only performing beach clean-ups, but also seems to be contributing to a change in the collective mindset of youngsters and their families. It is also a way to reduce school dropout levels, providing local youth with positive alternatives to use their free time, and giving them valuable experiences and life skills to enhance their chances of improving their quality of life towards adulthood.

Given the length and scope of this short paper, its purpose is mainly of an informative and explorative nature, and thus refrains from making claims about the developmental impact of the discussed case.

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