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Accelerating the Transition to Sustainable Production Systems

Exploring Circular Economy Business Models in Emilia-Romagna, Italy

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Key messages

- Enabling policies and an integrated approach to material recovery can be beneficial for companies embracing circular economy principles.
- Emilia-Romagna is the first Italian region to promote circular economy principles by law.
- This *Insight* compares two Emilia-Romagna businesses, which are similar in terms of their commitment to circular economy innovation but differ in scope and structure.
- Circular economy business models have the potential to deliver significant climate change mitigation benefits, illustrated by carbon savings in the cases presented.

Introduction

The circular economy seeks to redesign industrial systems by creating sustainable relationships among the three main components of the production cycle: environment, producers and consumers. It is geared towards creating cyclical material loops that are cost-efficient and long-lasting.[1] The idea of circular material flows was first outlined in 1966 by Boulding, but its origins can be traced back to the late 1800s.[2] However, it is only recently – following the launch of the *Circular Economy Package* by the European Commission (EC) in 2015[3] – that several circular economy initiatives have been launched at European Union (EU), national and regional levels. Emilia-Romagna, a leading Italian region in terms of entrepreneurship, innovation and economic dynamism, provides a good example of how the circular economy is being promoted.[4]

This *Insight* discusses two Emilia-Romagna business models – Bio-on and La Città Verde – selected by the Institute of Biometeorology of the Italian Research Council (CNR-IBIMET), an Italian Climate-KIC partner, as examples of best practice. They represent different levels of circular economy application and operate materials recovery with different aims. Both organisations, although established before the formal launch of the *Circular Economy Package* in 2015, anticipated market needs and enhanced their activities by taking advantage of recent circular economy policies that incentivise businesses to turn waste into a resource.

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Emilia-Romagna: innovation and circular economy policies

Emilia-Romagna has one of the highest rates of gross domestic product per capita in Italy, and has more than 420,000 active small- and medium-sized enterprises. Regione Emilia-Romagna, the regional council, is the main public driver of innovation and sustainability policies.[5] The region's strategy, developed by the council in conjunction with the Consortium for Innovation and Technology Transfer (ASTER) in Emilia-Romagna, focuses on using circular economy principles to upgrade the regional industrial system.

Emilia-Romagna is the first Italian region to adopt (in 2015) Law 16 - *Rules and regulations supporting the circular economy*,[6] aiming to reduce mixed waste production and promote recovery. It has established a permanent circular economy forum, which includes political, social and economic actors, underpinned by an online platform that facilitates information sharing on circular economy legislation and promotes collaboration. The region has developed financial incentives including an €11 million fund for investment in waste management, which includes a dedicated budget to create municipal centres for product reuse and incentives for businesses that prevent waste.

Bio-on is a for-profit company focused on product innovation and La Città Verde is a social cooperative concerned with materials reuse. Although different in scope and structure, both provide examples of how a supportive circular economy policy environment and optimisation in operational processes can contribute to the enhancement of circular business models.

Circular economy business models: Bio-on

Founded in 2007, Bio-on Intellectual Property Co. Ltd is located in Bologna. In 2016, the company was named the national Italian champion in the European business awards.[7] Bio-on was established with the intention to create 100 per cent sustainable products based on renewable resources from diverting regional agricultural waste, the recovery of which was incentivised by regional policies.

Bio-on collaborates with international engineering companies to develop patents based on its material science capabilities. Since 2007, it has registered more than 50 patents and forecasts a turnover of €140 million by 2020. One of the company's circular product innovations and patents relates to the development of an exclusive process to produce polymers (polyhydroxyalkanoates or PHAs) derived from the bacterial fermentation of molasses, sugar cane and sugar beet syrups.

PHAs are free from genetically modified organisms (GMOs) and solvents, and 100 per cent bio-degradable. They can be substituted for petroleum plastics while retaining the same performance, thermo-mechanical properties and versatility. Compared with existing bio-

Bio-on and La Città Verde: key strengths and challenges

Strengths	Challenges
Bio-on	
PHA production is derived from agricultural waste and does not displace edible food. PHAs are 100 per cent bio-degradable, GMO- and solvent-free, so they do not bio-accumulate in food chains or spread dangerous pathogens.	PHA production is expensive given small production volume, costing €9 per kg versus €1 per kg for conventional plastics.
Bioplastics production results in a 42 per cent reduction in carbon footprint generation compared with petroleum plastics.[8] If all petroleum-based plastics were substituted with bio-plastics and renewable energy was used in production, around 3.5 million barrels of oil per day could be saved.	High production costs mean that the market share of Italian and European PHAs remains small.
La Città Verde	
Activities multiply local expertise and social capital in its communities.	Lacks a comprehensive approach to measuring its environmental and social impacts.
Early adoption of circular economy principles combined with regional finance initiatives have enabled the cooperative to convert many waste fractions.	Greenhouse gas emission reductions and other benefits are under-reported; the only material measured consistently is recovery of forestry waste and wood packaging (c. 8,000 tonnes p.a.).
Created a comparative advantage by developing local circular economy innovations.	Waste recycling requires extensive expertise; yet activities of the cooperative are mostly labour-intensive, so lack a more science-based approach.

Figure 1. Bio-on business model

Source: Bio-on (2017)

plastics, PHAs are promising because they are resistant to moisture and have low oxygen permeability. These characteristics combined with their biocompatibility imply that PHAs could be used in nanotechnology, cosmetics, product packaging and toys.

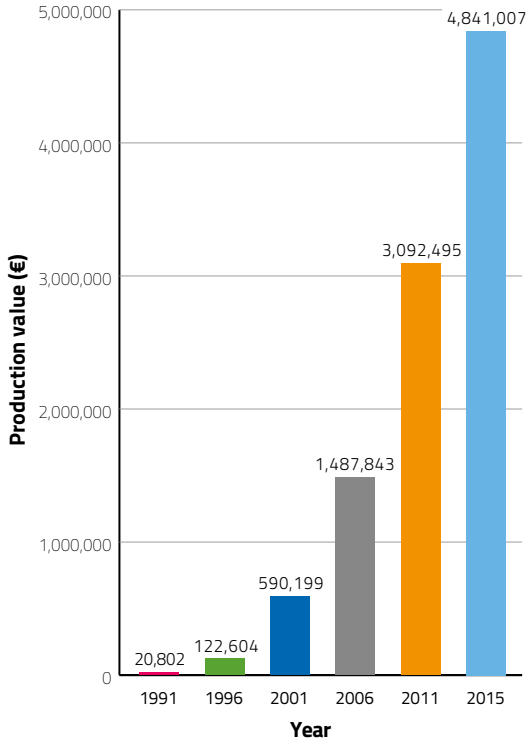
Bio-on's development plan for 2017 envisages the construction of a series of PHA bioplastic production plants for an overall output of 100,000 tonnes per year. Based on a life cycle assessment, which considers the life cycle from raw material production to waste collection and disposal, 2.6 kg of CO_2 is emitted per kg of PHA produced versus 3.4 kg for polypropylene. Specifically, Bio-on is trying to address the challenges of high cost of material recycling and small market demand by prototyping cheaper alternative production processes (see table and Figure 1).

Circular economy business models: La Città Verde

La Città Verde is a green social cooperative active in Bologna and Ferrara.[9] Established in 1991 as a small social enterprise, it now provides employment to nearly 90 people, 30 of whom are socially disadvantaged. Environmental sustainability and social inclusion are central to La Città Verde's economic development. It works in close collaboration with municipalities, hospitals, local schools and private companies to promote waste management and recovery initiatives. These range from sweeping public areas, recycling and kerb-side and bulky waste collection to the creation, installation and maintenance of public street furniture made from materials reclaimed from municipal reuse centres. In 2015, the cooperative's production value, which represents the earnings coming from all their services, was €4.8 million (Figure 2).

La Città Verde has built strong relationships with its customers, has a constant focus on innovation through targeted training, and develops products and projects that contribute to improving citizens' welfare. In 2015, the

Figure 2. La Città Verde production value (1991–2015)



Source: La Città Verde (2017)

organisation was among 13 international winners of the Ashoka Schneider Electric Foundation Social Innovation prize[10] for transforming agricultural waste into biofuels to provide cheap energy to schools, sports facilities and the poor.

Between 2011 and 2014, La Città Verde participated in the Local Waste Market for Second Life Products project[10] in Ferrara. This created circular supply chains to intercept waste (e.g. hospital textiles and rubble from demolished buildings), recovering 90 tonnes of hospital textiles and 90 tonnes of unused waste fractions, sparing 2,216 tonnes of CO_2 (See table).

Enabling factors and opportunities to advance the circular economy

Continued dependence on scarce natural resources is not a viable option for organisations seeking sustainable competitive advantage. The two cases illustrate this point. Both recover materials (at different scales) and seek to ensure their end-products have an environmental impact that is as low as possible. More specifically, for Bio-on, which focuses on finding substitutes for petrochemical materials, cross-sectoral collaborations, particularly with research centres, are a key enabler of continuous improvement in its product development pipeline. In

contrast, La Città Verde considers social awareness as the most important enabler for its circular business model, since it believes that information is the key to enabling behavioural change. For this reason, when implementing new circular initiatives, La Città Verde invests in employee and stakeholder engagement through training and open discussions.

Key circular economy enablers for both organisations are:

- Ability to anticipate market needs
- Ability to develop sustainable consumption and production patterns and international collaborations; in the case of Bio-on through patent development and for La Città Verde by developing local circular supply chains that simultaneously improve local capabilities in material recovery and reuse
- Ability to communicate the benefits of resource efficiency, quality and safety of production in an effective way, thereby gaining stakeholders' trust
- An enabling policy environment: Emilia-Romagna's economic and legislative support has been vital in solidifying and sustaining their competitive advantage.

Conclusion

This *Insight* describes two different businesses and the perceived enablers of their circular economy business models. Reflections on these cases suggest that what starts as product innovation has the potential to lead to a new business model. Circular economy business models are more likely to be successful when they contribute to innovation and create positive dynamic cycles involving employees, stakeholders, local communities and consumers. Furthermore, these business models are more likely to be replicated or expanded when supportive legislative frameworks are in place (e.g. Emilia-Romagna's 2015 Law 16), since these level the playing field enabling emerging circular economy business models to compete on an equal footing.

Several challenges still need to be addressed, including but not limited to the following: a) the high cost associated with some forms of material recycling, for example producing PHAs; b) despite the initial progress made by the EC *Circular Economy Package*, Emilia-Romagna's Law is the exception rather than the rule, illustrating the lack of complementary national and EU legislative frameworks to help companies make the transition to circular practices in other regions of Europe; and c) appropriate indicators need to be developed to enable companies to collect consistent data and monitor progress of the environmental and socio-economic benefits of the circular economy.

Endnotes

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Climate Innovation Insights is a platform for reflection and discussion on the lessons, challenges and opportunities of addressing climate change through innovation. It brings together key insights, informed opinion, best practice and methodological approaches to understand how research, education, business and government can, together, accelerate the transition to a zero-carbon economy. The series is developed and published by Climate-KIC, Europe's largest public–private partnership focused on climate innovation. We would like to thank the Series Editor, Dr Geraldine Brennan and the two external reviewers, Dr Carmen Ruiz Puente and Dr Inês dos Santos Costa.

About Climate-KIC

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