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The engaged university delivering social innovation

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Abstract
This paper examines a programme initiated and managed by an entrepreneurial university in the United Kingdom (UK), aiming to foster the circular water economy in Sub-Saharan Africa. Our focus is on transitioning from conventional models of the entrepreneurial university to innovative forms of knowledge exchange that prioritise social innovation and sustainable development, as per the "engaged university". Through an in-depth qualitative study, we find that three interrelated levels of engagement—engaging individuals, engaging organisations and engaging communities—are essential for universities delivering the third mission of societal impact. Employing the established framework developed by Hughes et al. (in: Knowledge exchange between the arts and humanities and the private, public and third sectors, Arts & Humanities Research Council, Cambridge, 2011) to examine university activities, we expose the social innovation underpinning people-based, problem-solving and community-based activities. In the context of the third mission, social innovation involves bringing individuals, organisations and communities together through supporting entrepreneurship, collaboration and mutual learning capacities both within and beyond the university setting. The mechanisms driving university engagement are thus a process of multilevel social innovation, relying on support from individual researchers, project leaders, partner institutions and local end-user communities. Adopting a multilevel perspective allows us to identify the distinct mechanisms of engaged universities, which transcend those of other university models in the realm of social innovation. We argue that the engaged university model extends understanding of how supports for social innovation can connect and create networks to tackle global challenges.

Keywords Entrepreneurial university · Engaged university · Third mission · Social innovation

JEL Classification I23 · I15 · O35

1 Introduction

Scholars and policymakers have long considered universities as major economic and cultural actors in society (Cunningham et al., 2019). In addition to their traditional roles in teaching and research, universities are recognised for their role in transferring knowledge

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from local to global networks while anchoring entrepreneurship and innovation within regional economies (Audretsch et al., 2014; O'Mara, 2012). This paper is interested in understanding university engagement activities aiming to foster social innovation (Audretsch et al., 2022), and the supports required for the dynamic knowledge exchanges it entails. The need for understanding such processes crystallises when we consider how universities can accelerate the sustainable development goals (SDGs) (Guerrero et al., 2016; Leal Filho et al., 2021; Mawonde & Togo, 2019), by responding to climate and pandemic-related issues, which have heralded significant threats to universities' standard operating practices (Corazza & Saluto, 2020; Guerrero & Pugh, 2022). While university-driven social innovations can create new operating norms (Milley & Szijarto, 2020; Tjörnbo & McGowan, 2022), there is insufficient understanding of how universities can foster knowledge exchange which creates social (as well as economic) value.

The shift of university "third mission" or "engagement activities" to address social and sustainability objectives coincides with what scholars have conceived as the "engaged university" (Breznitz & Feldman, 2012). These universities balance social and economic goals (Thomas et al., 2023), by transferring knowledge through intellectual property, spin-offs and entrepreneurship education (Hayter et al., 2020; Menter, 2023). In attempts to extend understanding about how universities deal with their social goals, researchers have gone further to investigate how universities are engaging in collaboration and leadership (Audretsch & Belitski, 2022; Rådberg & Löfsten, 2023) to develop innovation ecosystems[1] that create societal value (Domanski et al., 2020). Through their work, scholars have noted the lack of appreciation of the "non-technical" aspects of knowledge exchange that can foster economic activity, such as those outside of science and engineering departments and the private sector, and held in informal, social interactions (Hughes & Kitson, 2012). The framework developed by Hughes and Kitson (2012) implies that while university knowledge reaches society via research and teaching, universities also draw inspiration from end-users. Universities engage in partnerships across sectors which become solidified through interactions based on people (i.e., interpersonal exchanges), problem-solving (i.e., research projects), commercialisations (i.e., patents, spinouts) and/or communities (i.e., public-facing activities) (Hughes & Kitson, 2012). Entering this research space, this paper asks the broad scoping question: *"What is the role of engaged universities in social innovation?"* and, relatedly, "*What are the mechanisms underpinning university engagement in social innovation in response to global challenges?"*.

In answering these questions, we examine a UK based "entrepreneurial university" (Gordon & Jack, 2010; Pugh et al., 2016, 2021b) engaged in a third mission programme around the circular water economy, which is co-delivering social benefit with academic and community actors in Botswana, Ghana, Kenya, Malawi, Nigeria and Zambia. Broadly speaking, European business schools are deepening their presence in Africa (*Financial* Times, 2023). We interrogate how one university is pursuing a strategy to drive social innovation with, in and for Global South communities, through engagement activities aiming to bolster entrepreneurial capital development beyond the university. As we see it on the ground, we clarify how engagement happens, and what supports for interactions between individuals, organisations and communities need to be in place for it to work. We demonstrate that 'engaging' is not magically pulling a rabbit out of a hat; it involves facing the context of the university and its external environment. We envisage this like an iceberg,

[1] Innovation ecosystems involve *"a network of interconnected organisations, organised around a focal firm or a platform, and incorporating both production and use side participants, and focusing on the development of new value through innovation"* (Autio & Thomas, 2014: 3).

where most engagement activities remain hidden underneath teaching, research and entrepreneurship, and what meets the eye is the precipice of knowledge application.

Under the tip of the iceberg lie unresolved gaps between the engaged university concept and the entrepreneurial university and the triple helix models. Resolving this tension, we build on the engaged university concept defined by Breznitz and Feldman (2012) and the work of Hughes and Kitson (2012) regarding the impact pathways of universities and show that the engaged university concept is appropriate to explain social innovation processes (Benneworth, 2013). First, we show that universities engage in social innovation through three interrelated mechanisms to support: (1) entrepreneurial capacities to connect research and society through relationships; (2) collaborations across disciplines and geographies through a partnership housed at the university; and (3) mutual learning through interactions with communities to create local benefits. Second, we adopt a multilevel perspective to consider the mechanisms of engagement activities, showing the importance of project leaders who are connecting individuals, organisations and communities. We find that there is substantial overlap in the university's support for social and technical innovations, which extends our understanding of how universities ought to approach social innovation.

2 Theoretical foundations

2.1 Tensions within the traditional university perspectives

Concepts such as entrepreneurial university (Audretsch, 2014) and triple helix have been critical in elaborating the connections between entrepreneurship education, technology transfer and the wider context of entrepreneurial opportunities (O'Dwyer et al., 2022; Paleari et al., 2015). The entrepreneurial university idea emphasises the importance of entrepreneurship, collaboration and technology transfer (Audretsch, 2014), which can be seen in different university activities, such as licensing, spin-out and patenting (Guerrero & Urbano, 2012), as well as human capital development through employment, and knowledge creation through research and commercialisation via incubation (Guerrero et al., 2016; Lamine et al., 2018). The entrepreneurial university concept has set the expectation that universities carry out a third mission of knowledge exchange, alongside teaching and research, via *"mechanisms to facilitate the spillover of knowledge from the research core and applied programmes generating that knowledge to society"* (Audretsch, 2014: 317).

The entrepreneurial university concept has been pivotal in defining the primary role of universities in regional development (Pugh et al., 2022), whereby knowledge flows across the university, industry and government actors (Etzkowitz, 2008). In the paradigm of sustainable development, scholars have developed the quintuple helix model to incorporate the role of civil society and the natural environment in knowledge production and innovation (Carayannis et al., 2012). Despite the helix models, there is a view that universities and other actors blend roles without explaining the interactions that specifically support social innovation (Tjörnbo & McGowan, 2022) and isolating the entrepreneurial university concept from the context where knowledge flows. There is insufficient understanding of the ways universities can identify wider "markets" for the third mission, such as through building partnerships with actors, including SMEs, who share common interests in developing innovation (Comacchio et al., 2012; Hughes & Kitson, 2012). University activities are seen to foster commercial and educational outputs (Perkmann et al., 2013), through advancing

science parks (Amoroso et al., 2019), large-scale research institutes (Rådberg & Löfsten, 2023) and by building relationships (Gordon et al., 2012).

However, recent work has recognised that entrepreneurial universities are playing a *"broader and more extensive role"* (Menter, 2023: 1) in contributing to broader social and sustainability agendas. We agree on the need to broaden our conceptualisation of third mission and knowledge exchange (Menter, 2023), and propose social innovation as the means for understanding how university activities generate social and sustainable impacts (Chankseliani & McCowan, 2021). With recent perspectives comes greater acknowledgement that universities support social innovation from within the core research, teaching and the third mission activities (Tjörnbo & McGowan, 2022), namely by supporting knowledge flows that fuel the innovation process. The engaged university concept improves upon the entrepreneurial university and helix perspectives in that it appreciates the interactions between universities and other partners driving social innovation.

2.2 From entrepreneurial to engaged university

The engaged university concept enables us to account for universities playing multiple roles in regional development, both by commercialising knowledge and fostering academic entrepreneurship, as well as by contributing to institutional networks (Boucher et al., 2003) and taking a more hands-on approach to social innovation (SI). According to Edwards-Schachter and Wallace (2017), *"SI is a collective process of learning involving the distinctive participation of civil society actors aimed to solve a societal need through change in social practices that produce change in social relationships, systems and structures, contributing to large socio-technical change. A less restrictive view of SI contemplates the role of social practices embedded in the simultaneous generation of traditional innovation outcomes*" (p. 73). According to Alos-Simo et al. (2020), social innovation begins with ideas for solving social problems and developing them into pilotable prototypes, which can deliver stable offerings with scale-up potential (Polman et al., 2017). Social innovation can occur at multiple levels (Polman et al., 2017; SIMRA, 2016), and, in very different contexts. Nevertheless, it should meet both economic and social needs (SIMRA, 2016).[2]

For the purposes of looking at the expanded third mission of universities (Bayuo et al., 2020), we employ SI to emphasise the relationships and interactions which are inherent in university engagement activities worldwide, especially those aiming to reach Global South communities (Aroncena & Sutz, 2021). This lens is appropriate because it can help build upon the engaged and entrepreneurial university concepts, which tend to focus on individual regions without unpacking the collective aspects of innovation (DiVito & Ingen-Housz, 2021). Discussions of university-driven social innovation have emphasised universities as facilitators of learning and knowledge processes and as steerers of regional growth (Pugh et al., 2021a, 2022). More empirical work and theorisation are required to understand how universities are actualising engagement in social innovation.

To understand exactly how social value is created in the university system (Autio & Thomas, 2014), it is important to understand the complexities driving the process. Lacking practical tools for investigating engagement mechanisms, we need analytical frameworks that account for the social innovation processes that link the university to the wider

[2] Social innovation can include: *"new institutional environments (e.g., of formal and informal rules) and arrangements (spatial and procedural), new relationships between actors, networks and interactions (e.g., new attitudes, collaborations, values, behaviours, skills, practices and learning processes) and new fields of activity (e.g., social entrepreneurship, social enterprises)"* (SIMRA, 2016: 34).

innovation ecosystem (Feldman et al., 2019; Guerrero & Urbano, 2016). For example, Misra and Pugh (2023) found in their recent study in India that ad-hoc interactions between academic and regional stakeholders are a key means through which university-region ties become established in the university's third mission. Importantly, the precise mechanisms of academic engagement depend on academic access to support resources (Perkmann et al., 2013). We contribute to understanding how knowledge from one university shapes and is shaped by exchanges between individuals, organisations and communities engaging in social innovation through building on extant theories of university impact pathways (Hughes & Kitson, 2012; Hughes et al., 2011).

Following this logic, we elaborate on the different mechanisms of university engagement in social innovation. People-based activities typically include forums, lectures, training, enterprise education and participating in networks; problem-solving activities consist of joint research and hosting personnel; community-based activities offer lectures and dialogues to local end-users (Hughes et al., 2011). In our study, we discuss how established forms of university knowledge exchange, people-based, problem-solving and community-based activities (Hughes et al., 2011), take place through interactions across individual, organisational and community levels.

3 Methodological design

3.1 Empirical context

To better understand how engagement unfolds, we use a qualitative approach and explore the building of a partnership between an entrepreneurial university in the UK (Lancaster) and research partners throughout Sub-Saharan Africa. In 2017, a £7 million grant was awarded through a UK government fund designed to tackle global challenges. These early steps evolved through the grant award into a large programme called Recirculate, where the university engaged in driving eco-innovation in Africa through capacity building for a safe, circular water economy, spanning regions in Ghana and Nigeria, as well as in Botswana, Kenya, Malawi and Zambia (Zozimo et al., 2022).

Recirculate brought together social and environmental scientists with local entrepreneurs and communities to develop knowledge exchange and engagement surrounding circular water economy solutions. The social aspects of knowledge exchange were considered valuable, as an extension of the entrepreneurship and innovation work the university has led for over 20 years (Dada et al., 2016; Gordon et al., 2012). Within the larger Recirculate project, we focus here on two programmes therein: the Stimulating Entrepreneurial Thinking in Scientists (SETS) workshops in Africa (and online) and the Women Innovators Network in Africa (WINA) (Appendix Table 6).[3] In SETS, the university applied a proven entrepreneurial learning model developed at Lancaster in a new context (Pugh et al., 2021a; Zozimo et al., 2022). Due to Covid-19, the Recirculate team developed a digital curriculum together with five African university partners to encourage collaboration, knowledge sharing and entrepreneurial thinking to support the circular water economy. WINA, a transregional network built around female leadership and networking, has co-created a network

[3] For more information, please see: https://recirculate.global/capacity-building/workshops/ and https://recirculate.global/sets/.

Table 1 International stakeholders

Leading partner institution	Country
Lancaster University	United Kingdom
Council for Scientific and Industrial Research (CSIR)	Ghana
University of Benin	Nigeria
Lancaster University Ghana	Ghana
RECIRCULATE Collaborations	**Country**
African Technology Policy Studies Network	Kenya
Botswana International University of Science and Technology	Botswana
The Copperbelt University	Zambia
National Commission for Science and Technology	Malawi
Affiliated Collaborations	**Country**
Green Advocacy	Ghana
HATOF Foundation	Ghana
Umar Bun Hatab Islamic School	Ghana
Sewerage Systems Ghana Ltd	Ghana

across Africa that provides peer support, mentoring and leadership training for emerging female entrepreneurs, with a strong emphasis on the Recirculate stakeholders (Table 1).

3.2 Data collection and case analysis

Data collection took place between 2018 and 2022 (Table 2). The qualitative approach used combined 52 interviews, observations and archival documents (Silverman, 2011). Of the observations, 22 were webinar observations (participatory and non-participatory) due to the impact of the Covid-19 pandemic on data collection (Ramli et al., 2021). The in-person observations enabled direct participation with the stakeholders and offered the opportunity to generate understanding of the relationships and contexts being studied (Jack, 2005).

We also draw on observations that took place at in-country workshops (Appendix Table 6), project work-package meetings, annual stakeholder meetings (Table 2), and digital engagements such as through monitoring of the WhatsApp group and blog pages. The WhatsApp group became especially important in substituting real-life communication formats as the pandemic ensued.

We selected respondents with the intention of gaining multiple perspectives on university engagement in social innovation. This purposeful approach to sampling (Gartner & Birley, 2002; Pratt, 2008) also gave us the opportunity to understand the situations respondents found themselves in Bansal and Corley (2011). For the interviews, questions were designed to inquire about the individual experiences in the third mission programme and perceptions concerning the project's delivery of inclusive knowledge exchange. We used an interview schedule which allowed us to account for the expertise of the different informants (Table 3).

To build an in-depth understanding, an interpretive, inductive approach was adopted (Alvesson & Sköldberg, 2000), and we gathered meaningful data about how knowledge

Table 2 Data description

Type	#	Hours	Dates	Actors	Use in analysis
Interviews	52 informants	65.5	May 6, 2020–April 16, 2021	Researchers, partners	Transcripts which were coded by first and fourth authors and discussed with group of five authors at regular meetings, leading to descriptive theme (the roles of different engagement levels) and explanatory themes
Webinars	22	22.75	September 9, 2020–December 17, 2020	Researchers, partners	Field notes collected by first author, which were considered in group discussions
Meetings	4	28	November 26, 2020; December 15, 2020; October, 2021	Researchers, partners	Observations of various presentations by different programme participants by the first author, leading to insights regarding the collaboration of individuals, organisations and communities in achieving programme milestones
Documents and blogs	45	n/a	2018–2021	Work-packages	Analysis by the first author to develop the initial interview guide and track the evolution of programme themes
Observations	First author	3 mos	September 2021–December 2021	Visiting researcher	Daily interaction with the university's social context and infrastructure (the Centre for Global Eco-Innovation) by the first author, leading to an appreciation of the social as well as economic and technological aspects of innovation

Table 3 Description of informants

Informants		
Individuals	Organisations	Countries
Senior Researcher (SR) Researcher (R) Junior Researcher (JR)	Lancaster University Lancaster University Ghana University of Strathclyde Copperbelt University Kenyatta University University of Benin Botswana International University of Science and Technology	UK, Ghana, Zambia, Kenya, Nigeria, Botswana
Project leaders (SM)	Lancaster University Lancaster University Ghana	UK
Practitioner/Entrepreneur (PR)	Environmental journalism start-up Water and sanitation start-up Council for Scientific and Industrial Research of Ghana	Nigeria, Ghana
Webinar presenter (WE)	Lancaster University Lancaster University Ghana	UK, Ghana

exchanges were evolving throughout the programme's timeline (Brundin, 2007). Combining interviews and observations helped to generate thick descriptions (McKelvey, 2004) of the perspectives of the informants (Thompson et al., 1989) on the programme.

The data analysis followed Eisenhardt (1989), which involved gathering the data and going through it for relevant material to uncover emerging explanatory themes (Jack, 2005). We first assigned descriptive codes based on commonalities and inconsistencies in the data, using the informants' words to showcase the reality of their situations. We then brought themes together as analytical categories aligned with our research interests. The research team was key to ensuring reliability in the analysis process. Through constantly comparing the categories and concepts, and our iterative reviewing of the data (Silverman, 2011), we were able to arrive at analytical categories to explain the nature of university engagement, enabling us to unpack the mechanisms contributing to social innovation.

4 Findings

We structure our findings according to the three mechanisms of university engagement across three levels—individual, organisational and community—which interact to create social innovation. Having noticed several corresponding activities with the codes that emerged from our data, we introduce a model to illustrate how social innovation happens across a multitude of stakeholders. These codes reveal the different supports needed from the university to meet programme objectives (Appendix Table 7).

4.1 Engaging individuals through people-based activities

We saw the interconnections between individuals with a shared commitment to the third mission programme. At the micro-level, we observed that a select group of Lancaster personnel (primarily the project leaders) were engaging individuals through people-based activities, namely through fostering knowledge exchanges, enterprise education and social interactions (i.e., through work-package meetings). We found evidence that these project leaders supported a broader capacity-building effort to stimulate entrepreneurial thinking and create a common space for participants to engage with the challenges they saw:

> It [Recirculate] was a platform where I met various academicians from diverse backgrounds and experienced entrepreneurs who shared their success stories. (PR5, Ghana)

Moreover, we identified situations which by bringing people together created opportunities for individuals at the university:

> Professor [mentions name] knocked on my door and presented me with this opportunity and said, 'Look we were in a board meeting and your name came up because we are looking for a multidisciplinary group. So, you take this opportunity'. (R9, Zambia)

By design, the scope of the activities aimed to connect individuals experiencing similar challenges, including *"those who need the solution" (PR1, Nigeria)*. This approach to generating knowledge was seen to offer a way to, *"engage people a lot more than if you were to just read a report" (JR1, UK).* Interestingly, this way of developing knowledge exchange and social interactions was baked into the grant proposal, which emphasised that social innovation involves a process of co-design with different stakeholders. This support for knowledge exchange through social interaction became a vehicle for bringing the people involved together.

The factors driving people-based activities involved the efforts of the project leaders to encourage individuals to interact with one another. The project leaders communicated a broad viewpoint on knowledge exchange based on multidisciplinary and multisector perspectives. Activities to bring people together aimed to better understand the challenges facing communities in sub-Saharan Africa:

> It's important to build and work with other academic partners in other disciplines, sharing diverse knowledge is important to understand the problems and work with communities, working with NGOs, business and industries. Lancaster's Knowledge Exchange activities also provide this space to bring people together and find commonality. (WE4, UK)

This seemed to relate to an emerging network which was being built through social interaction. What was interesting, however, about this network was that it seemed reliant on a few lead individuals and their being able to bring in individuals to help them build it, "*It was based on people Lancaster knew; we thought about what could be their role in the project" (SM3, UK).* Project leaders allowed their colleagues in sub-Saharan Africa to make judgement calls regarding *"who might actually benefit from being part of this Recirculate project" (R8, Botswana)* within their respective institutions. As their choices shaped the knowledge being brought to the table, they also shaped the types of activities required

by the university to support the broad notion of knowledge transfer. For instance, there were programmes aimed to develop 'entrepreneurial mindsets':

> I have attended the Recirculate entrepreneurship programmes and somehow, I am beginning to have a mindset change to see the commercial value of science. (R10, Kenya); Recirculate shows me a different perspective…that the scientist needs to connect to the business community; the scientist needs the research to get to the level of policymaking, and…the community. (PR1, Nigeria)

While it was recognised that the nature of the project and its spanning communities in the UK and Sub-Saharan Africa "*required a lot more effort than your standard research project*" *(JR1, UK),* the support from the project leaders helped. The capacity-building effort was solidified in the SETS training, which invested in individuals:

> We had the SETS training, stimulating entrepreneurial thinking in scientists. There were workshops in 6 countries and over 200 people engaged, including super experts, senior directors of agencies in their countries. We know everyone in the group. It is an ecosystem. (SM3, UK)

The project leaders driving the SETS training sought to build the existing capacity of researchers to collaborate on tackling different social and environmental problems. By virtue of the geographic dispersion of different actors, the way things worked had to be flexible. This meant doing away with some formalities, such as dropping academic credentials from name tags and encouraging participants to interact on a first-name basis. Individuals came to share an entrepreneurial mindset, making it possible to see the links between academic science and technical innovation when interacting with other individuals:

> When I went to Botswana with the Recirculate team to participate in the Recirculate knowledge exchange training, I had the opportunity to engage with industry people, which has really, really helped me as an academic. (R11, Nigeria)

Significantly, the participants' first-name acquaintance with both the leaders and team members of their allocated groups generated a sense of dynamism in their interactions, which were essential in keeping the people-based activities running:

> I loved his enthusiasm and interest in bringing about change in our societies. I would have left the project if it wasn't for him…I believed my institution did not have the needed systems…to support our work. (R3, Ghana)

As Recirculate was connecting individuals across the home UK university and the Sub-Saharan African communities who were engaged with different activities, it became evident that a network was being built across the project and that this network was enabling those who were part of it to engage in knowledge exchange. When pandemic-related disruptions ensued, project leaders repurposed the WhatsApp group and used social media to host regular webinars, allowing individuals to disseminate information and to exchange knowledge informally. The efforts sustained an inclusive culture of interaction which worked to bring people together; this was evident in participants' willingness to continue to connect with one another and with external stakeholders.

4.2 Engaging organisations through problem-solving activities

Problem-solving activities consisted of organisational efforts to work together on solutions-driven research. These activities engaged different partners in the UK and Africa. At the meso-level, we observed that the lead university engaged organisations through such activities, specifically by facilitating the co-development of research and by hosting different personnel through residency programmes and workshops geared towards circular water economy topics (i.e., sustainable irrigation, bioenergy, sanitation technologies and practices). These activities consisted of developing a robust partnership for creating knowledge that could tackle in-country environmental challenges. Within the physical and digital project activities, researchers could develop their problem-solving capacities more collectively:

> Social innovation is backed by a problem. There has to be an obstacle that triggers it. Innovation and entrepreneurship happen when there is better capacity. (SM3, UK)

The research projects within Recirculate centred around turning obstacles (i.e., inadequate water and sanitation) into innovative solutions to contribute to a circular water economy (i.e., compostable toilets, wet-and-dry irrigation techniques, solar-powered boreholes, environmental podcasts). Lancaster's support for joint problem-solving activities was only possible because of the funding received for the work-packages, workshops and programmes:

> Even though many researchers have expertise in the areas they work, they may be reluctant to approach industry. The workshops and residency programs aim to build capacity and provide experiential learning (i.e., company visits) to promote a collaborative model. Through the process of engaging with others the researchers are more likely to get what they need from practitioners…Through reflecting on their own place in society, the researchers are more likely to harness their own capabilities and confidence. (R1, UK)

With support from the GCRF, the partnership brought different actors together who were seeking to improve the circular water economy in Africa through commercially viable innovations, as well as changes in social practices around water use, reuse and consciousness.

The problem-solving activities were enacted through relationships. Through the project, the different universities, industry and non-profit organisations were able to come together. The individuals who were engaged with the project held the contacts and goodwill to make the interactions work in the way they did. Amongst the project leaders was an alumnus originating from one of the partner countries who was called to run the capacity-building workshops. This leader's shared socio-cultural identity with the prospective partner institutions was relevant and useful in improving the entrepreneurship, collaboration, learning capabilities within the project and in creating a sense of social connection with the project participants, who came to appreciate the co-design, co-creation, and co-delivery approach of Recirculate. At the same time, the university was housing the partnership based on its recognition and expertise, whereby "*Recirculate was becoming a platform to engage other partners" (WE4, Ghana).* Much of the legitimacy and support the Recirculate project received from its partner institutions in sub-Saharan Africa could be linked to the feelings of belonging and ownership the project participants felt, including the project leaders'

decision to launch Recirculate in one of the partner countries where the UK university had a presence[4]:

> Parallel job postings were created at Lancaster Ghana – [seeking] leaders of integrated research projects. (SM1); Lancaster Ghana is a transnational academic group. (SM2)

Because of its history of knowledge exchange work and regional engagement combined with the experience of programme leaders, Lancaster did not have to set up these partnerships from scratch. Instead, it was about bringing the right people together. Indeed, *"it helped that [they] worked together before" (SM3, UK).* In terms of the partnership network, there were direct counterparts in the UK and Africa, such as the Centre for Global Eco-Innovation (CGE) at Lancaster and the CGE at the University of Benin in Nigeria (SM3, UK).

The in-country workshops worked to start addressing problems collectively through providing the physical facilities for engagement. Project leaders took quite a "*large team of the professional development and services staff, the knowledge exchange staff*" (SM5, UK), which enabled actors to meet "*the delegates from Botswana, Malawi, Zambia, Kenya and Nigeria, Ghana – delivering that capacity building*" *(SM5, UK).* The project leaders allocated resources, such as physical resources (large meeting rooms, subscriptions to digital tools, etc.), administrative resources (professional staff for managing projects) and funding, to ensure the interorganisational partnership could be effective.

When facilitation went well, new research collaborations could emerge, such as in the Kitwe or Lancaster workshops:

> If you are thinking of a [research] project and you need collaborators in a particular field, it's just a matter of looking through the profiles and requesting for collaboration (for instance the people that we met at the Kitwe workshop, the people that we met in Lancaster and on the WhatsApp platform). And because you are in the same network, they share with you…and even circulate to the wider university community. (R12, Zambia)

These types of research collaborations represented multiple organisations with the shared interest in combining their research and practical interests, spanning from topics in natural science to entrepreneurship. For solutions to be reached, it was necessary to continue developing knowledge with pre-existing connections in Sub-Saharan Africa:

> There was research that was being spearheaded by [name] from Nigeria, and [name] got in touch with us…around the issue of the bio economy. (R9, Zambia); After I came back from the Recirculate residency in Lancaster, I tried to form a group just for women in my faculty where we share opportunities…specifically it was created to help each other grow in terms of entrepreneurship. (R9, Zambia)

As in the scenario we described above, we saw how activities support solutions to relevant problems, acknowledging that without the project leaders managing the partnership, it would have been difficult for actors to recreate similar opportunities. It was "*really about causing change…new ways of solving challenges" (PR5, Ghana)*. Working with organisations outside the university walls created new knowledge (i.e., co-authored publications) and informed the development of eco-innovations (i.e., commercially viable, sustainable

[4] For more information, please see: https://www.lancaster.ac.uk/partners/.

products and processes). Problem-solving activities are aimed at creating positive societal and economic value.

4.3 Engaging communities through community-based activities

Community-based activities aimed at going beyond knowledge dissemination to create knowledge that could be applied more directly. These activities built on the people-based and problem-solving activities to derive mutual benefits to a wider group of stakeholders:

> Mutual benefit for people is critical. The benefit for the researcher might be getting a peer review, maybe a degree, the business might get something different, colocation, shared space, meeting opportunities, generating revenue. (WE4, Ghana); Writing an article is one thing, but how do we actually do it? Policymakers are ready to read but we need to give them a brief…it is difficult for them to understand the research language (government speaks a different language). (R5, Ghana); The biggest challenge would be accessing the communities. (SM2, UK)

To achieve mutual benefit, translating the research was a key community-based activity. The project leaders remained committed to one of the project's understandings that *"research can't sit in a bubble" (SM4, UK).* The project leads wanted to *"make sure that [research] is truly grounded in the community" (JR1, UK),* and that support for individuals who were motivated to engage with communities in Sub-Saharan Africa, through developing innovation, was provided.

In this context, it became clear that gender was an important community-level issue, which subsequently led to the establishment of the WINA project. There was not only a gender gap amongst project participants, but also a need to support women entrepreneurs. WINA emerged whilst members were mingling on a "*roof terrace in Accra" (SM2, UK).* It was developed and built by one of the authors (a researcher with Recirculate) and the group of women innovators, helping push ideas from initial informal conversations to formalised collaborations. WINA was a social innovation of the project, instrumental in supporting those women with the capacity to act on behalf of local communities in sub-Saharan Africa.

Meeting the objective of working *"with, in and for African communities" (GCRF Proposal)* was possible through relating beyond the initial research community. As the "*initial focus was on industry research and entrepreneurship, not on end-users*" *(SM3, UK),* project leaders had to adapt. They put resources towards understanding the needs of local communities in sub-Saharan Africa, such as working with local researchers and practitioners. The project leaders provided the support for developing applied research, such that "*African researchers translate ideas for what Africa needs" (SR1).*

The notion of mutuality was evident from the very beginning; project leaders and researchers were consistently keen on meeting communities. On the one hand, this reflected the need to "*be invited in*" *(SM2, UK);* on the other hand, community members also were invited to attend workshops by the university (PR2, Ghana) and welcomed into the research process. As one informant said, "*our researchers would meet smallholder farmers" (SM4, UK).* The pandemic somewhat interrupted this process, but the university has relied on community relations to ensure innovations have desirable economic and societal benefits.

We saw the project leaders learning from in-country partners to foster productive knowledge exchanges. In effect, there was a dependence on those with closer proximity to the community:

> What has often happened is our partners in country (whether they're small holders or communities) have been the key mediators between Lancaster researchers, research and the end-user community. (SM4, UK)

Our observations illustrated how leveraging the partners from the local context helped build trust around exchanging different learnings from the project. In return, in-country partners received support and resources to deliver tangible impacts, such as eco-innovations. For example, one instance of research translation occurred when Recirculate project leaders secured an additional £700 k UK GCRF project purposefully designed to improve the water, food and energy nexus. It included two demonstration bioenergy plants, one within a primary school in Accra, Ghana and the other within a university campus at the University of Benin, Nigeria. What started as Recirculate led to another funded innovation knowledge exchange project:

> There are internships available for students at the [anaerobic digester] plants, and we are going to show the primary school kids how it works as an environmental education initiative. We want it to grow, we want the energy to power the school to also reach the houses of staff. (SM3, UK)

While the eco-innovations originating in local communities are relatively small in scale, they came about through collaboration. Through working with one local NGO, for example, Lancaster researchers were able to go into low-income communities to study different behaviours of community members, leading to discoveries of water and sanitation solutions—*"new things [and] ideas [to] become products and services that are beneficial to the community" (SR1, Ghana)*. However, without support from partners maintaining the innovations with communities (i.e., smallholders, entrepreneurs, families), there was no guarantee that mutual benefits would continue.

Against this backdrop, scholars were expected to "*return case studies showing research pipelines through to impact in non-academic fields…to say how it changed the economy or the environment or policy*" *(SM5, UK)*. On the UK side, project leaders also targeted a wider community through Recirculate. In addition to British Council webinars, Recirculate was a conduit to the COP26 climate conference, with researchers presenting the activities of Recirculate and the WINA network. Indeed, presentations at Recirculate annual meetings also offered an opportunity to demonstrate impact and engagement for the university on a broader plane, offering more visibility.

Table 4 summarises the findings according to engagement across the individuals, organisations and communities engaging in social innovation. People-based activities promoted the capacities and attitudes for social innovation amongst individuals, such as researchers, project leaders or practitioners. Problem-solving activities stimulated social innovation in organisations, such as universities and research institutions combined into the project network. Community-based activities supported social innovation in regional communities, consisting of local partners and end-users in Africa. The quotes demonstrate that activities designed for one level contribute to other activities, which reinforces the multilevel process of engagement in social innovation.

Table 4 University engagement in social innovation (adapted from Hughes et al., 2011)

	Levels of university engagement	People-based activities	Description
Individual	*Change the way research relates to their community around the Sustainable Development Goals (SM4, UK)*	Social interactions (i.e., WhatsApp group, PARTICIPATE webinars, FLOW blog)	Project leaders drawing on personal networks Informal knowledge exchanges across disciplines and geographies on the topic of entrepreneurial thinking (i.e., SETS)
		Problem-solving activities	**Description**
Organisational	*Stimulating entrepreneurial thinking in Africa - not introducing new things, developing what they already have (R5, Ghana) It is an ecosystem of stakeholders. Through the WhatsApp group, we show the power of engagement (for Recirculaters in Nairobi, Zambia, Botswana, etc.) and we're consolidated into one group chat (SM3, UK)*	Circular water economy workshops (i.e., residency programme, capacity building workshops)	Engagement across multiple stakeholders (i.e., support for collaboration across partners) Inclusive knowledge exchanges via entrepreneurial and research networks (i.e., WINA; work-package research)
		Community-based activities	**Description**
Community	*We have to be on the same field…to understand what the community needs…we get to the grassroots and get people's view (R5, Ghana)*	Community-centric research and engagement	Knowledge discovery through the project (i.e., co-developed research with NGOs, with African research institutes and universities) Knowledge application with end-user communities (i.e., eco-innovations)

5 Discussion

The role of engaged universities in social innovation involves supporting connections between the knowledge of individuals, organisations and communities through activities that support the third mission. The mechanisms of social innovation are multilevel, where activities aim to support the capacities of engaged individuals through building networks (i.e., WINA and SETS, knowledge exchange workshops) and encouraging entrepreneurial thinking, of engaged organisations to collaborate with other organisations across sectors, and of engaged communities to meet the local demands for innovation. In our study, the project leaders needed to create activities that connected individuals, organisations and communities involved in solving global challenges in Africa. This study demonstrates that spanning across academia, industry and civil society (Hughes et al., 2011) depended on highly connected project leaders who were able to offer greater access to wider communities through their individual relationships. These relationships were activated to facilitate knowledge exchange and sharing. As a result, knowledge exchange between all participating parties became more harmonised so that this way of connecting and the visible benefits that it offered became a way of operating.

This paper discusses the impact pathways of an engaged university. Building on Hughes et al., (2011) it emphasises a social innovation process across multiple levels that is inherent in people-based, problem-solving and community-based activities. Through analysing

our findings at multiple levels (Davidsson & Wiklund, 2001), we illustrate that for more holistic engagement to occur, there needs to be social innovation connecting each level of the university knowledge exchange activities (Edwards-Schachter & Wallace, 2017). In our study of an international university engaging with partners in sub-Saharan Africa, the context of social innovation is broader (Table 4) than impact cases of national high technology clusters (Guerrero & Urbano, 2012). University engagement is a manual (not automatic) process involving deliberate efforts to connect individuals, organisations and communities through the third mission. Hughes and Kitson (2012) talk of the need for research to "interact with society" (p. 729). Through our findings we show that there is a process of social innovation at play involving collective knowledge processes, which works in tandem with traditional entrepreneurial university missions and activities. Our study shows that the people-based, problem-solving and community-based activities are inherent to this process, such that individuals, organisations and communities are engaged in social innovation. Indeed, there is very much a feeling of all being in it together. Without supplanting commercialisation activities, these activities fostered the third mission of Global North university to drive societal impact in the Global South. Our findings extend understanding of how academics go beyond knowledge creation and technology transfer to engage in social relationships that can support new connections, research and capacities that serve society. Thus, the hidden efforts to foster knowledge pursuits and socioeconomic impact (Hughes & Kitson, 2012; Hughes et al., 2011), express themselves as social innovation, which supports engaged individuals, organisations and communities.

Breznitz and Feldman (2012) state: *"An emerging role for universities is one of active neighbourhood involvement, in which they are engaged in projects with local communities…[and] using these communities as labs to test new ideas and find better ways to achieve social and economic goals."* (p. 139). Whilst Breznitz and Feldman (2012) provide rationales for the larger impact of universities in local business and policy, in this paper we go further by viewing contemporary universities as fundamentally globalised actors, expanding their geographical reach through third mission efforts. The shift from entrepreneurial to engaged universities (Thomas & Pugh, 2020) involves new activities and processes which have implications for the traditional entrepreneurial university concept. Our study shows that university knowledge exchange aims not only to bolster commercialisation and business performance, but also to drive solutions to global challenges through engaging researchers, organisations and communities in an international research project. We see that this entails offering a space of social interaction and a collective approach to problem-solving. The lack of attention to universities engaging in social innovation, as well as the tendency to view individual regions in isolation, and to focus on leading economic regions is noted in the literature (Pugh et al., 2022). We extend understandings of university engagement in addressing issues of social welfare (Benneworth, 2013) and sustainable development (Arocena & Sutz, 2021) through showing the multilevel process inherent in different activities. We show that while engaged universities can *"incorporate agendas associated with pressing societal challenges"* (Fischer et al., 2021: 362), this happens through social innovation supporting individuals, organisations and communities working to expand the third mission of impact.

Drawing inspiration from the example of Recirculate, we propose a novel model for the engaged university—one that is oriented towards the social innovative practices and partnerships needed to achieve the third mission. Table 5 illustrates the connections between individuals, organisations and communities which resulted from activities and engagement mechanisms. The mechanisms refer to the ways the project leaders were enabling capacity building efforts at each level by forging connections between individual participants,

Table 5 Multi-level university engagement activities, processes and outcomes

Activity	Description	Engagement mechanism
Engaging individuals		
People-based activities: enterprise education, participating in networks	Establishing interest in university engagement by drawing in talent and encouraging participation	Supporting the entrepreneurial capacities of the project participants
	Bringing people together through a co-designed project across disciplines and locations, allowing for new connections and entrepreneurial thinking	
	Starting programme activities to represent the skills and interests of project participants	
Engaging organisations		
Problem-solving activities: joint research, prototyping and testing of innovations, setting of physical facilities, hosting personnel	Working with partners to convene in-person and digitally and communicate across disciplines and themes	Supporting the collaboration capacities of the international partnership network
	Housing the project based on the project leaders' network and expertise	
	Combining diverse research and practical interests into projects to co-develop innovative solutions to social and environmental problems	
Engaging communities		
Community-based activities: Events in the community, citizen science, public exhibitions of research	Reaching out to establish contact with local communities and understand their needs for innovation	Supporting the mutual learning capacity across research and end-user communities
	Seeking permission to collaborate with community members in research and knowledge exchange activities	
	Collaborating with communities to co-deliver innovations in the local context	

Process: *Project leaders helped to connect individuals' knowledge to the mission of the university through an international project*

Project leaders drew on their network and the university resources to connect knowledge with the needs of communities

partnered organisations and local research and end-user communities in Africa. This process involved looking at the engaged university as a dynamic infrastructure (Pugh et al., 2021a) whereby engagement activities occurred (Table 5).

Reflecting on the entrepreneurial and engaged university literature, we see value in unpacking the connections between people-based, problem-solving and community-based activities (Hughes et al., 2011). This approach has enabled us to show the role of project leaders in facilitating these connections through supporting the entrepreneurial and innovative capacities of individuals, organisations and communities. We depict the whole iceberg, where most of the effort comes from complex knowledge exchanges underlying direct knowledge applications at the tip (Fig. 1).

While many academics do engagement work alongside research and teaching obligations, it goes relatively unrecognised within promotion and tenure processes (Fitzgerald et al., 2012), meaning there is a risk such work becomes de-prioritised within the engaged university (Thomas et al., 2023). Our case shows the importance of looking at social as well as hard infrastructures (like technology transfer offices) when looking into the role of universities in public sector partnerships (Hughes & Kitson, 2012), where we see the potential for patentable inventions and intellectual property being exchanged (Thursby et al., 2001) across multiple institutional contexts. The way this works is through the university investing in activities that can develop the capacities of different actors, thus supporting social innovation to emerge from within the hidden connections within and outside

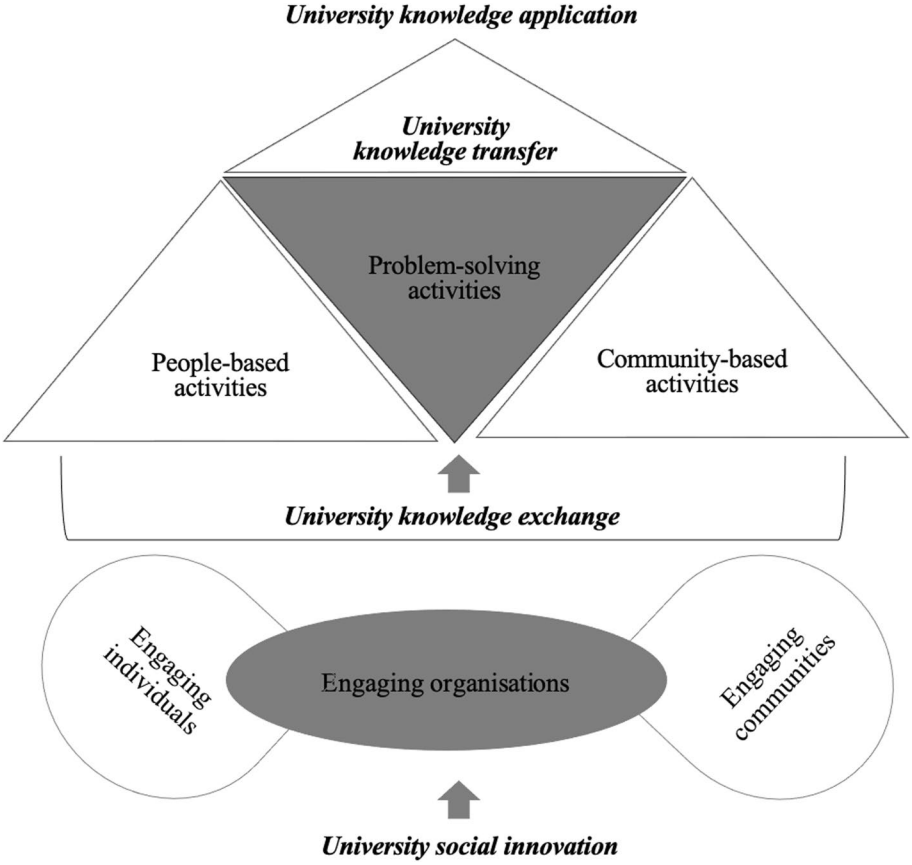

Fig. 1 The depth and breadth of university engagement in social innovation along three levels

the university. In effect, the interactions between individuals, organisations and communities are underlying the exchange and application of relevant knowledge in the real world.

6 Conclusion and implications

Universities are increasingly engaged in innovative forms of knowledge exchange that prioritise social innovation and economic development. Despite the expanded third mission, there is a demand for greater understanding of the social, ecological and economic impacts of universities (Menter, 2023). Through an in-depth study of an entrepreneurial university programme designed to foster the circular water economy in sub-Saharan Africa, we considered the key components for successful engagement. This showed that project leaders were key in engaging individuals, organisations and communities in knowledge exchange. The mechanisms of engagement involved building the capacities for social innovation and manifested as different activities (Tables 4 and 5). The project leaders were central in supporting multi-actor multidisciplinary and multiregional collaboration, empowering academics and the community to act. Our multilevel perspective demonstrates that the

university can only foster social innovation when individuals, organisations and communities embrace their roles in shaping third mission activities. Together these components hold the meaning of the engaged university.

Against the backdrop of the entrepreneurial university and triple helix literatures, the engaged university concept is better suited for examining social innovation, especially in the context of partnerships across multiple regions. The engaged university concept encompasses the different resources being attained and deployed for the third mission. Universities are facing pressures to overcome resource inequities and inefficiencies, intensifying competition for limited funding resources and increasing pressure to generate income streams from research commercialisation (Audretsch & Belitski, 2022). Future avenues for engaged university research include delving deeper into the resources needed to drive social innovation, which holds promise for understanding the activities conducive with sustainable development work.

In terms of researching the impact of the hidden iceberg of engagement, we argue that the multilevel framework offers greater analytical depth about what goes on within and outside a project for social innovation to emerge. In providing a richer theoretical conceptualisation of engaged universities, through the interrelated mechanisms of engagement, we have pushed forward our theoretical understandings of this mode of contemporary universities and their impact on their wider regions and societies (Breznitz & Feldman, 2012). We show that knowledge exchange needs to be co-produced at each of the levels we describe to constitute engagement, and that university activities can contribute to addressing global challenges beyond the surrounding regions. This allowed us to extend understanding about the more complex picture of the social, ecological and economic impacts raised by Menter (2023), resolving through our study an important research gap.

Appendix

See Tables 6 and 7.

Table 6 Entrepreneurial university-led activities in multiple locations in Africa*

Date	Workshop title	Location
7–11 January 2018	Knowledge Exchange and Engagement	Accra, Ghana
21–25 January 2018	WP4 Water and Energy Production	Accra, Ghana
29 January–1 February 2018	WP1 Innovation and Entrepreneurship	Accra, Ghana
4–8 February 2018	WP3 Water and Food Production	Accra, Ghana
11–15 February 2018	WP2 Health and Sanitation	Accra, Ghana
19–22 February 2019	WP1 Stimulating Entrepreneurial Thinking in Scientists	Accra, Ghana
25–29 March 2019	Knowledge Exchange and Engagement	Lilongwe, Malawi
8–12 April 2019	WP1 Innovation and Entrepreneurship	Kitwe, Zambia
3–7 February 2020	Knowledge Exchange and Engagement	Gaborone, Botswana
24–28 February 2020	WP1 Innovation and Entrepreneurship	Nairobi, Kenya

Programmatic activities continued mainly online as a rebranded PARTICIPATE program, which covered several themes including bioenergy, enterprise, sustainable agriculture, health and sanitation, women in research, policy, SDGs, research impact, as well as the online version of SETS. For more information please see: https://recirculate.global/participate/

Table 7 Social innovation programme objectives

Social innovation objectives	Outputs
To co-create appropriate scalable programmes that will contribute to international research and knowledge exchange initiatives	Stimulating Entrepreneurial Thinking Among Scientists (SETS) training the trainers workshop, replicable in multiple countries
To provide a platform for dissemination to improve community-research interactions	Networks (i.e., Women Innovators Network for Africa, WINA; SETS; Fostering Innovation and Technology in Africa, FITA) across African communities
To build capacity in working with, in and for communities	Long term engagement during residencies periods in the UK
To produce research publications	Collaboration with African research institutions to develop high quality science, technology, engineering and maths (STEM) research for sustainable development and eco-innovation
Knowledge Exchange (KE) Participate Training	Training designed to catalyse the interdisciplinary process of co-designing research that can be translated to meet the needs of communities across Africa. By giving participants time to deepen aspects of their work and offering platform to communicate with others, the KE training encourages the two-way process of knowledge dissemination to improve community-research interactions

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