



Design Ecosystems Fellowship Report 2022

The Circular Personal Care Ecosystem for Yorkshire

Author: Anna M. Alessi



**FUTURE
OBSERVATORY**

Author

Anna M. Alessi¹

¹ Project and Communications Manager, Biorenewables Development Centre, 1 Hassacarr Close, Dunnington, York, YO19 5SN, anna.alessi@york.ac.uk

Overview

The personal care product sector is under pressure to reduce the industry's adverse impact on the environment. Many companies have set ambitious goals to reach net-zero emissions and play a leading role in a low-carbon economy transition. This is largely driven by growing customer demand for transparency and sustainable cosmetic products.

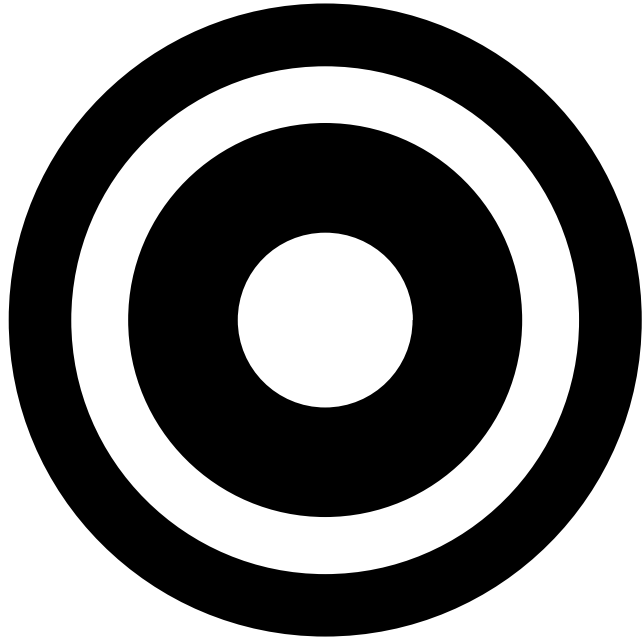
The aim of this exploratory research was to map the innovative personal care product ecosystem of Yorkshire by identifying the main components of the ecosystem, showing examples of initiatives accelerating the sector's shift to circularity and highlighting current trends and future opportunities.

The active stakeholder engagement and research occurred between July–Dec 2022.

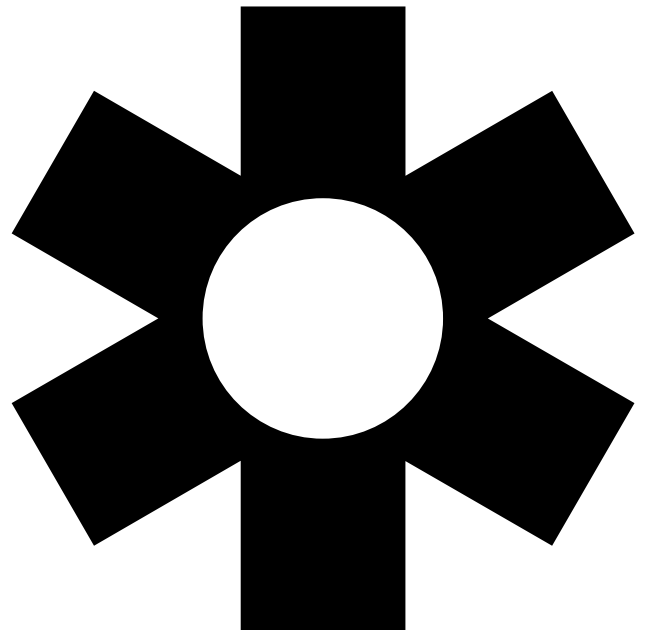
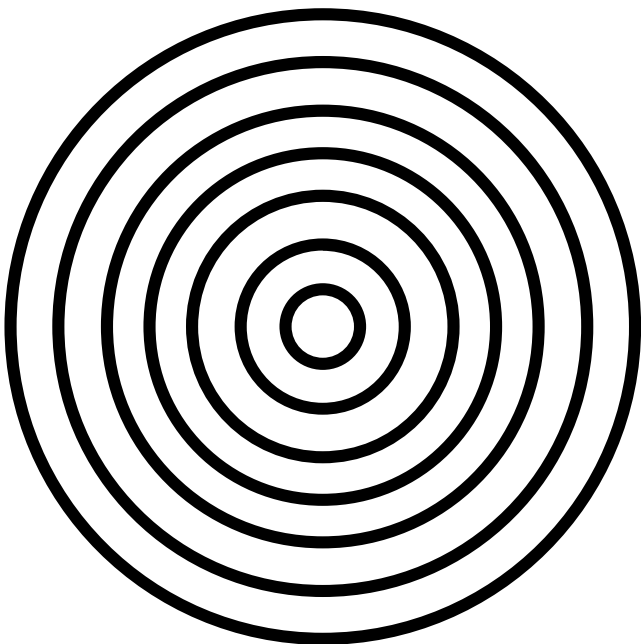
Full grant award amount: £19,998

Research objectives

- Review the potential transition steps to decarbonise the network by looking at circular product design
- Provide an overview of the personal care ecosystem for Yorkshire and opportunities for the region to lead low-carbon innovations for the ecosystem
- Identify innovation gaps within the ecosystem as a target for future research and collaboration opportunities



Research activity



The innovation-driven transition to circular economy principles for the personal care and cosmetic sector can be aided by understanding the main components and interactions within this ecosystem. Research in mapping innovative ecosystems was shown to benefit any sector by connecting people and resources to work together to develop new approaches and solutions for the ecosystem.^{1,2}

Mapping an ecosystem is a powerful tool that can be used by different stakeholders as a catalyst to develop new – or strengthen existing – collaborations, find knowledge and resources, impact decision-making, identify new opportunities for actions and drive policy changes.

To meet the research objectives, this project was delivered in three phases:

Phase 1. Desk-based discovery was conducted to establish the current state of the personal care ecosystem. The systematic review of technical and scientific publications, magazine articles, white papers, trade associations and corporate reports focused on understanding trends in the personal care sector including technical advances in sustainable ingredients, production methods and packaging technologies. The environmental hotspots in the product life cycle were reviewed and potential solutions to reach the sustainability goals were identified. The market research provided the current state of the personal care sector in the UK.

This phase showed that the personal care product ecosystem is a vibrant and thriving sector of the UK's economy with a value of £8.5 billion (2021). The value of personal care products for the UK economy is driven by consumer spending (£29.72 billion) with half spent on personal care and maintenance products (e.g., shampoo, face creams, lotions, soaps). The industry is a fast-moving, trend-driven sector that responds to consumer demand for clean, environmentally friendly products.^{3,4}

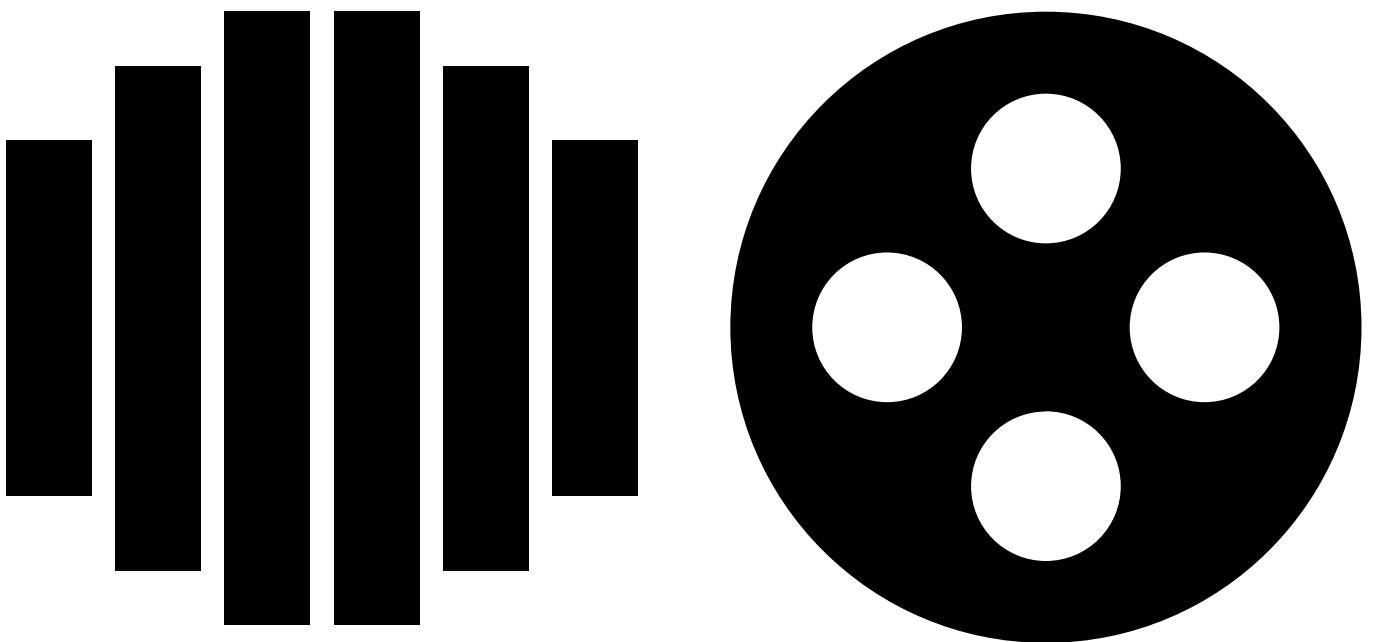
Phase 2. Stakeholder engagement aimed to identify core players of the ecosystem for the qualitative consultations. These consultations were designed to gain a better understanding of the current challenges, and the approach to sustainability and review any undertaken actions and interactions with other players within the ecosystem. The findings from these consultations were fundamental to the mapping exercise, defining the interventions for the ecosystem and future actions. During this phase, the fellow participated in the industry trade event organised by the Society of Cosmetic Scientists (Coventry, 15 Nov 2022) that enabled her to meet relevant stakeholders and attend seminars on legislation, packaging, formulation, life cycle analysis, recycling and sustainability.

In this phase, 65 stakeholders were identified (Table 1). 24 were asked to participate in consultations via email, phone and social media, and 13 were interviewed for research (L'Oreal, Cosmetic Cluster UK, YNY LEP, Bee Clean Soap, Salt & Steam, Lush, O&3, Full Circle, Croda, Kerfoot, Cosy Cottage Soap, Green Rose Chemistry and Green Bioactives).

As the green beauty trend has become paramount for the sector, many of the respondents have put policies and environmental management systems (e.g. L'Oreal, Lush, Croda) in place to operate within circular economy principles. This includes sustainable sourcing and synthesising of ingredients, incorporating eco-design into formulae, products and packaging, reusing water and/or generating renewable electricity and heat for facilities.

Phase 3. The results of the stakeholder consultation were summarised in a simple graphical overview. The main components and the relevant stakeholder information were shared with the Beyond Words studio for data visualisation. The design of the ecosystem was supported by creating a geographical map that illustrates the Yorkshire stakeholders identified in this project. The stakeholder list is included in Table 1.

Proposed design ecosystem The Circular Personal Care Ecosystem for Yorkshire



This research showed that Yorkshire can offer a comprehensive ecosystem for the personal care sector, ranging from ingredients suppliers, natural raw material producers and formulators/ contract manufacturers to academic research in green chemistry, biotechnology, testing facilities and business support (Figure 1 and 2).

The region is a base for well-established specialised suppliers of personal care and beauty product ingredients (e.g., Croda, Kerfoot, Stephenson) and expertise in cosmetic formulation and contract manufacturing (e.g., Olean Personal and Care, InLine Health & Beauty and Friendly Chemical Co).

At the heart of the Yorkshire ecosystem is a vibrant network of independent firms adopting circular economy principles to mitigate their industry's existing footprint. This component showed a growing trend, as many firms were established in the last 5 years, but the number of new businesses entering the ecosystem is significantly lower than in the South East or London regions.

The ecosystem has access to services offering free business support, expertise and resources (e.g. training, events, funding) to help businesses grow and promote the ecosystem activities (case studies, social media campaigns and awards).

Networks and clusters are a vital part of the Yorkshire ecosystem. They enable businesses to share best practices, develop collaborative projects and solve collective challenges (e.g. Cosmetics Cluster UK, BioVale, High-Value Biorenewables NIBB).

The ecosystem benefits from the ongoing research in Yorkshire HEIs. The dense network of researchers and students generates scientific discoveries, technological advances and the advancement of knowledge, and this can support the industry and its efforts towards innovation in green chemistry, biotechnology and skin research.

With the ambition to reach net-zero emissions and become a carbon negative region, Yorkshire established several initiatives to accelerate this transition: BioYorkshire, Circular Towns and Yorkshire Circular Lab.

The Yorkshire ecosystem provides an innovation-driven framework of interactions between ecosystem players that aim to boost the local economy, create new jobs, and reduce the sector's impact on the environment.

Collaboration between seaweed grower SeaGrown and two manufacturers, Cosy Cottage Soap and Bee Clean Soap, demonstrates the opportunity for reducing carbon footprint by sourcing locally produced raw materials, eliminating waste and circulating products and materials. Those businesses are based in the Yorkshire Circular Towns of Scarborough, Malton and Selby. The towns' local businesses and communities embrace the circular economy approach as a driver for collaboration and economic growth to create new jobs and attract new firms to the region as well as delivering environmental and social benefits. These initiatives can create micro ecosystems for personal care players with a presence of local supply of raw materials, ingredients and brands supported by a strong collaborative approach.

Another example is the Stephenson and Bentley farms which have teamed up to implement a sustainable farming model to turn crops grown locally – oilseed rape, hemp, flax, meadowfoam – into ingredients for personal care.

The ecosystem can exploit opportunities within the vast Yorkshire food and drinks industry to create upcycled ingredients for personal care product formulations using minimal energy helping to tackle the waste crisis. These ingredients can also be used for novel regenerative agricultural practises for obtaining plant-derived ingredients that reduce synthetic fertiliser input or greenhouse gas emissions.

The ecosystem players embed innovative design in their product life cycle, driving change and enhancing environmental performance. Examples include plastic-free reusable, refillable packaging, and waterless and compact solutions that create a zero-waste closed-loop supply chain system (e.g. Miniml).

Equally important is the use of ingredients obtained in the most efficient way that minimises waste associated with the extraction of ingredients and manufacturing processes. Keracol – a spin-out of the University of Leeds branded as Dr Craft – uses the extracted pigments from Ribena blackcurrant juice production pomace to create a range of natural hair dyes. The company’s R&D effort is toward upcycling other food waste by-products (e.g. from the wine industry).

Yorkshire provides examples of good practices in the manufacturing phase, using technologies that reduce energy, water consumption, emissions and waste. For instance, Croda has reduced greenhouse gas (GHG) emissions by 12.7% since 2018 by switching to renewable electricity across its manufacturing sites. Croda installed an 11 MW biomass system at their site in Hull to supply low-carbon steam to the plant, fuelled by locally sourced and suitably managed forestry residues. To create a circular solution, ash residues are diverted into sustainable by-products such as soil improvers and building blocks.

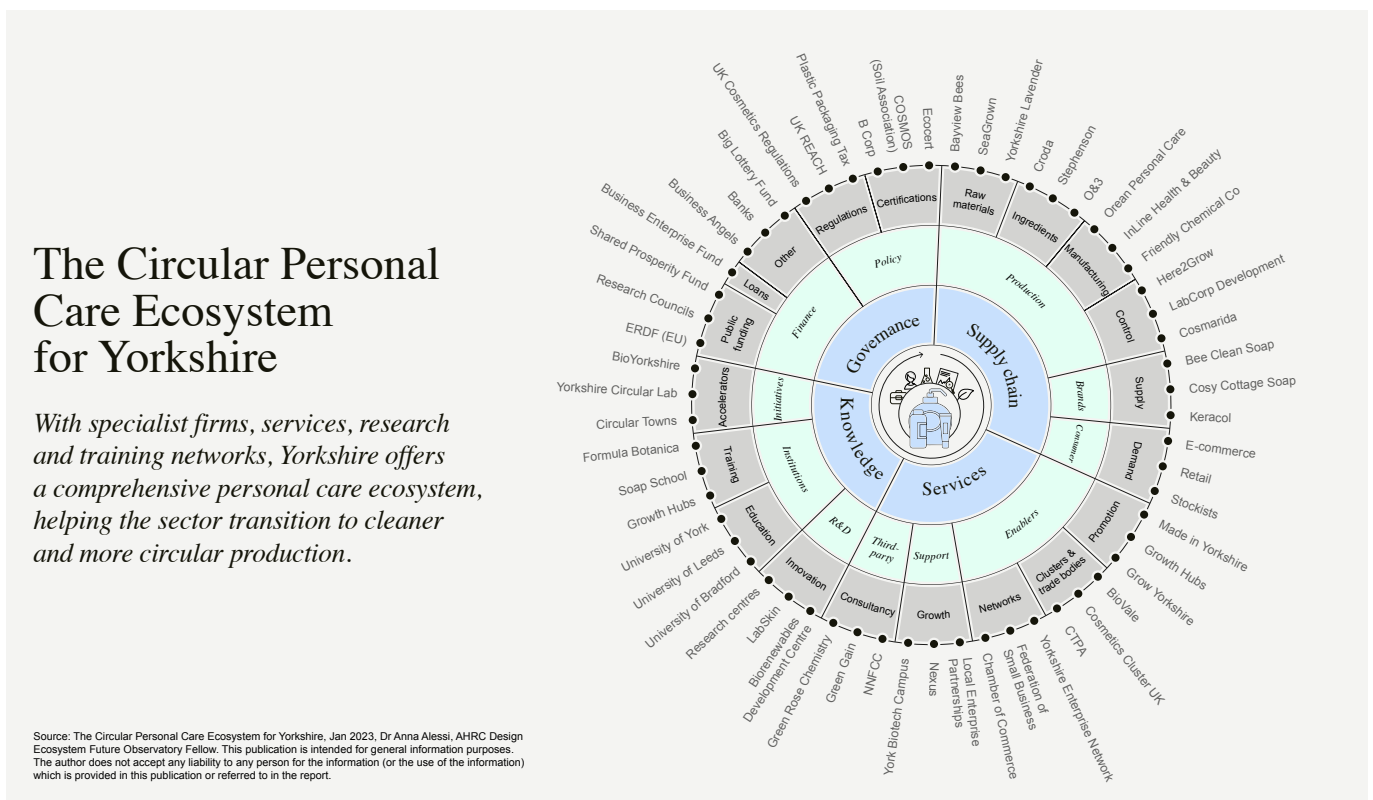


Figure 1. The Circular Personal Care Ecosystem for Yorkshire

Target outcomes and priority action areas

The personal care industry plays an important role in the UK's economy, but it contributes to a growing climate crisis by using large amounts of natural resources to produce billions of consumer products that pollute our waters, lands and air. The entire value chain must act together towards the long-term target outcomes.

Target 1. Conscious consumerism

The current level of personal care product consumption is unsustainable, with the average person stocking 16 products on their bathroom shelf. The life cycle analysis showed that the biggest proportion of the carbon footprint in the personal care product life cycle is linked to its use.⁵ The industry must play a role in encouraging a more conscious consumption that will reduce the industry's environmental footprint and take responsibility for their product beyond the sale point by providing the consumer with options for recycling, refilling and designing new products that minimise waste generation and energy consumption. The sector must also play a role in ethical marketing, avoiding toxic messages and greenwashing.

Target 2. Circular personal care ecosystem

This research showed that the complexity of the cosmetic product life cycle is the main barrier to achieving full circularity, as elements of a linear economy cannot be avoided. However, the growing demand for sustainable products forces this sector to be more creative and responsive to the current environmental challenges by changing manufacturing processes, sourcing natural and sustainable ingredients, designing new packaging solutions and investing in green chemistry and biotechnology solutions.

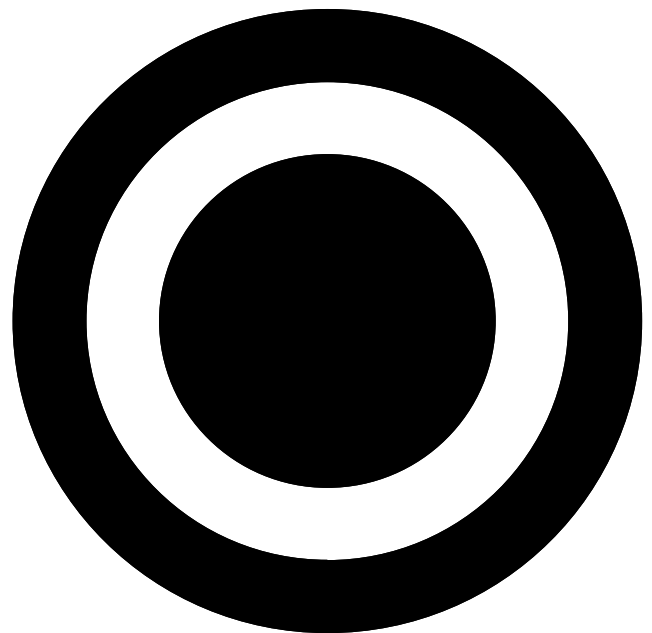
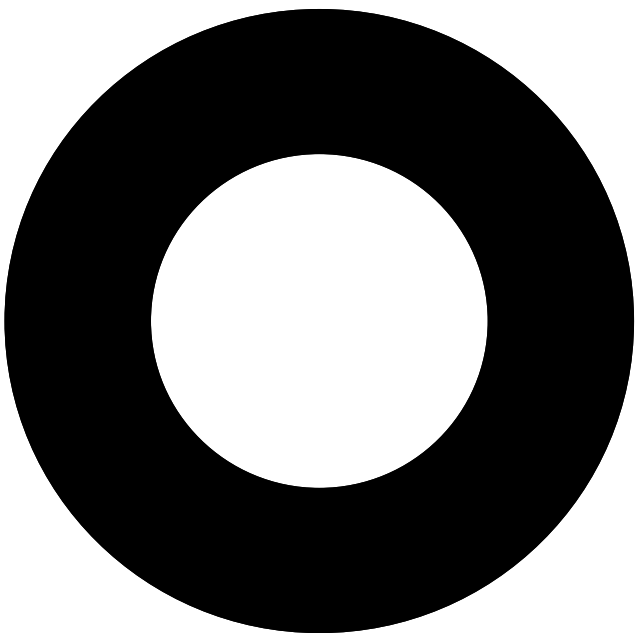
Target 3. Green biotech solutions

The production of ingredients contributes to the personal care product's carbon footprint by using a diverse range of fossil-based resources and land to produce raw materials. In response, the personal care market must seek technical innovation to develop suitable alternatives by applying green chemistry and biotechnology approaches. Fermented ingredients for cosmetics such as fermented coconut, chilli or pumpkin offer the possibility to replace synthetic preserving agents. Organic acids such as citric acid, lactic acid or glycolic acid are produced by a variety of microorganisms and used commonly in personal care products. By-products from agriculture such as straws can be utilised as an energy source for microbes to grow and to convert sugars into those compounds. This offers an opportunity to convert resources which are usually wasted into higher value products with a wide application in personal care products.



Stakeholder	Target	Actions
Government	2, 3	Provide access to innovation investment - finance to support transition to low carbon production methods, development of innovative biobased solutions for ingredients and packaging for personal care products that can lead to novel products and processes
Government, third-party organisations & producers	1	Encourage consumer behaviour change – support in changing consumer practices, developing strategies for consumer engagement in new waste management strategies e.g., refill stations, consumer education and advice on energy and water saving strategies
Large cooperations, Universities & RTOs	all	Enabling innovation and knowledge share – development of novel technologies for the ecosystem supported by R&D and commercialisation activities, provision of resources (access to equipment, incubator space), creation of programmes to encourage spinouts & start-ups, entrepreneurial training and networking opportunities, education of highly skilled workers, knowledge exchange
Communities	1, 2	Engagement - supporting local producers, boosting local economy, encouraging behaviours change, lobbying for investment for local initiatives

Conclusions



Conclusions and achievements

The overall aim of this early-stage research was to gain knowledge and a better understanding of opportunities for the personal care industry transition routes to low-carbon business models. The research gathered information through the extensive review of current trends and technological advances that will benefit future research projects. The comprehensive stakeholder engagement identified players whose actions focus on implementing strategies to minimise environmental impact by switching to bio-based resources, novel packaging solutions and product designs, collaborating with local producers and ingredient suppliers, and investing in renewable energy for the manufacturing facilities. The fellow has gained new skills in ecosystem mapping, visualisation and market research. The study identified innovation gaps such as the development of high-value bio-based ingredients using industrial biotechnology and novel production systems, such as controlled environment agriculture that would benefit the personal care ecosystem in obtaining more sustainable ingredients.

Principal Investigator's personal evaluation

Stakeholder engagement was the most challenging phase of the research. Direct communication via emails and phone calls were only partially successful as many respondents didn't express interest in the research due to lack of time or not seeing the direct benefit of the study to their business. Meeting relevant stakeholders was facilitated through participation in the SCS Formulate trade show. This allowed the Fellow to approach new contacts and introduce them to the project, but due to the nature of this event only brief discussions took place. Some consultations were hampered by confidentiality issues which could be addressed in the future by the signing of NDAs.

The most enjoyable element of the research was the development of a visualisation with the Beyond Words agency. The team at BW was highly professional, very responsive to emails, willing to incorporate last-minute changes into the concept and design and able to provide useful guidance and ideas for the design.

Other outputs based on the research

The outcome of this study will be announced in several newsletters including BioVale, High-Value Biorenewables Network and IBioIC, which reach a wide audience across bioeconomy industries, businesses, academics and policy stakeholders. For instance, the BioVale newsletter is sent to over 1,300 subscribers. The case study outlining the research findings will be published on the BDC website (March 2023) and promoted via the BDC and BioVale social media campaign. Several stakeholders agreed to promote the project outcomes to their audiences.

Future research plans

- Organise and deliver a one-day face-to-face workshop to a selected group of ecosystem stakeholders, in partnership with the Cosmetics Cluster UK. The aim of the workshop will be to discuss the future of Yorkshire's ecosystem, the barriers and challenges and the new collaboration opportunities across the



supply chain that will support the growth of the ecosystem. During this study, the consultations were structured as 1:1 interviews, so future research would benefit from roundtable discussions with a group of stakeholders to review the map and interactions.

- Using ERDF- funded support for Yorkshire SMEs, scope and deliver short research projects for selected businesses identified in this research.
- Identify future funding opportunities.

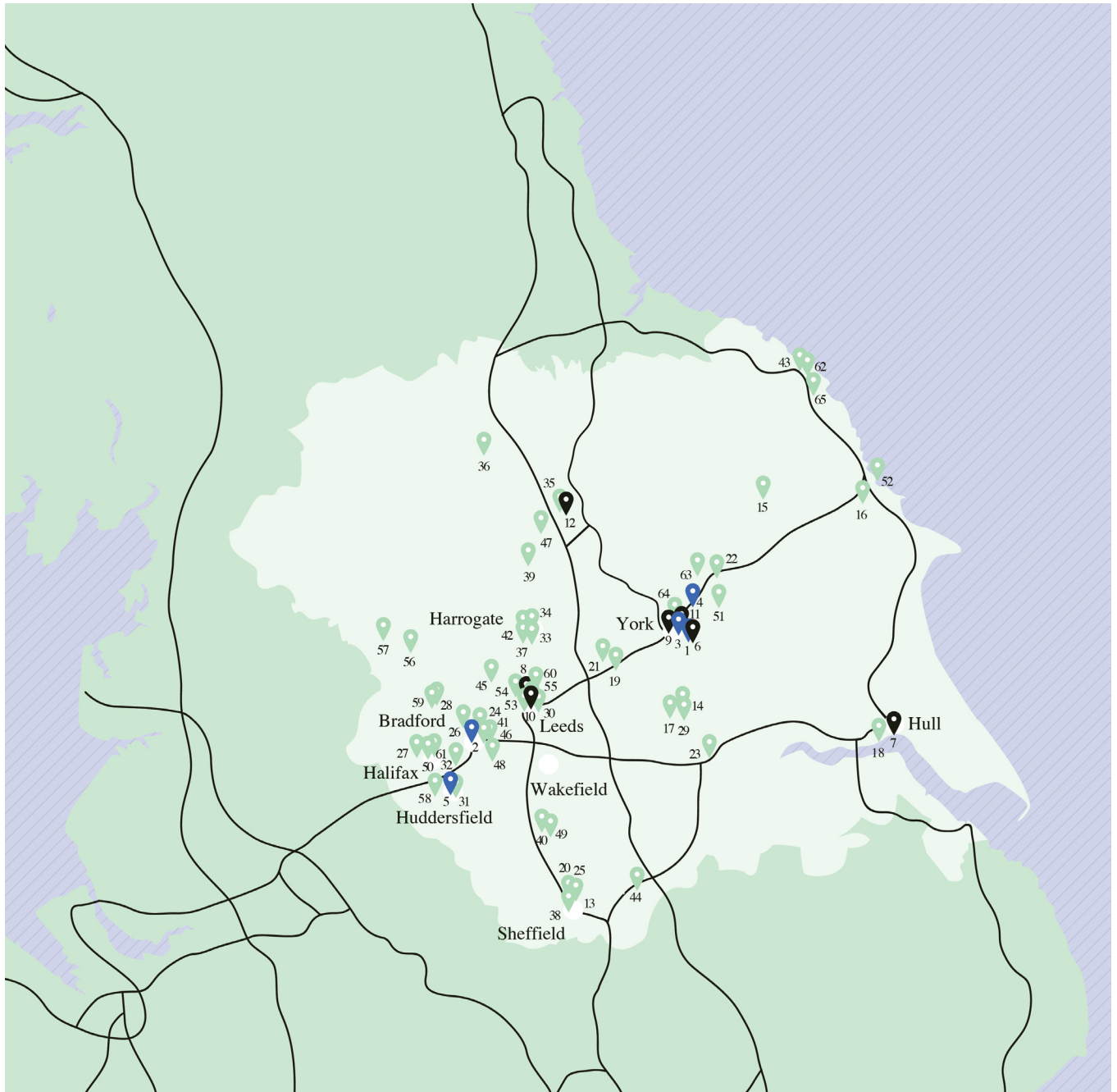


Figure 2. Map of Yorkshire stakeholders in the personal care ecosystem. See Table 1 for the stakeholders' names.

Table 1. The list of stakeholders in the Yorkshire personal care ecosystem.

	Name	Grouping	Component	Function	Website
1	Biorenewables Development Centre	Knowledge	R&D	Innovation	http://www.biorenewables.org/
2	Centre for Skin Science		Institution	Education	https://www.bradford.ac.uk/css/
3	Green Chemistry Centre of Excellence		R&D	Innovation	https://www.york.ac.uk/chemistry/research/green/
4	LabSkin		R&D	Innovation	https://www.labskin.co.uk/
5	Soap School		R&D	Training	https://soapschool.com/
6	BioVale	Services	Enablers	Cluster	https://www.biovale.org/
7	Cosmetic Cluster UK		Enablers	Cluster	https://www.cosmeticsclusteruk.com/
8	Green Gain		Third-party	Consultancy	https://www.greengain.co.uk/circular-economy
9	Green Rose Chemistry		Third-party	Consultancy	https://greenrosechemistry.com/
10	LCR LEP		Services	Growth	https://www.the-lep.com/
11	NNFCC		Third-party	Consultancy	https://www.nnfcc.co.uk/
12	YNY LEP		Services	Growth	https://www.ynylep.com/
13	Abbey Perfumery	Supply chain	Brand	Supply	https://www.abbeyperfumery.co.uk/
14	Active Cosmetic Ingredients		Production	Ingredients	https://www.active-ingredients.co.uk/index.php
15	AnnWyn Botanicals		Brand	Supply	https://www.annwynbotanicals.co.uk/
16	BayView Bees		Production	Raw materials	https://bayviewbees.co.uk/
17	Bee Clean Soaps		Brand	Supply	https://www.beeleansoaps.co.uk/
18	Bubbles Handmade Cosmetics		Brand	Supply	https://bubblecosmetics.com/
19	Clariant		Production	Ingredients	https://www.clariant.com/en/Corporate
20	Cosmarida		Production	QC control	https://www.cosmarida.com/
21	Cosmiko		Production	Manufacturing	https://cosmiko.co.uk/



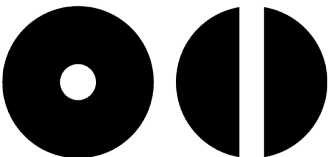
22	Cosy Cottage Soap	Supply chain	Brand	Supply	https://www.cosycottagesoap.co.uk/
23	Croda Cosmetics		Production	Ingredients	https://www.croda.com/en-gb
24	Dolores and Rose		Brand	Supply	https://doloresandrose.co.uk/
25	Face Theory		Brand	Supply	https://www.facetheory.com/
26	Fikkerts		Brand	Supply	https://www.fikkerts.com/
27	Friendly Soap		Brand	Supply	https://friendlysoap.co.uk/
28	Global Cosmetic Developments		Production	Manufacturing	https://globalcosmeticdevelopments.com/
29	Here2Grow		Production	Manufacturing	https://here2grow.com/
30	Inline		Production	Manufacturing	https://www.inlinehealthandbeauty.com/
31	James Robinson Speciality Ingredients		Production	Ingredients	https://jr.si.com/
32	John Drury & Co		Production	Manufacturing	https://www.john-drury.co.uk/
33	Josie Rose Skincare		Brand		https://www.josieroseskincare.com/
34	Keracol		Brand	Supply	https://www.keracol.co.uk/
35	Kerfoot		Production	Ingredients	https://www.kerfootgroup.co.uk/
36	Kiss the Moon		Brand	Supply	https://kissthemoon.com/
37	LabCorp Development		Production	QC control	https://drugdevelopment.labcorp.com/
38	Libra Speciality Chemicals		Production	Ingredients	https://librachem.co.uk/
39	Makers Ingredients		Production	Ingredients	https://www.makersingredients.com/
40	McCallum Manufacturing		Production	Manufacturing	https://mccallummanufacturing.co.uk/
41	Mibelle		Production	Manufacturing	https://mibellebiochemistry.com/
42	Myroo Skincare		Brand	Supply	
43	Nature's Laboratory Ltd		R&D	Innovation	https://natureslaboratory.co.uk/
44	Navy Professional Ltd		Brand	Supply	https://www.navyprofessional.com/

45	Nicholas James	Supply chain	Production	Manufacturing	https://www.nicholasjamesuk.co.uk/
46	North Chem		Production	Manufacturing	https://www.northchem.co.uk/
47	O&3 Limited		Production	Ingredients	https://www.oand3.com/contact-us/
48	Orean Personal Care Limited		Production	Manufacturing	https://www.orean.co.uk/
49	Pretty Little Treat		Brand	Supply	https://www.prettylittletreats.co.uk/about/
50	Sabel		Production	Manufacturing	https://www.sabel.org.uk/
51	Salt and Steam		Brand	Supply	https://www.saltandsteam.co.uk/
52	Seagrown		Production	Raw materials	https://www.seagrown.co.uk/
53	Stantondown		Production	Manufacturing	https://www.stantondown.com/
54	Stephenson Personal Care		Production	Manufacturing	https://www.stephensonpersonalcare.com/
55	Surfagem		Production	Ingredients	https://surfagem.com/?c=GB
56	The Friendly Chemical Co.		Production	Manufacturing	https://www.thefriendlychemicalco.com/
57	Miniml		Brand	Supply	https://minimlrefills.co.uk/
58	The Dales Soap Shed		Brand	Supply	https://www.thedalesssoapshed.com/
59	Thornton & Ross Ltd		Production	Manufacturing	https://www.thorntonross.com/
60	Tilda's Tribe		Brand	Supply	https://tildastribe.co.uk/
61	Unilever UK		Production	Manufacturing	https://www.unilever.co.uk/
62	Veloskin		Brand	Supply	https://veloskin.cc/
63	Whitby Sea Salt	Production	Raw materials	https://www.whitbyseasalt-ltd.co.uk/	
64	Yorkshire Lavender	Production	Raw materials	https://www.yorkshirelavender.com/	
65	Yorkshire Soap	Brand	Supply	https://yorkshiresoap.co.uk/	
66	Sweet Cecily's	Brand	Supply	https://www.sweetcecilys.com/	

References

1. Alex Hetherington, et al., 'The Circular Fashion Ecosystem: A Blueprint for the Future', Institute of Positive Fashion (September 2021), instituteofpositivefashion.com/uploads/files/1/CFE/Circular_Fashion_Ecosystem_Report.pdf [accessed 15 February 2023].
2. Anna Whicher and Andrew Walters, 'Mapping Design for Innovation Policy in Wales and Scotland', *Design Journal*, 20/1 (2017), 109-129.
3. Statista, 'Beauty & Personal Care Report', Statista Consumer Market Insights (January 2023), www.statista.com/study/55499/cosmetics-and-personal-care/ [accessed 15 February 2023].
4. British Beauty Council, 'The Value of Beauty', British Beauty Council (July 2019), britishbeauty-council.com/wp-content/uploads/2020/05/Value_of_beauty_FINAL.pdf [accessed 15 February 2023].
5. Laura Golsteijn, et al., 'Developing Product Environmental Footprint Category Rules (PEFCR) for Shampoos: The Basis for Comparable Life Cycle Assessment', *Integrated Environmental Assessment and Management*, 14/5 (2018), 649-659.

These Design Ecosystem Fellowships reports were commissioned by Future Observatory. Future Observatory is a national programme for design research supporting the UK's response to the climate crisis. The three-year programme is coordinated by the Design Museum in partnership with the Arts and Humanities Research Council (AHRC), which is part of UK Research and Innovation (UKRI)

 FUTURE
OBSERVATORY