

## **The circular water economy and the seven Cs**

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## **THE CIRCULAR WATER ECONOMY AND THE 'SEVEN C's'**

### **<a>ABSTRACT**

Scholars in the field of sustainable entrepreneurship have highlighted the need for future research to examine how a supportive external environment for sustainable entrepreneurship can be created (Bischoff and Volkmann, 2018). In order to address this research gap, we conducted a study on a regional circular economy ecosystem centered in the recycling of wastewater. The study is based on 45 user-stakeholder interviews from 10 different types of organizations within a local sustainable entrepreneurship ecosystem, based in Finland. The findings highlight the importance of conscious, collaborative stakeholder support and ecosystem coordination for creating strong sustainable entrepreneurial ecosystems. This chapter then offers a contribution to fill the research gap in terms of a framework for a supportive environment for entrepreneurs within sustainable entrepreneurial ecosystems, founded on seven enablers crucial for entrepreneurs to pursue circular endeavours.

### **<a>KEYWORDS:**

Circular Economy; Sustainable Entrepreneurial Ecosystems; Innovation and Entrepreneurship.

## <a>INTRODUCTION

In the introduction to this book, the editors emphasise that there is a lack of knowledge about the institutional and societal transformations needed to implement circular practices, particularly those requiring radical changes at societal and institutional level, and therefore there is an urgent need for a more comprehensive understanding of how such circular economy (CE) innovations can be achieved. This chapter tries to add some understanding of system or ecosystem level enablers for circular economy innovation focused on the perspectives and experiences of entrepreneurs trying themselves to enter the circular economy with innovative products and services. It is based on the study of an eco-industrial park, called 'EcoSairila', in the Finnish city of Mikkeli. Mikkeli is located c. 230 kms north east from the capital Helsinki, in the Saimaa lake area and has a population of c. 55,000 people.

EcoSairila is boosting the regional, circular water economy, around the recycling of wastewater, based on the logic of industrial symbiosis and related innovative, new businesses. We studied this case to better understand what conditions within the local, sustainability-focused, entrepreneurial ecosystem would energise entrepreneurs to enter the CE. Although large cities have been studied, to our knowledge no research exists addressing the transition to a CE in small and medium sized towns and cities such as Mikkeli. EcoSairila is a cornerstone of Mikkeli's smart specialization strategy. By 2030 the goal is to generate new, Mikkeli based, symbiotic start-ups and SMEs with a collective turnover of over €100m.

EcoSairila's goal is challenging on many levels. Any business opportunity identification, in particular novel CE opportunities, is difficult (Bechtel et al., 2013; Rizos et al., 2016). Several authors note that there is often a general lack of technologies, knowledge and technical skills for more 'advanced technical' options (Rizos et al., 2016). CE businesses also typically involve

multiple stakeholders and a need for suitable partners (Bechtel et al., 2013), and hence, challenges in collaboration within some form of an ecosystem are further accentuated. Prior research has highlighted that some form of external support from the entrepreneurial ecosystem is crucial to entrepreneurial success, in particular for sustainable entrepreneurship (Cohen, 2006). However, a grand challenge for sustainable entrepreneurial ecosystem stakeholders is that the nature of the interactions within an ecosystem and the conditions for creating a supportive entrepreneurial ecosystem remain unclear (Cohen, 2006). Similarly, the perspective of the entrepreneurs themselves is rarely considered when designing and improving such support systems (Hakala et al., 2019; O’Shea et al., 2019).

In order to support EcoSairila to attract and grow innovative CE start-ups and SMEs, we posed the following research question as central to our case study: *“What enablers need to exist within the local sustainability focused entrepreneurial ecosystem to engage and support innovative CE focused entrepreneurs?”* While we conducted a case study of EcoSairila with specific practical aims, we also contribute to the literature on sustainable entrepreneurial ecosystem development by developing a framework for ecosystem enablers that encourages entrepreneurs to focus their efforts on innovating for a local circular water economy. The seven identified enablers are: *competences, customers, connectors, collaboration, co-ordination, culture and centre*, which we term collectively “the Seven C`s”.

## **<a>ENABLERS FOR CIRCULAR ECONOMY ENTREPRENEURSHIP**

To identify the relevant enablers and to construct an initial conceptual framework for our study we scouted the existing literature for enablers in CE focused ecosystems (Bechtel et al., 2013; Rizos et al., 2016) and regional CE development referring mainly to studies focusing on local

eco-industrial parks (Mathews & Tan, 2011; Ghisellini et al., 2016). Added to these, we also perceived other related topics such as sustainable entrepreneurial ecosystems and generic entrepreneurial ecosystems literature (Cohen, 2006; Mason & Brown, 2014). Related to CE, prior studies have focused mainly on Chinese regions and towns, but some studies also consider European countries like the UK, the Netherlands, Denmark, and Germany (Ghisellini et al., 2016).

From these studies, we searched especially for *key components and actors* within these systems (Cohen, 2006; Mason & Brown, 2014) which then allowed us also to decode the core enabling components. First, a clear enabling component relate to *competences* that the entrepreneurs have themselves. In particular, access to various ‘sustainability competences’ (Eizaguirre et al., 2019), technologies, knowledge, information and technical skills, that help the entrepreneurs to identify, assess and implement ‘advanced technical’ options for their business (Rizos et al., 2016; Bechtel et al., 2013).

In previous studies, another important enabling component is the presence of customers who offer piloting opportunities for new products and create market demand for sustainable business ideas (Rizos et al., 2016). Business to business customers inside the system can provide extremely valuable symbiotic relationships (Chertow, 2007).

Within ecosystems, the importance of a *connector* role is also highlighted (Shane & Cable, 2002). For instance, the use of experienced business people (Mason & Brown, 2014), researchers acting as diplomats, missionaries and knowledge brokers (Haarla et al., 2018), and organisations acting as agents or brokers in the innovation process (Kanda et al., 2018). Another key enabler is *collaboration*, which increases productivity, reduces R&D costs and creates shared sense-making (O’Shea et al., 2019) around new opportunities. Collaboration also enables the finding and developing of suitable partnerships (Bethel et al., 2013),

understanding and contacting markets and customers efficiently (Rizos et al., 2016), and distributing new ideas in the ecosystem (DiVito and Ingen-Housz, 2019).

*Coordination* within the ecosystem leads to increasing efficiency, coherence of activities and prevention of overlapping functions and roles (Jacobides et al., 2018). This can mean for instance coordinated decisions and integration of sustainability product concepts into businesses (O’Shea et al., 2019). Coordination is also about clarity, e.g. around ecosystem identity, its shared goals, policies and governance (Hakala et al., 2019). Previous studies use the term “entrepreneurial climate” or “entrepreneurial *culture*” as important part of entrepreneurial ecosystems (Malecki, 2018). But besides being entrepreneurial, the *culture* can also embrace the idea of the CE as a whole (Mathews & Tan, 2011) and allow shared sustainability orientation amongst the stakeholders (O’Shea et al., 2019; DiVito and Ingen-Housz, 2019). Finally, according to previous studies the idea of a *centre*, a physical and virtual place, is important as a visible symbol for the existence of the ecosystem. The real value of the centre is created by its function that unites various supporting resources, partly enhances the supportive culture and makes related services more accessible for entrepreneurs (Spigel, 2016).

## **<a>METHODOLOGY AND CASE DESCRIPTION**

The Mikkeli Blue Economy Water Hub, also known as ‘EcoSairila’, is a CE business park which functions as a center of excellence in water circularity research, processes, and business. The €100m investment includes local communications and transport structures as well as funding for ‘blue economy’<sup>1</sup> research and development by local universities. A Membrane

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<sup>1</sup> By this concept we refer to better stewardship of our natural water resources. Like in the concept of “green economy”, the blue economy model aims for improvement of human wellbeing by promoting circular economy and significantly reducing environmental risks (modified from: <https://thecommonwealth.org/blue-economy>)

Bioreactor (MBR), wastewater treatment plant and water reclamation plant has been built 40 meters deep in the bedrock adjoining Mikkeli city and Lake Saimaa and the park incorporates research and pilot facilities, and a biorefinery producing biogas and organic nutrients. EcoSairila is in a privileged position in that it is closely connected with water separation scientists at two local universities and other water treatment partners on site. There are also other excellent support resources within the ecosystem including a regional development agency, the resources of the city itself and of the regional (county) council acting as coordinator for EU-funding.

For the purposes of the study we undertook 45 user-stakeholder interviews, conducted between spring 2019 and summer 2020. The respondents were 28 individuals from 10 different organizations within the EcoSairila ecosystem including SMEs, pre-start-ups, development agencies, research labs, civil servants and EcoSairila itself. The interviews lasted between 45 and 60 minutes. The transcripts and meeting notes comprised c.350 pages of data.

The overall goal was to develop a framework for various stakeholders such as regional development organization and the local members of a research and education cluster when building an entrepreneurship focused CE. Finally, to understand practical implications of our framework, we tested its logic on a start-up within EcoSairila. This start-up is a brewery company that wants to be amongst the world's first to use waste (sewage) water to brew its beer. This short example is also included at the end of the chapter to show how the final model can be applied to a case.

## **<a>FINDINGS AND ANALYSIS**

Our analysis is data-driven and theory based around these clusters, developing the model through theory-practice iterations, conceptualized eventually as the Seven C's: *Competences, Customers, Connectors, Collaboration, Coordination, Culture and Center.*

### **<b>Competences**

Our data highlights that CE – related competences were acquired elsewhere than in the Mikkeli region, or if in the region, in some other working life context than as an entrepreneur. In several examples, the entrepreneur had moved to the area because of a close connection to the region or other contacts already in the area. Most often the entrepreneurs had built their “sustainability orientation” (O’Shea et al., 2019) in the Helsinki region where access to various “sustainability competences” (Eizaguirre et al., 2019) had opened. For example:

*“I guess I have held quite long these green values and thought about my idea...but it helped me that the Mikkeli area is a good area to live a healthy life near the nature...”*

Some entrepreneurs had personal ties, such as family, friends and other informal networks, which they favoured as a partner competence over the ability to set up a business (D’Hont et al., 2016). Sometimes this access to crucial competences had been found amongst trusted friends with shared values and “sustainability orientations” (O’Shea et al., 2019). In terms of formal organizational competences used for entrepreneurial concept support, the city development agency was mentioned several times:

*“The biggest thing was that there was only one person .... [I could get help and advice for] everything ...starting the business and getting funding, or legal advice or anything like that via one contact person”*

For water circularity expertise, Mikkeli has two university research groups of ‘water separation’ scientists that is relatively large and highly qualified in its area globally. There is also further technology and process expertise within the EcoSairila park itself. Mentors, university alumni and other experienced actors with social capital also act as an enabler. However, the access to network competences is something in which respondents would like to see improvements; they felt that the system needs more and different experts to be readily accessible. Recent new ventures have relied on venture coaches and innovation agents being sourced from a green innovation centre in a different town. While this has been helpful it was felt that this dependence on experts from a neighbouring region was not an optimal solution:

*“One of our challenges in Mikkeli, if we want to do something similar like in many places already, is to have someone who helps researchers and businesses to collaborate, the so called, (green) innovation expert”*

### **<b>Customers**

This enabler refers to the demand for products and services both inside and outside the ecosystem. The EcoSairila ecosystem is fortunate in that there is a company that manages the whole water treatment cycle, which provides a market outlet and other customer possibilities for other entrepreneurs in the field. Respondents felt that EcoSairila could offer a good context where new sustainable business ideas could emerge also in B-to-B – business (Pastakia, 1998) in the symbiotic relationships:

*“...LP company, which is the biggest barley producer in Finland, they have an interest to build this full circle so that the end-waste from EcoSairila biogas-plant would go to the fields of the barley farmers [as fertilizers]. So, it would make the full circle.”*

For customers outside of the ecosystem, several respondents were positive that nationally there is and will be “green customer potential” (Gleim et al., 2013) increasing in the future:

*“I guess in that respect we are relatively lucky in Finland that we have some systems [for recycling / circularity] already... and people don’t naturally just throw trash on the floor, and these kind of things...”*

### **<b>Connector**

The enabler importance was highly visible in the interviews. It was used for example to describe persons working in MIKSEI, Mikkeli city council or the Mikkeli University Consortium (MUC):

*“Mr M also sees the Mikkeli University Consortium as a part of the discussions around regional development, helping to build coherence strategy within the ecosystems, that different organisations have different roles, so one important thing it does is host meetings, gathering people to meet.”*

It was also used to refer to the need for a facilitator (Gliedt et al., 2018; Howells, 2006; Kanda et al., 2018; Kivimaa et al., 2019) to work in the system as ‘innovation intermediaries’ or specialists (Patala et al., 2020) facilitating innovation processes and creating new opportunities.

### **<b>Collaboration**

The need for Collaboration, like the ‘Connector’ enabler, is something that most respondents were very aware of. Collaboration can enable the finding and developing of suitable partnerships (Wooi and Zailani, 2010), contacting markets and customers efficiently (Rizos et

al., 2016) and distributing ideas efficiently among different actors in the ecosystem (DiVito and Ingen-Housz, 2019):

*“MIKSEI, has had discussions with all the universities... they have constant discussions with the local businesses, they do that work.”*

At a strategic level, six or seven core stakeholders meet regularly, but still there is a feeling that more enabling, dense collaboration could take place:

*“We have been discussing that we should have more meetings... We are trying to get closer.”*

At an operational level, respondents would like stakeholder collaboration to also focus on researchers and graduate students, to bridge the gap between sustainable entrepreneurship ideas and turning those ideas into start-ups:

*“We have had some meetings trying to find some businesses from students, and...we (currently) lack...straight line from the student idea to the business, and the support.”*

One issue appears to be that the overriding shared sustainability intent (O’Shea et al., 2019) is not yet powerful enough and that ecosystem collaborators are not having “the sense of urgency” to support a systemic regional approach in CE business development, versus a pre-occupation with their individual roles:

*“Maybe we all have too much to do in our own work and do not have time for this type of exercises.”*

While Mikkeli city has enabled many things to support local CE entrepreneurship, still, respondents mentioned that more openness is needed; if collaboration is weak, or non-systematic, then trust among different parties will not grow to the level needed.

## **<b>Coordination**

This enabler has not naturally emerged in the Mikkeli CE. The city council recognizes this and the director for development explains the city's role as facilitating openness and more coordination within the ecosystem. However, CE entrepreneurs within the system would like to see this done more formally:

*“Seems that no one is controlling the system level...”*

Some respondents would like the regional organizations to be more focused and coordinated:

*“the spill-over effect that would come from, for example the research done by the university water research groups...maybe there could be some kind of coordination in the means of research done by these organisations.”*

At the same time, several users would also like to see more clarity (in how the system fits together and how it works for their interest) and more formal coordination:

*“I know that MIKSEI is there and some other players, but it is very hard to get the overview. Who does what and how do different parts fit together...right now I think they do not necessarily fit together?”*

## **<b>Culture**

Components of the Culture enabler are still relatively underdeveloped. EcoSairila is taking its first steps in development and attempts to build a CE brand to persuade entrepreneurs to establish their businesses locally. Many interviewees saw that regional “entrepreneurial culture” has been advancing through the presence of the MIKSEI development agency and EcoSairila. However, more needs to be done to develop this entrepreneurial culture and this specific cluster where a new business could fit as:

*“it requires rather than an individual or even small company thinking, it requires cluster thinking to be able to, to take [-] and there for the circle and the circle economy, just to repeat, doesn't take place at the individual or even small groups, small business.”*

### **<b>Centre**

Many of the respondents considered that the Centre, the actual place of activity was an important enabler for the ecosystem, particularly in terms of the CE. The investment on the CE park site has been significant at €100m and the resulting infrastructure and water purification facilities provide piloting and prototyping possibilities as a foundation for technology start-ups:

*“Plants need to start first...we need the big stuff first so to speak...then the SMEs will come...”*

However, SME respondents stated that there does not exist a single centre in the traditional physical building sense. Even if respondents had identified some shared events between different stakeholders in the ecosystem, the importance of the physical centre was brought up in some interviews:

*“Even though it was very helpful to achieve concrete and very valuable help by MIKSEI and having one person to talk to all the time...in overall I guess it would be helpful to have one physical recognized place for start-ups in the area”*

We summarise our findings and analyses, in Table 1 below, which provides an overview of the **Seven C's** model or framework as the main contribution from this chapter.

## <a>CONCEPTUAL FRAMEWORK

The proposed framework on sustainable entrepreneurial ecosystems and its propositions provide practical insights for sustainable entrepreneurs concerning their interactions with stakeholders of sustainable entrepreneurial ecosystems. Strong stakeholder relationships, multi-stakeholder partnerships and extensive support can in turn facilitate the operations of a sustainable small enterprise.

Table 1 : CE enablers from the entrepreneur's perspective

<b>CE enablers</b>	<b>Relevant literature on enablers</b>	<b>Key findings in the case study</b>
<i>Competence availability:</i> (1) of entrepreneur(s) themselves; (2) through the system.	Especially various 'sustainability competences' (Eizaguirre et al., 2019), technologies, knowledge, information and technical skills, enabling 'advanced technical' options for their business (Rizos et al., 2016; Bechtel et al., 2013).	(1) Often acquired outside the region; sustainability linked to pre-existing values; informal networking; region attractive for living.  (2) Key development agency support; but lack of innovation expertise
<i>Customer availability:</i>	Industrial symbiosis (Chertow, 2007) and especially focusing on green values and practices of consumers (Gleim et al., 2013).	Already B-B – green business especially fitting EcoSairila and overall supposed B-C green customer potential.
<i>Connector availability:</i>	Conversants (Shane and Cable, 2002) experienced business people (Mason and Brown, 2014), researchers (Haarla et al. 2018), third-party, broker, and facilitator (Gliedt et al., 2018; Howells, 2006; Kanda et al., 2018; Kivimaa et al., 2019).	Some connector support already existing, such as a development agency, city council, university consortium.
<i>Collaboration inside the ecosystem:</i>	Increases productivity and reduces costs (Acs et al., 2008); collaborative sense-making (O'Shea et al., 2019); partnerships (Wooi and Zailani, 2010), contacts to customers (Rizos et al., 2016) and distributing ideas in the ecosystem (DiVito and Ingen-Housz, 2019).	Identified as something which is needed more, but it has the classical problem of investment need without the certainty of useful outcomes, trust needs to develop. Support is available as connectors host meetings, gathering people, organize networking hubs.
<i>Coordination:</i> system level fitting the parts of	Shared goals, and policies boundaries and governance (Hakala et al. 2019); efficiency and coherence (Jacobides et al. 2018); co-	Desire is to get an actor to take a more formal role to coordinate different parts of the ecosystem. The current system is

the ecosystem together.	sensemaking and co-integration (O'Shea et al., 2019).	informal and 'facilitated' by the city council through 'nudging' activities.
<i>Culture</i> : an innovation oriented and sustainability willing or demanding culture	Both entrepreneurial culture (Malecki, 2018) and culture promoting circular economy (Mathews & Tan, 2011) and shared sustainability orientation amongst the stakeholders (O'Shea et al., 2019; DiVito and Ingen-Housz, 2019).	There already exists a sustainability willing culture. EcoSairila developing the brand image as an EU centre of water excellence; It has persuaded some entrepreneurs to establish their businesses in the CE park.
<i>Centre</i> : a physical and virtual place	Unites various supporting resources, enhances the supportive culture and makes related services more accessible for entrepreneurs (Spigel, 2016).	EcoSairila is growing as a physical centre of excellence for water circularity and research, but a clear and visible centre is needed for creating access for specific resources

This model can be applied as a starting point for sustainable entrepreneurial ecosystem development, and then as a reflector of status along the developmental path of the ecosystem. Here, below (Table 2) we illustrate how the framework relates to a CE start-up brewery based in EcoSairila aiming to utilize the purified wastewater in their beer production.

Table 2: Illustrative example of the Seven C's model applied to the case of a local SME

<p><b>Competence availability:</b> Sustainability competences and related knowledge for water circulation are present in EcoSairila and in the university water circulation lab. From the founding partners, one came with some brewery experience and the other is a business school graduate. The brewery received key development agency support related to funding, piloting, and legitimizing in its early phase.</p> <p><b>Customer availability:</b> The established 'Saimaa' brewery is based in Mikkeli and there is already a brand for mainstream Mikkeli beer. Organic microbreweries themselves have a local and national market. Finnish supermarkets and consumers provide a nationally available 'green customer potential'.</p> <p><b>Connector availability:</b> The director of EcoSairila has himself been the main connector for the brewery and the CE ecosystem support functions, especially the development agency, Miksei.</p> <p><b>Coordination:</b> For the brewery, a high level of clarity of the ecosystem exists, as they are closely connected to EcoSairila and its director, physically and mentally.</p> <p>Coordinated <b>Collaboration</b> is enabled via the main connector person, the director of EcoSairila.</p> <p><b>Culture:</b> the brewery benefits from the water circularity brand of EcoSairila and aims to be the first all circular economy brewery in the world. There is also a subculture of craft beer enthusiasm in the area due to the other relatively successful craft brewery in the city, as well as due to national and international trends. EcoSairila is developing a CE brand image and has persuaded current and nascent entrepreneurs to establish their businesses in the CE park. It is also growing into an EU centre of excellence for water circularity and the city is known</p>
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for its CE technology and processes; University research units also hold open research conferences/research impact activities with EcoSairila

*Centre:* The brewery is based in the CE park which houses the “centre” water treatment, biogas, and fertiliser plants. Business support available in city centre is only 3kms away. The business park functions as a physical centre of activity and the centre of service, knowledge and support is in the city centre.

The main theoretical contribution of this study is the above Seven C’s model. As far as we know, this model is the first attempt to unite, into a theoretical and practical model, different enablers identified both in generic and sustainable entrepreneurship ecosystem research and the literature around CE focused ecosystems and regional CE development (the local eco-industrial parks). Even if not exhaustive, we consider this model as a good starting point when beginning to theorize sustainable ecosystem enablers around large eco-developments like EcoSairila. For strengthening this entrepreneur-centered and in-depth view we would highlight the importance of analyzing user experiences of future entrepreneurs with various service design techniques (for instance Helkkula et al. 2012), focused on these ecosystem enablers.

## **<a>CONCLUSIONS**

This case study was about EcoSairila, in the city of Mikkeli, Finland. This chapter puts forward a framework or model of enablers which support entrepreneurial engagement in the circular economy. This model is founded on the process view of ecosystems, placing the entrepreneur as a key user of the process. In our view it is important to build an in-depth understanding of enablers, within an ecosystem, for entrepreneurs to be confident enough to take CE opportunities.

This model can be of value to existing and aspiring sustainable entrepreneurs, those working as intermediaries, and stakeholder support organisations, in the following ways:

- For regional sustainable innovation and CE policy makers to gain a better overview of the existing collaboration and support mechanisms for sustainable entrepreneurship
- by using this model as a benchmark to identify specific areas of an ecosystem which are in need of further development or which require additional stakeholder support for sustainable entrepreneurship
- For ‘connectors’ and intermediaries to use as diagnosis model to see where their contributions are needed (Kanda et al. 2018)
- an audit tool for individual stakeholder organisations, to review how they participate and collaborate and support local CE entrepreneurship
- This model could be utilized in practice as a tool for CE ecosystem development facilitation (Kanda et. al 2018), for example in stakeholder workshops

Overall, our findings will encourage the establishment of extended collaboration and support mechanisms for entrepreneurs with a specific focus on sustainability, such as sustainable investments, sustainability education or sustainability-focused governmental incentives.

Enhanced stakeholder support can ultimately influence larger institutional structures and norms leading to institutional change towards sustainability. Through increased engagement in sustainable entrepreneurship, stronger sustainable entrepreneurial ecosystems could further pave the road towards a more sustainable future.

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