The lighthouse effect: How successful entrepreneurs influence the sustainability-orientation of entrepreneurial ecosystems

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A B S T R A C T

The Sustainable Development Goals (SDGs) agreed by the United Nations are a call to action for policy-makers around the globe to tackle grand societal challenges. Sustainability start-ups can help meet some of the most pressing challenges. Regions of start-up activity are commonly referred to as entrepreneurial ecosystems (EEs), although the share of sustainability start-ups varies markedly from one EE to another. While literature on EEs is abundant, scholarly work on sustainability-oriented EEs, i.e. those with a high share of sustainability start-ups, is still relatively scarce. In particular, there is limited understanding of the reasons why some EEs have a higher share of sustainability start-ups than others. The present paper considers this gap in the literature by contrasting the EEs of Berlin and Lagos, which have very different shares of sustainability start-ups. Forty interviews conducted with founders, investors, hubs and government representatives in both EEs showed that particularly successful start-ups in an EE, so-called lighthouses, play an important role in shaping the cultural, social and material attributes of an EE. This means that the sustainability orientation of these lighthouses is instrumental in creating environments in which sustainability start-ups can flourish. Moreover, lighthouses can attract new talent and resources to a region, which further underlines their role as accelerators of an EE towards sustainability. Overall, the lighthouses are a critical factor in explaining the share of sustainability start-ups. Policy-makers can strengthen this effect by giving access to extra resources and opportunities to promising start-ups and by showcasing their success.

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1. Introduction

The Sustainable Development Goals (SDGs) agreed by the United Nations are a call to action for policy-makers around the globe to tackle grand societal challenges (The United Nations, 2017), such as climate change and the loss of biodiversity. Sustainability start-ups can help meet some of the most pressing of these challenges (Apostolopoulos et al., 2018; Horne et al., 2020; Muñoz and Cohen, 2017; Sullivan et al., 2018; Terán-Yépez et al., 2020). Sustainability start-ups can be defined as those whose business model contributes to one or more of the SDGs (Seelos and Mair, 2004). This focus on sustainability is welcomed by policy-makers, who are keen to prevent start-ups in their region from pursuing growth at all costs (Buchanan, 2014; Saxenian, 1983). A famous example of this single-minded attitude is the Silicon Valley-based ridesharing app, Lyft, which went viral when celebrating the

remarkable fact that one of its drivers was working only a few minutes before giving birth (Menegus, 2016).

Regions of entrepreneurial activity, such as Silicon Valley, are commonly referred to as entrepreneurial ecosystems (EEs). EEs can be defined as a set of interdependent actors and factors coordinated in such a way as to enable productive entrepreneurship in a particular territory, most commonly a large city (Stam and Spigel, 2017). While Silicon Valley is still the most famous and successful EE in the world, even The Economist (2018a) recently noted that "Silicon Valley is changing, and its lead over other tech hubs is narrowing". Notable challengers to Silicon Valley that have emerged in recent years range from European EEs such as London, Tallinn and Berlin to emerging economy EEs such as Bangalore and Lagos (Bank et al., 2017; Chow and Rubin, 2013). The makeup of these EEs can differ from Silicon Valley, and many of these emerging EEs feature a larger — at times significantly larger — share

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of sustainability start-ups than Silicon Valley (Tiba et al. n.d.).

While literature on EEs (Alvedalen and Boschma, 2017; Erina et al., 2017; Spigel, 2017; Stam, 2015; Van Weele et al., 2018b) and sustainable entrepreneurship (Gast et al., 2017; Horne et al., 2020; Muñoz et al., 2018; Terán-Yépez et al., 2020; Tiba et al., 2018) is abundant, scholarly work on sustainability-oriented EEs is still relatively scarce (Hoogendoorn, 2016). Hoogendoorn (2016) considered drivers for differences in the number of sustainability start-ups on a country level. Muñoz and Cohen (2017) used a socio-ecological perspective, arguing that sustainability-oriented start-ups should be temporally synchronised with the social and bio-physical cycles in which they are embedded. While valuable, both studies failed to consider that EEs differ widely in their attributes — even within the same country (Tiba et al. n.d.). Nor do existing studies consider potential interactions between the attributes of the sustainability EEs.

Tiba et al. (n.d.) provided data on where to find sustainability-oriented EEs, as well as some insights on causal drivers for such ecosystems. They found that a high national or regional GDP, in combination either with a large number of female entrepreneurs or a low level of religiousness in an EE, can foster the emergence of sustainability start-ups. However, these indicators do not fully explain differences in the share of sustainability start-ups in all EEs considered. For example, Lagos (which is economically less well developed and has a high rate of religiousness, as well as a low number of female founders) was found to have a relatively *high* share of sustainability start-ups. Meanwhile, sustainability start-ups in Berlin (high GDP and low religiousness) were found to be relatively *low* in number. This suggests that there are other (combinations of) factors that influence the share of sustainability start-ups in an EE. We aimed to discover these by comparing the EEs of Berlin and Lagos and by qualitatively exploring which elements contribute to differences in sustainability. The research question to be answered was: *Which factors drive the share of sustainability start-ups in an EE?*

We conducted 40 semi-structured interviews with sustainability and non-sustainability entrepreneurs in these EEs, as well as incubators, investors and government officials, in the spring and summer of 2018. Building on the EE framework provided by Spigel (2017), we discuss how culture, histories of entrepreneurship, social networks, investors, mentors, government and local opportunities interact to reinforce either a sustainability or a non-sustainability EE.

The interviews indicate that markedly differing histories of entrepreneurship can explain the different share of sustainability start-ups in these EEs. Successful entrepreneurs become leaders, or lighthouses. These leaders create and shape the various cultural, social and material factors that make up an EE. Their example helps entrepreneurs to find a route through the dangerous waters of business venturing and to make their start-up a success. Moreover, their success radiates beyond a region to attract additional resources and human capital.[1] While the early successful start-up community in Berlin concentrated on growth-at-all-costs start-ups, which were then replicated by the respective EE actors, the early successful start-up community of Lagos contained several sustainability start-ups, which were then seen as role models to copy in the respective EE.

The narrative in the present paper focuses on the effect of these lighthouses, as this topic came to the fore in our interviews. In doing so, the paper bridges previous perspectives presented by scholars of both economic geography and institutional entrepreneurship, to understand the emergence of sustainability entrepreneurship. It also extends our understanding of the role played by successful entrepreneurs in shaping their EEs' development. However, we acknowledge throughout that this is only one factor, albeit an essential one, according to our data, that contributes to the building of an EE. Other factors interact and reinforce one another to shape the makeup of their respective EEs.

The remainder of this paper is structured as follows. Section 2 provides the theoretical framework employed in the analysis of the EEs of Berlin and Lagos. Section 3 details the methods adopted for the work. Section 4 presents and discusses the results, while section 5 summarises our argument and outlines possible future areas of research.

2. Theoretical framework

We begin by reviewing the literature on sustainability entrepreneurship, as well as the role of EEs in relation to these. An existing framework from the EE literature is adapted to explain how different attributes of an EE contribute to determining the share of sustainability start-ups in that EE. This is supplemented by an explanation of the role successful entrepreneurs, or lighthouses, can have in shaping these different attributes to enable future entrepreneurs. This theoretical framework is enriched with empirical data from the outlier cases of Berlin and Lagos in the findings section, where we show how lighthouses plausibly influence the attributes and direction of the EE and can hence influence the share of sustainability start-ups.

2.1. Defining sustainability entrepreneurship

Much of the — still relatively young — social/environmental/sustainability start-up literature has been preoccupied with defining what aspects make entrepreneurship *sustainable* (Muñoz et al., 2018; Schaefer et al., 2015; Terán-Yépez et al., 2020; Tiba et al., 2018). The various definitions encompass a wide range of both for-profit and not-for-profit activities in various organisational forms (Hoogendoorn, 2016). The one unifying understanding appears to be that entrepreneurs in this realm have a focus on social value creation (Zahra et al., 2009). Depending on the substrand of this entrepreneurship literature, either social or environmental issues may be moved centre-stage (Tiba et al., 2018), although scholars are also developing more integrated frameworks (Muñoz and Cohen, 2017; Muñoz and Dimov, 2015; Walley and Taylor, 2002).

When defining sustainability entrepreneurship, the first challenge is to consider what constitutes social value creation. Following Horne et al. (2020), the Sustainable Development Goals (SDGs) agreed by the United Nations in 2015 (The United Nations, 2017) may serve as guidelines for identifying activities of social value, employing the terminology *sustainability entrepreneurship* to reflect this. The SDGs, developed by 193 countries and a wide range of stakeholders, including NGOs, businesses, scientists, local authorities, women, youth, and indigenous peoples (Nilsson et al., 2016), are arguably the principal framework within which to capture global challenges. Start-ups can promote the SDGs, but they run the risk of promoting one SDG or one aspect of sustainability at the expense of others (Muñoz et al., 2018; Nerini et al., 2019). Hence, some scholars argue that a holistic perspective is needed to assess sustainable entrepreneurship, rather than a single aspect or SDG (Muñoz et al., 2018; Muñoz and Cohen, 2017). However, for the purposes of the present study, such a holistic approach is problematic. Start-ups are emerging companies that have not yet had

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[1] Lighthouses were originally intended to help captains of ships avoid dangerous locations along the coast. This literal analogy does not hold in our paper, as the lighthouses are not intended to signal the need to avoid certain locations. On the contrary, they attract resources and human capital. However, they do help entrepreneurs to steer their businesses.

much impact and remain surrounded by uncertainty. This makes it difficult to ex-ante systematically assess the consequences of their business models on all SDGs over the long term. Therefore, it makes sense to examine the motivations of these start-ups, and define ventures as sustainability start-ups if their core activities aim to address one or more of the 17 SDGs (Seelos and Mair, 2004). Such start-ups differ from those that are solely seeking profit and pay no attention to the SDGs at all. The group of start-ups that aim to promote one of the SDGs may be referred to as the sustainability start-up community, which is characterised by their shared goals, norms, values and work practices (Van Weele et al., 2018a).

2.2. A framework for sustainability in entrepreneurial ecosystems

While writings on the different attributes of such ventures abound, few scholars have hitherto explored the factors that lead to the emergence of sustainability start-ups and the communities made from them. Those who have considered the antecedents of sustainability entrepreneurship have frequently focused on the micro-level, looking at individual companies and founders (Austin et al., 2006; Dees, 1998; Hechavarría, 2016; Mair et al., 2006). However, such enterprises do not come into existence in isolation but are shaped by the contexts in which they are created (Acs et al., 2017; Aldrich and Martinez, 2007; Alvedalen and Boschma, 2017; Muñoz and Dimov, 2015; Truffer and Coenen, 2012). Nonetheless, meso-level studies that take into consideration the EEs in which these companies are situated are few and far between (Alvedalen and Boschma, 2017; Boschma and Frenken, 2006; Hoogendoorn, 2016; Hoogendoorn et al., 2010).

The emerging literature on EEs offers further insights (Alvedalen and Boschma, 2017; Pitelis, 2012; Stam, 2015). Numerous frameworks have been developed to describe what constitute EEs (Malecki, 2018), many of which have been criticised for being 'laundry lists' of attributes rather than frameworks (Stam and Spigel, 2016). A framework that does consider how attributes of an EE interact is that proposed by Spigel (2017). It captures the attributes commonly mentioned in other EE frameworks (e.g. Isenberg, 2011), while also recognising that they are in constant interaction. Within this framework, there are three primary sub-dimensions: cultural, social and material factors. These three interact with and support or reinforce one another and can be split into a number of subfactors (see Fig. 1). The three groups of attributes by Spigel (2017) may be represented as a circle of interacting factors. Furthermore, the present model deviates from Spigel's pyramid representation of the attributes in emphasising that no theoretical hierarchy between different ecosystem attributes appears to exist. In the following, each ecosystem attribute is discussed, and the way in which they interact to determine the *share* of sustainability start-ups in an EE is explored in the section on findings and discussion.

2.2.1. Cultural factors

Cultural factors are defined by Spigel (2017) as "the underlying beliefs and outlooks about entrepreneurship within a region". These beliefs are driven by existing *cultural attitudes* and *histories of entrepreneurship* that emanate from the EE. Social acceptance of risk-taking and the social regard for entrepreneurs can have a great impact on founding rates (as well as the kinds of start-ups founded) and related activities in a location (Ritsilä, 1999). Histories of successful entrepreneurship can play an important role in creating such social acceptance (Feld, 2012). These stories can be used in entrepreneurship campaigns and can inspire young entrepreneurs to start a venture in a similar spirit (Aldrich and Martinez, 2007). The extent to which an orientation towards sustainability is or is not reflected in the culture both of a location and of an EE will thus
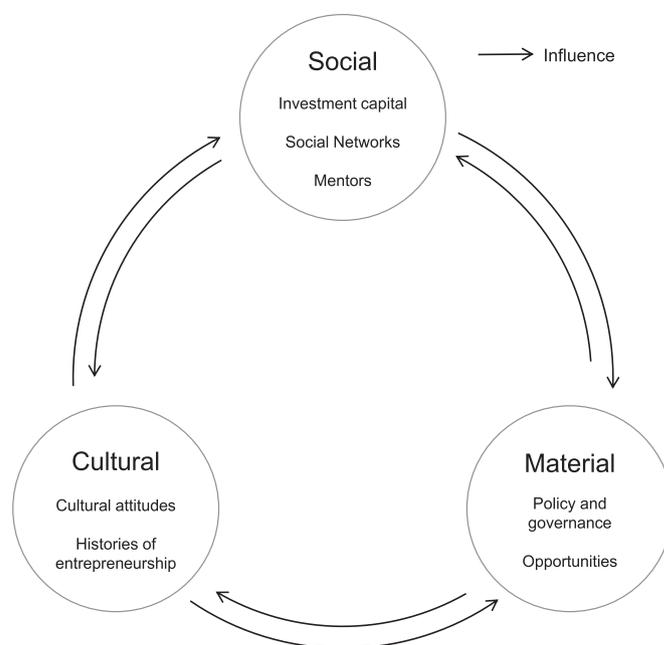

Fig. 1. Contextual factors influencing share of sustainability start-UPS In an EE. Source: The authors, based on Spigel (2017).

have a strong effect on the prevalence of sustainability start-ups in an EE.

2.2.2. Social factors

Social attributes of an EE are the "resources composed of or acquired through the social networks within a region" (Spigel, 2017). The EE contains four different social attributes: *social networks*, *investors*, *mentors* and *worker talent*. Local social networks based on trust can help to disseminate knowledge and best practice among entrepreneurs, as well as bringing them together with valuable resources (Aldrich and Martinez, 2007; Dacin et al., 2010; van Rijnsoever, 2020). In this respect, investors are of central importance. Beyond providing capital, investors often also act as mentors. guiding the development of a start-up, and are thus invaluable in fostering a flourishing ecosystem (Bocken, 2015; Nicholls, 2006; Ter Wal et al., 2016). Moreover, investors can steer the direction of a start-up as a condition for investing or by using voting power on the board if they take equity (De Clercq et al., 2006). In developing countries, investing NGOs or government agencies increasingly wish to 'green' development aid in this manner (Ciplet et al., 2013; Hicks et al., 2010). However, such additional requirements for development aid also make the investment process more complicated and carry the risk of reducing the effectiveness of the investment (Hicks et al., 2010; Möhner and Klein, 2007). Mentors regularly share best practice knowledge and access to their social networks, thus dramatically accelerating the initial development of new ventures (Bosma et al., 2011; Mason and Brown, 2014). At the core of any business are the people who work for it. Therefore, access to a talent pool of skilled people, willing and able to work in the somewhat chaotic and high-risk environment of a start-up, is equally important (Spigel, 2017). In EEs where strong social networks exist for sustainability entrepreneurs, giving them access to investors interested in sustainability start-ups, as well as mentors and talent motivated to work for such start-ups, local sustainability start-ups are likely to flourish.

2.2.3. Material factors

The material attributes of an EE include all the contextual conditions that exist within an ecosystem outside of the social networks described above. They include *infrastructure* and *support services*, as well as less tangible factors such as *regulation*, *opportunities* and *markets* (Hoogendoorn, 2016; Nissan and Castañ, 2012; Spigel, 2017). The former two are fundamental conditions that will be relevant for start-ups in the sustainability and the traditional entrepreneurial realm. All entrepreneurs will equally benefit from access to electricity, the internet and lawyers or accountants. The primary way in which governments can shape the face of an EE is through regulation that determines the ease of starting a (sustainability) venture, as well as matters of taxation (Defourny and Nyssens, 2008). A government oriented towards fostering sustainability entrepreneurship can grant special rights and/or tax cuts to such start-ups. Opportunities and the access to markets, too, play an important role in the development of a vibrant EE. For sustainability start-ups, the existence of a local social or environmental problem represents such an opportunity (Hoogendoorn, 2016; Matsunaga et al., 2010). The challenge is to exploit the opportunity at the moment when the social, ecological and market conditions are right, and to remain in 'sync' with all three dimensions (Muñoz and Cohen, 2017).

2.2.4. Interaction of factors

The attributes mentioned do not stand alone but rather interact to create EEs (Spigel, 2017). Furthermore, a change in one factor will ripple through an entire EE and influence the other factors. Thus, they can only be understood jointly. For example, it is not enough for an EE to provide ample opportunities for sustainability ventures if such opportunities are not timely recognised and identified as such (Mair and Marti, 2009). The way in which contextual factors (e.g. the failure of the government to provide services) are perceived is to a large extent shaped by cultural factors. Consequently, in a society that recognises social/environmental challenges as opportunities for venture creation, such ventures are more likely to develop. These factors do not constitute any inherent hierarchy but rather reinforce one another in various ways.

2.3. The lighthouse effect

An important factor of these EEs, which is not explicitly captured by the framework presented by Spigel (2017), are the start-ups that form their nucleus. These start-ups are successful in the sense that they score highly on various business performance indicators, such as size and growth of sales, employees, investments or market share (Eveleens et al., 2017; Murphy et al., 1996). These indicators show that their business is viable and that they substantially contribute to the diffusion of (sustainable) products or services. Successful business performance is thus a condition for commercial start-ups to make a societal or environmental contribution beyond the boundaries of their own organisation (Hall et al., 2010; Tiba et al., 2018). Such successful start-ups are partially shaped by and shaping the EEs in which they are situated. Particularly successful start-ups are in an ideal position to have an impact on their context and create conditions in which they will further flourish as they enjoy a high level of legitimacy and recognition (Feld, 2012; Harper-Anderson, 2018).

Such successful start-ups may be called lighthouses, as they stand out from the community of start-ups in an EE and provide guidance to the wider EE. The way in which lighthouses do this is twofold and combines mechanisms described in the literature of institutional entrepreneurship (Battilana et al., 2009; DiMaggio, 1988) and of evolutionary economic geography (Boschma and Frenken, 2006). While the former focuses on the way in which

entrepreneurs shape and are shaped by formal and informal institutions, the latter tends to consider networks and the dissemination of knowledge through them as paramount.

First, within the EE, lighthouses shape formal (material) and informal (cultural) institutions, such as policy and culture, in such a way as to support their current way of operating. This idea builds on the concept of institutional entrepreneurship, which argues that individuals or organisations can consciously or unconsciously change the institutional setting in which they are situated and that 'leaders' are particularly well-positioned to do so (Aldrich and Fiol, 1994; Battilana et al., 2009). As leaders, lighthouses also inspire a level of mimetic isomorphism (Aldrich and Martinez, 2007; DiMaggio and Powell, 1983) in entrepreneurs who follow their example (Hannan and Freeman, 1986; Sud et al., 2009). Beyond their immediate surroundings, successful start-ups also create a reputation for an EE beyond the city boundaries, thus attracting new actors or resources to their EE (Florida et al., 2008; Lee et al., 2004; Rao, 1994). Start-ups shape their EEs but also make explicit that they have the potential to attract resources not just from within but also from outside the EE.

Second, a special role is reserved for the founders of lighthouses, who often serve as the embodiment of success. Founders of lighthouses influence other (social) actors in the EE directly by engaging with them. An example of this would be the mentoring of founders of younger start-ups. This idea is more closely linked to evolutionary economic geography, which argues that regions specialise as a result of knowledge-sharing among actors in an EE (Alvedalen and Boschma, 2017; Balland et al., 2015; Boschma and Frenken, 2006).

In this way, lighthouses shape the cultural, social and material attributes of their EEs, thus enabling and empowering younger start-ups, which resemble these success cases in some way. The dominant models in an EE can become self-perpetuating by this process (Boschma and Frenken, 2009). This lighthouse effect is explored in greater detail in the empirical part of the present paper. With regard to the share of sustainability start-ups, the prevalence of successes in the sustainability sphere can lead to the formation of more sustainability start-ups (Sud et al., 2009). Conversely, the lack of such successes (and the dominance of a different model) could reinforce a different kind of business model and thus explain a lower share of sustainability start-ups within an EE.

3. Methods

In order to better understand the underlying mechanisms that drive the development of sustainability entrepreneurship in an EE, a qualitative multiple case study approach is adopted here (Yin, 2003). Case studies yield in-depth insights into a subject and help uncover causal mechanisms and formulate theories that might later be tested in a quantitative research design (Eisenhardt, 1989; Lijphart, 1971). A case study approach allows further factors to be identified that help determine the share of sustainability start-ups beyond the state-of-the-art literature. This research approach is abductive, combining the incomplete existing theories with empirical data, the better to gain new, more plausible insights into unexplained phenomena (Alvesson and Kärreman, 2007; Tavory and Timmermans, 2014).

In this paper, we elected to study two very different cases: the EEs of Berlin and Lagos. Comparing these two extremes contributes to the generalisability of findings from both cases (Patton, 1990). Moreover, both cases are outliers with regard to existing theories about where sustainability start-ups are expected to be found, which justifies our abductive approach. Both of the selected EEs show some level of sustainability entrepreneurship, but Lagos has a higher share of sustainability entrepreneurs than Berlin (11.5% vs.

6.2%) (Tiba et al. n.d.). With their location on different continents and vast differences in economic factors such as GDP per capita (~3,500 USD vs. ~26,300 USD, respectively) (Startup Genome Project, 2017), as well as cultural differences, these two cases are ideally suited for this investigation. Furthermore, previous research on sustainability entrepreneurship has rarely explored developing economies and thus the inclusion of Lagos appears a worthwhile choice.

3.1. Case description

Berlin is the leading EE in Germany, having a strong infrastructure, including ample young talent and universities, as well as attractive incentive systems in the form of government programmes (Startup Genome Project, 2017). The city is known for its vibrant tech community, driven particularly by the early successes of Rocket Internet, Germany's largest incubator, and some of its e-commerce enterprises, e.g. Zalando, an online fashion retailer (The Economist, 2018b). In recent years, a sustainability start-up community has also developed in parallel to these tech ventures. Companies include educational start-ups such as the ReDI school (Dreyer, 2018) and Kiron Higher Education, both of which focus on educating refugees, as well as health start-ups, such as Ada Health, which uses AI to diagnose illnesses (CrunchBase, 2016). Indeed, in 2016 some social start-up founders in Berlin launched the Social Entrepreneurship Network Deutschland (SEND), an association of entrepreneurs focused on creating a 'grandchild-friendly future'. Nonetheless, the share of these sustainability-oriented start-ups within the Berlin EE remains comparatively low when compared with other EEs such as Lagos.

Lagos, with its 17.5 million people the most populous city on the African continent, is Nigeria's economic centre (Aspen Network of Development Entrepreneurs, 2017). It, too, has a vibrant tech scene and a high concentration of young people (Startup Genome Project, 2017). Two of its biggest[2] local tech start-ups are the e-commerce platforms Konga and Jumia. However, Lagos's start-up community is not dominated by these business models in the same way that Berlin's is. Rather, numerous sustainability start-ups such as Wecyclers, which provide a solution to Nigeria's vast waste problem, have sprung up. Nigeria's leading technology hub and early-stage incubator, the Co-Creation Hub (Chub), is focused on sustainability-oriented business models and incubated Wecyclers, among many other of Nigeria's most successful sustainability start-ups. With Chub founded in 2010 — two years before Konga and Jumia (CrunchBase, 2016; Treisman, 2015) — the sustainability start-up community in Lagos developed in parallel to its general tech community and played a significant role in shaping Lagos as an EE. This orientation towards sustainability entrepreneurship is also reflected in Lagos's landscape of investors, which includes a large number of foundations and NGOs that focus on sustainability business models rather than conventional ones (Aspen Network of Development Entrepreneurs, 2017). One such investment that attracted great public attention was made by the Chan Zuckerberg Foundation, which invested 24 million USD in 2016 into another Chub venture, Andela, which trains young Nigerians to become coders.

3.2. Sample selection

Different sampling methods were employed in each EE. The point of departure for the identification of interviewing partners in both ecosystems was a list of all companies on Crunchbase.com

that were founded between 2012 and 2017, so as to include only start-ups. Among these, the companies that had a business model relevant to the SDGs were identified (Tiba et al. n.d.) and contacted. As the number of commercial start-ups on those lists far outweighed that of sustainability start-ups, commercial start-ups to be contacted were chosen at random.

While the initial response rate among entrepreneurs in Lagos was relatively high, few Berlin start-ups responded to our research requests. Snowball sampling was thus employed to recruit further interviewees, particularly in Berlin but also in Lagos. This is a common method employed to recruit difficult-to-reach populations (Kirchherr et al., 2017). The initial contacts for these came mostly from the professional networks of the authors (Miller and Brewer, 2003). Government interviewees were selected by contacting the most relevant institutions for the EE in the respective locations.

3.3. Interview schedule

Semi-structured interviews were carried out in the field (Lagos and Berlin) in June and July 2018, and telephone interviews were carried out from May to July 2018. The 15 telephone interviews were mostly conducted at the request of interviewees, as these did not require them to be physically present and were seen as more convenient. Previous studies have shown that the data quality of telephone interviews is as high as that of face-to-face interviews (Kirchherr and Charles, 2018). Three interviewees chose to respond to our interview request in writing. For this, they were provided with the interview guide (see Appendix) used by the researcher to conduct spoken interviews, and follow-up questions were posed via email (Schiek, 2014). While the responses lacked the depth of some of the spoken interviews, they nonetheless offered some interesting insights. The interviews were conducted in English and in German. Recorded interviews were transcribed by local researchers and the main author of this paper.

In total, 40 interviews were conducted, 21 in Berlin and 19 in Lagos. In both locations, no further interviews were conducted once we reached thematic saturation, i.e. the interviews revealed no new insights on drivers of sustainability entrepreneurship in the respective EE (Green and Thorogood, 2004; O'Reilly and Parker, 2012). Such saturation can be achieved swiftly and is widely accepted to be reachable from as few as 6—12 interviews within a relatively homogeneous group in one location (Guest et al., 2006; Van Rijnsoever, 2017).

The interviews were with representatives from sustainability start-ups (21 interviews: 11 in Berlin, 10 in Lagos), commercial start-ups (six interviews), organisations supporting (sustainability) entrepreneurship (seven interviews — four hubs/incubators and three NGOs), investors (four interviews) and public bodies supporting entrepreneurship (three interviews). All interviews were coded with the first letter indicating the EE of the interviewee (Berlin or Lagos). The second letter denotes the type of entity interviewed. The third stands for the mode of interview. See Table 1 for an overview of the interviewees. A difference was found in focus on the SDGs of the sustainability start-ups. In Berlin, SDG 3 — Good Health and Wellbeing was most often targeted (four times), followed by SDG 4 — Quality Education and SDG 6 — Clean water and Sanitation (twice each). In Lagos, the focus was on SDG 8 — Decent Work and Economic Growth (six times) and SDG 4 — Quality Education (five times), these SDGs often being mentioned in conjunction with each other. The sustainability start-ups of the majority of interviewees in both EEs had a focus on technology, often an app.

The semi-structured interview guide was developed through an iterative process by the authors, but the interviews themselves

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[2] According to CrunchBase (2016).

Table 1
Overview of interviewees.

Position	City	Type	Mode	Code	Target SDG	Focus on technology
CEO & Founder	Berlin	Commercial Start-up	Face to face	BCF1		
CEO & Founder	Berlin	Commercial Start-up	Telephone	BCT1		
CEO & Founder	Berlin	Commercial Start-up	Telephone	BCT2		
Community Leader	Berlin	Hub/Incubator	Telephone	BHT1		
CEO & Founder	Berlin	Hub/Incubator	Telephone	BIT3		
Consultant	Berlin	Investor	Face to face	BIF1		
Project Lead	Berlin	Investor (Governmental)	Telephone	BIT1		
Customer Consultant	Berlin	Investor (Governmental)	Telephone	BIT2		
Head Berlin Office	Berlin	Investor	Face to face	BIF2		
CEO & Founder	Berlin	NGO	Written	BNW1		
Founder	Berlin	Sustainability Start-up	Telephone	BST1	Across SDGs	No
CEO & Founder	Berlin	Sustainability Start-up	Face to face	BSF1	Across SDGs	Yes
CEO & Founder	Berlin	Sustainability Start-up	Face to face	BSF2	3 Good Health and Wellbeing	Yes
CEO & Founder	Berlin	Sustainability Start-up	Face to face	BSF3	4 Quality Education	No
CEO & Founder	Berlin	Sustainability Start-up	Face to face	BSF4	11 sustainable Cities and communities	Yes
MD & Founder	Berlin	Sustainability Start-up	Face to face	BSF5	3 Good Health and Wellbeing	Yes
Founder	Berlin	Sustainability Start-up	Face to face	BSF6	4 Quality Education	Yes
MD & Founder	Berlin	Sustainability Start-up	Face to face	BSF7	6 Clean Water and Sanitation	No
CEO & Founder	Berlin	Sustainability Start-up	Face to face	BSF8	3 Good Health and Wellbeing	Yes
CEO & Founder	Berlin	Sustainability Start-up	Telephone	BST2	3 Good Health and Wellbeing	Yes
CEO & Founder	Berlin	Sustainability Start-up	Telephone	BST3	2 Zero Hunger, 3 Good Health and Wellbeing, 6 Clean Water and Sanitation	Yes
CPO	Lagos	Commercial Start-up	Face to face	LCF1		
COO	Lagos	Commercial Start-up	Telephone	LCT1		
CEO & Founder	Lagos	Commercial Start-up	Face to face	LCF2		
Acting National Coordinator	Lagos	Governmental Organisation	Telephone	LGT1		
Co-Founder	Lagos	Hub/Incubator	Face to face	LHF1		
Founder	Lagos	Hub/Incubator	Face to face	LHF2		
Founder	Lagos	Investor	Face to face	LIF1		
Coordinator West Africa	Lagos	NGO	Telephone	LNT1		
Senior Programme Coordinator WA	Lagos	NGO	Face to face	LNF1		
Programme Lead	Lagos	Sustainability Start-up	Written	LSW1	4 Quality Education, 8 Decent Work and Economic Growth	Yes
CEO & Founder	Lagos	Sustainability Start-up	Telephone	LST1	12 Responsible Consumption and Production, 7 Affordable and Clean Energy	No
CEO & Founder	Lagos	Sustainability Start-up	Telephone	LST2	1 No Poverty	Yes
CEO & Founder	Lagos	Sustainability Start-up	Face to face	LSF1	4 Quality Education, 8 Decent Work and Economic Growth	Yes
Business Development Assistant	Lagos	Sustainability Start-up	Written	LSW2	1 No Poverty, 11 Sustainable Cities and Communities	No
Co-Founder & Team Lead	Lagos	Sustainability Start-up	Face to face	LSF2	4 Quality Education, 8 Decent Work and Economic Growth	Yes
CEO & Founder	Lagos	Sustainability Start-up	Telephone	LST3	4 Quality Education, 8 Decent Work and Economic Growth	Yes
VP Investment & VP Operations	Lagos	Sustainability Start-up	Face to face	LSF3	8 Decent Work and Economic Growth	Yes
Co-Founder	Lagos	Sustainability Start-up	Face to face	LSF4	4 Quality Education, 8 Decent Work and Economic Growth	Yes
CEO & Founder	Lagos	Sustainability Start-up	Face to face	LSF5	11 Sustainable Cities and Communities	Yes

were conducted as "casual, comfortable conversations" (Berry, 2002). Questions were thus adapted to the situation and at times posed in varying order, depending on the answers provided. This allowed conversations to flow naturally and for the building of trust between researcher and interviewee (Berry, 2002). Furthermore, this allowed interesting topics raised to be further explored. Beyond generating deeper insights, the level of trust also fostered the snowball sampling, as interviewees were more inclined to give access to their personal and professional networks if they enjoyed the process (Kirchherr and Charles, 2018).

3.4. Analysis

The data gathered were organised in NVivo 12, a computer programme for qualitative data analysis, in a multi-step iterative process. Initially, we identified all passages in interviews that referred to factors that fostered and hindered the development of sustainability start-ups in the respective EEs and clustered the passages according to emerging themes. These emerging categories were labelled employing the wordings used by interviewees, where possible, so as to reduce researcher bias (Bazeley and Jackson, 2013). Through an iterative process of reading and rereading the transcripts, as well as reviewing all interviews coded to the same topic, we combined similar codes into first-order concepts (Gioia et al., 2013). In order to marry this inductive approach with the rigour of more theory-driven approaches, the codes developed in these initial steps were consolidated and mapped to second-order categories defined in the section "theoretical framing" (Gioia et al., 2013; Van Weele et al., 2017). It is at this point that the inductive approach became abductive, joining our empirical data with our theoretical framework to reach plausible explanations for the share of sustainability start-ups (see Alvesson and Kärreman, 2007). The findings were then triangulated with other data, particularly press research, as well as reports published by investors, hubs and NGOs active in the respective EEs.

4. Findings and discussion

Building on the framework introduced in the theory section, this section is structured in three subsections. First, we discuss how the cultural environments in the Berlin and Lagos EEs are shaped by histories of entrepreneurship. We then consider the role of social factors in both these systems, showing how existing social structures in each EE can influence what type of start-up finds success. Finally, we estimate how material factors influence and are influenced by the types of start-ups that emerge. Overall, the focus is on the role lighthouses play in creating an EE that is either more or less oriented towards sustainability. The findings are largely congruent between the two cases, which contributes to their generalisability. Fig. 2 gives an overview of the attributes discussed and how they interact in both EEs. It may be noted that the underlying dynamics are the same in both EEs; however, differing histories of successful entrepreneurship lead to very different outcomes in terms of the share of sustainability start-ups. Berlin has a sustainability start-up share of 6.4%; for Lagos, this is much higher, at 11.6%. Our findings are summarised in Table 2.

4.1. Cultural factors

4.1.1. Cultural attitudes

Both in Lagos and in Berlin, a strong divide was found between perceived cultural attitudes within the EE and those within the wider population (see Appendix Table A1 for an overview of corresponding codes and representative quotes). While the wider population in Berlin is seen as largely supportive of sustainability
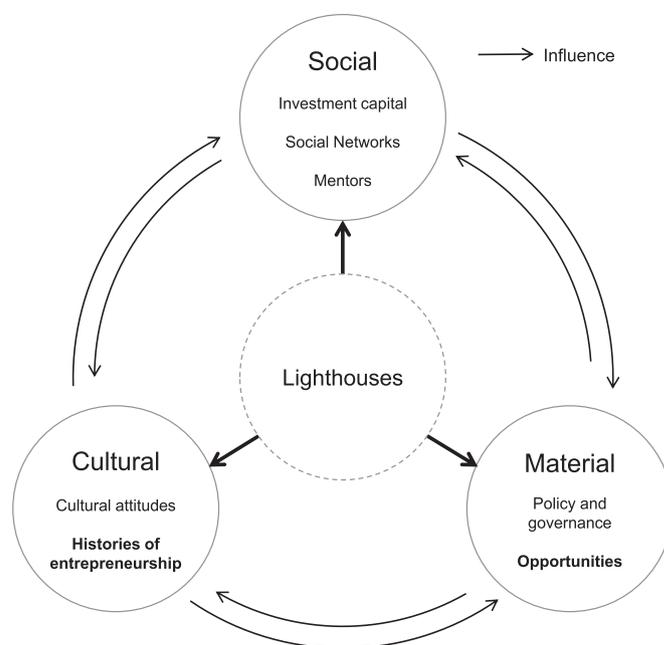

Fig. 2. Lighthouse Effect — Interaction of EE attributes in Lagos and Berlin. Source: The authors.

goals, this culture is not pervasive in the city's start-up community. The interviewees generally characterised the Berlin population as socially liberal and environmentally oriented (e.g. BIT3, BSF1, BSF5, BSF3, BST1). This also reflects local political preferences: nearly half (49.2%) of the population voted for either a left-wing party (SPD or DieLinke) or the Greens in the last parliamentary election (2017). In the central constituencies of the city, where most interviewees work and live, the concentration is significantly higher ("Bundestagswahl, 2017 in Berlin — Ergebnis-Karte aller Wahllokale," 2017). The view of the start-up community stands in stark contrast to this, having a reputation for being tech-focused and money-oriented. A commercial entrepreneur with several years' experience in the Berlin start-up community said he never encountered a strong social culture in the "normal start-up field" (BCT1).

Conversely, in Lagos EE, interviewees said they found a quite widespread orientation towards sustainability, although they were divided over how strongly this was present in the wider population. While several interviewees argued that values in Nigerian society centre around a sense of solidarity and mutual help, the same people also said that their society is primarily characterised by an individualistic drive for survival (e.g. LHF1, LHF2). Despite these conflicting perspectives, there was much broader agreement about the prevailing culture within the EE. Many interviewees said that they were perceiving a shift towards both sustainability and sustainability entrepreneurship (e.g. LSF1, LSF3, LSF5, LHF1). At the same time, sustainability and social impact appear to have gained traction within the EE and today "the [sustainability entrepreneurship] culture is very pervasive" (LIF1).

These tendencies within the two EEs also reflect the prevalence of sustainability start-ups in each location. It thus appears that cultural differences, not within society but more narrowly in the respective community, can explain some of the differences between Lagos and Berlin. The primary drivers, mentioned in both places, are the local histories of entrepreneurship or the influence of lighthouses, as is further explained in the next section.

Table 2
Overview of EEs and findings.

Factor		Berlin	Lagos
City	Metropolitan population[a]	6 million	21 million
	GDP per capita[a]	26,300 USD	3,500 USD
EE	Number of start-ups (2017)[a]	1,800−2,400	400−700
	Share of sustainability start-ups[b]	6.4%	11.6%
Cultural factors	Histories of successful entrepreneurship	Greatest success cases are conventional tech start-ups; no widely known sustainability start-ups	Some great tech start-up success stories and some well-known examples of successful sustainability entrepreneurs
	Cultural attitudes	Culture within EE strongly oriented towards achieving great financial success at all costs, driven by dominant success stories; small subculture of sustainability entrepreneurs	Strong orientation towards achieving both financial and social/environmental sustainability; pervasive culture of sustainability orientation also among conventional entrepreneurs (e.g. volunteering), both driven by local histories of sustainability start-ups
Social factors	Investment capital	Investment capital mostly focused on dominant tech industry present in Berlin; orientation towards sustainability widely seen as disadvantage	Varied landscape of investors including many foundations; orientation towards sustainability widely seen as an advantage; success cases serve as magnets to attract more funding
	Social networks	Local hubs mostly focused on conventional start-ups; sustainability start-ups sometimes supported by these, owing to lack of hubs with sustainability focus; best-known hubs were home to Berlin's greatest entrepreneurial success cases (mostly commercial)	Largest local hub (CcHub) focused on finding solutions to sustainability challenges − gained fame through the successes of its start-ups; hubs for conventional start-ups also available
	Mentors	To date, no large cases of successful sustainability founders who have sufficient capacity to support younger sustainability entrepreneurs. Little support also from the established conventional start-up community	Several cases of successful sustainability entrepreneurs mentoring young founders following in their footsteps; sustainability start-up community also supported by other successful entrepreneurs
Material factors	Policy and governance	No strong focus on fostering sustainability start-ups and little awareness of their existence. EE seen as a means of creating jobs.	Some focus on sustainability start-ups, by announcing focus sectors (e.g. agriculture) for which there is dedicated funding. However, no wide-reaching support. EE seen as a means of creating jobs.
	Opportunities	Limited awareness of local opportunities for sustainability venture creation owing to widespread mindset that sustainability challenges should be met by the welfare state and lack of examples of successful sustainability start-ups	Great awareness of local opportunities for sustainability venture creation, driven by success stories of such ventures and prevalence of social/environmental challenges

[a] (Tiba et al. n.d.).
[b] Start-up Genome Project (Startup Genome Project, 2017).

4.1.2. Histories of entrepreneurship

Local entrepreneurial culture is centrally driven by those start-ups that are already in an EE. Lagos and Berlin present vastly different images in terms of success cases, or lighthouses. Both cities have a flourishing tech community with successful e-commerce start-ups, among many others. However, Lagos also has a number of highly successful and widely known sustainability start-ups, arguably the most famous being the previously mentioned Andela. Andela gained international fame in 2016 when the Chan Zuckerberg Initiative endowed them with 24 million USD. Several interviewees observed how entrepreneurs of successful sustainability start-ups had inspired them in their endeavours (LSF2, LSF4, LSF5).

These kinds of role models are something that Berlin entirely lacks. One sustainability entrepreneur explained: "Lighthouses help; so, if you have one case in the media that people talk about, that influences, motivates people, inspires people to do the same. The problem is, I don't know yet of any large German lighthouse" (BSF7). Rather, the Berlin EE is dominated by the tech start-ups that drew their success from its largest incubator, Rocket Internet, which interviewees associated with a cut-throat mentality and extreme profit orientation. Most interviewees in Berlin emphasised the role of Berlin as a tech hub, rather than a place for sustainability (e.g. BSF3, BSF5, BSF7, BCF1, BSF8, BIT2, BIT3, BIF1).

Thus, similar dynamics may be observed in both EEs, where the orientation towards sustainability is driven and legitimated by lighthouses. However, these dynamics lead to different outcomes in the two EEs.

4.2. Social factors

4.2.1. Social networks

The differences between Berlin and Lagos are also evident in the social attributes of the respective EEs, which are closely interlinked with the lighthouses (see Table A2). In particular, the landscape of hubs and incubators that maintain and foster the social network, as well as providing an entry route into the EE for new start-ups, varies greatly. In both EEs, those hubs/incubators that helped generate successful start-ups are those that are best known and most widely recognised as successes themselves. While Berlin's Rocket Internet has a strong tech and low sustainability focus, one of Lagos's best-known incubators, CcHub, is focused solely on the creation of sustainability start-ups and has brought into existence some of Lagos's biggest successes in the sustainability sphere. One of its lead investors, the Indigo Trust, in its funding announcements, repeatedly refers to successful start-ups that were previously incubated at CcHub (O'Reilly, 2011).

Corresponding with its weaker sustainability community, Berlin lacks a comparatively large and successful incubator focused on sustainability topics. Rather, some of the representatives of

sustainability start-ups interviewed were supported by the more commercially oriented local hubs, such as the Axel Springer Plug and Play Accelerator (BST1, BST2, BST3). This supports the idea that legitimacy is contagious and that the legitimacy of successful start-ups can foster that of their affiliates (David et al., 2013). Also, it shows that, among entrepreneurial support organisations too, leaders will emerge (Harper-Anderson, 2018). These are then in an ideal position to help the emergence of further start-ups similar to the lighthouses they helped create. Lighthouses also strengthen and reinforce organisations that have helped them, such as incubators, and therefore create ideal conditions for start-ups with a similar focus to flourish. In this way, lighthouses with a focus on sustainability business models help create the social infrastructure that enables young sustainability start-ups.

4.2.2. Mentors

Founders of lighthouses are another group of people who can directly help develop the next generation of sustainability start-ups. In Lagos, several interviewees reported that they had been mentored by founders of one of the large sustainability start-up successes (LSF5, LSF4). In Berlin, the lack of lighthouses in the sustainability start-up community means that it also lacks those kinds of mentors. Furthermore, founders of commercially oriented lighthouses in Berlin reportedly rarely mentor sustainability start-ups. Indeed, both sustainability and commercial entrepreneurs said there are few connections between the two spheres (BCT1, BIF1, BCT2, BSF5). Beyond acting as role models, creating a culture for sustainability and enabling support organisations, founders of lighthouses also interact directly with young entrepreneurs, acting as mentors to help them launch their businesses. This in turn can lead to a higher share of sustainability start-ups. Conversely, if an EE has only conventional commercial start-ups, their founders frequently mentor businesses that are similar to theirs, as this is an area where they can offer the greatest expertise, leading to a relatively stronger non-sustainability start-up community.

4.2.3. Investors

Stories of entrepreneurial success, or lighthouses, also help attract investors focused on the dominant models in an EE, be they sustainability-focused or not. Corresponding with the prominence of its sustainability start-ups, most interviewees in Lagos mentioned that investors, commercial organisations, NGOs and development agencies alike frequently focus on the social and environmental impact of the start-ups they invest in (e.g. LNF1, LST1, LHF1, LIF1). Indeed, several interviewees claimed that it is easier to secure funding for start-ups which pursue social impact (LCF1, LSF5) and that investors actively demand sustainability from their investees (LNF1). There was also evidence of an interesting interaction among investors. One NGO actively took on the role of connecting start-ups with investors and advising commercial investors, NGOs and development agencies on realistic sustainability expectations when they invest, as these are often set too high and can become a burden for the start-up. Thus, they improved access to funding and simplified investment schemes. This is one way of alleviating some of the concerns about complex greening development aid (Hicks et al., 2010; Möhner and Klein, 2007).

In contrast with their Nigerian counterparts, none of the commercial start-up founders interviewed in Berlin had ever encountered an investor who stressed sustainability (BCF1, BCT1, BCT2, BIF1, BSF1). Even an impact investor focused on sustainability start-ups, who is active in Berlin, said it was not the best place to go if you wanted to find an investment-worthy sustainability start-up (BIF1).

Thus, the investment sphere, too, is shaped by Berlin's history of entrepreneurship, which does not have a strong sustainability focus. Analogous to the point on mentors above, an interviewee lamented that successful commercial entrepreneurs from Berlin do not enter into impact investing (BIF2) — as for example Mark Zuckerberg has done.

Lighthouses play a role in building an EE's reputation for what makes a good investment. Based on this reputation, investors with a focus on related business models are attracted to the EE. For sustainability start-ups, this means it is significantly easier to secure funding in a place where a sustainability lighthouse has already provided a proof of concept. Indeed, it means that conventional start-ups too have to start paying attention to sustainability issues. If such sustainability lighthouses are absent, on the other hand, investors are likely to direct their attention to other themes or to even regard a focus on sustainability as a disadvantage.

4.3. Material factors

4.3.1. Policy and governance

The policy landscape in both EEs is to some extent reflective of the lighthouse cases encountered (see Table A3). Whereas the Berlin government provides ample support to new ventures of all stripes (BIT2) (however, not with an explicit sustainability focus), government in Lagos is widely perceived as unsupportive (LST3, LCF1) although it provides some dedicated funding for "e-health, e-agriculture and e-education" (LGT1, LSF3; Chinedu, 2017). However, such start-ups do not enjoy easier access to a simplified bureaucratic process or tax breaks. When asked why the government supports start-ups, public representatives in both cities said the primary focus was job creation, rather than some other sustainability goal. Indeed, Berlin government representatives seem to have little awareness that sustainability start-ups exist at all in their city (LGT1, BIT2).

While the presence of lighthouses can help to create awareness among policy-makers about the kinds of start-ups their EE is harbouring, the extent to which these policy-makers then step in to help the start-ups remains unclear. Whereas interviewees in both EEs say they would like more government support — especially financially — the relatively low level of such support appears not to be a factor that dramatically impacts the sustainability start-up EE or the EEs' share of sustainability start-ups. The one role that governments can play is to raise awareness of sustainability business models as viable options for aspiring entrepreneurs, as the Lagosian government has done.

4.3.2. Opportunities

This opportunity recognition and the narratives around it are to a large extent also shaped by the presence of lighthouse cases. Many Lagosian interviewees reported that, in recent years, following the emergence of successful sustainability start-ups, there had been a growing awareness that the country's multitude of social and environmental problems represented an opportunity for venture creation (LHF1, LSF2, LCF2). Meanwhile, in Berlin, interviewees found that the strength of the welfare state limited the spread of sustainability entrepreneurship (BIF1, BSF1), while maintaining that Munich was a great place for sustainability start-ups. Driven by its strong tech lighthouses, Berlin was perceived as a place that represented opportunities for tech enterprises rather than sustainability enterprises. This evidently reinforces the existing order and inspires isomorphism among young entrepreneurs

looking for the best opportunities to launch a successful start-up.

Sustainability lighthouses therefore also play a role in helping young entrepreneurs to recognise sustainability challenges as opportunities for starting a new venture, thus fostering the development of a sustainability-oriented EE.

5. Conclusions

With regard to the research question, '*Which factors drive the share of sustainability start-ups in an EE?* it can be reported that the dynamics in both ecosystems, Berlin and Lagos, are relatively similar. Both EEs are shaped by outstanding local successes in entrepreneurship, their lighthouse cases, which have a large effect on the share of sustainability start-ups. While Berlin is most strongly defined by the success of its commercial tech start-ups, Lagos has seen sustainability start-up superstars develop in tandem with their commercial tech counterparts. These lighthouses touch upon and influence all elements of their EEs (cultural, social and material) in such a way as to foster the development of similar ventures, while also further strengthening themselves. In this way, dominant dynamics in both sustainability and non-sustainability EEs become self-perpetuating. The share of sustainability start-ups in an EE is thus to a great extent determined by the strength and visibility of its most successful sustainability entrepreneurs.

5.1. Theoretical implications and limitations

The lighthouse effect here described bridges theoretical perspectives presented by institutional entrepreneurship (Battilana et al., 2009; DiMaggio, 1988) and evolutionary economic geography (Alvedalen and Boschma, 2017; Balland et al., 2015; Boschma and Frenken, 2006) by emphasising the way in which exemplary lighthouses interact with the rules and norms that govern their EE, as well as with actors in entrepreneurial networks. Lighthouses are key conduits through which to perpetuate historically successful cultural, social and material elements of an EE and strengthen these further. This paper therefore extends our understanding of how different attributes of EEs interact to strengthen sustainability start-ups. Moreover, the EEs of developing countries are currently understudied and the paper represents the first investigation of which we are aware into drivers of sustainability start-ups in such a location. We found the same dynamics by which lighthouses shape an EE and its sustainability orientation in strongly contrasting cases. This increases the likelihood that our findings are theoretically generalisable, presenting an ideal starting point for future studies to test the presence of the lighthouse effect in a larger number of cases across the globe.

Our research has two primary limitations. The chosen cases, Berlin and Lagos, represent extremes in terms of economic, cultural and social attributes, as well as their share of sustainability entrepreneurs. Although they were selected for this study because of these very attributes, future studies can consider other EEs. EEs in other regions, such as Asia or America, which represent a large share of entrepreneurial activity generally, may provide novel insights into the dynamics that foster the development of sustainability EEs. It is to be expected that the lighthouse effect will also play a role in other EEs around the world, although some additional drivers for the share of sustainability start-ups may well emerge as relevant. Further, this paper employed interviewing techniques to gain an understanding of how the respective EEs developed, rather than taking a longitudinal approach. A more explicit focus on the evolution of sustainability EEs over time, rather than the snapshot here presented, will also yield novel insights, which will be relevant not only to established EEs but also to nascent ones.

Finally, we noticed that most of the start-ups that we interviewed, including lighthouses, were strongly focussed on their own sustainability objectives. However, they appeared not to think much about the possible negative side-effects of their business. This issue deserves more attention if we are to assess whether a start-up is truly sustainable.

5.2. Managerial implications

Our research is also relevant to policy-makers who wish to foster sustainability start-ups in their EE. First, placing an emphasis on certain sustainability topics and making dedicated funding available for start-ups that work on them, as has been done in Nigeria, can help foster the development of some sustainability lighthouses. However, it is important that the goals and expectations for start-ups are realistic and that the funding conditions are not too complex for small, inexperienced organisations such as start-ups. Second, publicly supporting sustainability start-ups that are already present in an EE, e.g. through joint media appearances, could increase public awareness of the sustainability start-up, thus generating cultural support and motivating young entrepreneurs to pursue a similar path. Third, it can be helpful to put in place regulatory conditions, such as tax advantages or simplified bureaucratic processes, to make it easy for such young entrepreneurs to found a sustainability start-up and lead it towards becoming a lighthouse for their EE. Finally, one needs to assess for all start-ups how sustainable they really are, and what their potential negative side effects are.

None of these measures alone represents a silver bullet, as cultural, social and material factors interweave to create an environment. However, they do promote the emergence of sustainability start-ups and ultimately the much-desired sustainability lighthouses to boost an EE's sustainability orientation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Sarah Tiba: Conceptualization, Investigation, Formal analysis, Writing - original draft. **Frank J. van Rijnsoever:** Writing - review & editing, Supervision, Conceptualization. **Marko P. Hekkert:** Supervision.

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Appendix

A — First and second-order codes

Table A.1 Cultural Factors

Second order codes	First order codes	Representative quote
Culture within an EE determines how start-ups operate and lighthouses are instrumental in shaping this culture	Nigerian society seen as socially oriented	"Nigerians are very kind people with a very strong social bond. That is just part of our culture." (LHF1) "Empathy is really an African thing. In the West, you don't take in your brother's son to live in your house. In Africa, that's always part of our culture." (LHF2)
	Nigerian society seen as not socially oriented	"Nigeria is not an altruistic society, people don't do things for the betterment of their neighbour, really — at least in Lagos." (LIF1) "Well, I wouldn't say there is a culture for [sustainability], people find it difficult to believe that training at [our company] is for free. Because it is strange for people to think so. They ask, 'Why would you offer training at no cost?'" (LST3) "I think there isn't a lot of, in terms of environmental, just environmental awareness, right. There is really not that much like societal awareness into keeping your surroundings just clean and all the benefits that come from that." (LCF2)
	Strong sustainability start-up community in Lagos	"There are a lot of problems here, a lot of things that are wrong, and, before now, people just complained and complained, but there has been a paradigm shift in that: I could actually do something to change the state of things." (LSF1) [Today] "the [social entrepreneurship] culture is very pervasive." (LIF1) "Social impact was not really a thing until three years ago. Now it's huge." (LSF5) "There is a culture to do social business because everywhere in Africa there is corruption, there is poverty, there are so many problems. We all are looking for ways to eradicate these issues. If there is a start-up that wants to solve any of these problems, I think that is good work. So, if you are solving problems in the health sector, the educational or agri-sector, that is brilliant." (LST2)
	Berlin society seen as socially oriented	"I think, if I look at the start-up ecosystem, it often revolves around money. If I look at Berlin culture more broadly, it isn't like that." (BSF1) "We have a huge nucleus of students and a culture of socially interested people who, like, say they come to Berlin to do something differently or they come to have a break so they all have free time." (BSF5) "I think Berlin generally attracts people who also think about society or the public." (BIT3)
	Berlin not the place for sustainability entrepreneurship	"Because you also have all the tech that is coming here, it's not the place where you say, 'Okay, I want to start a social enterprise: I have to go to Berlin'. You can still do it in Munich or wherever." (BIF2) "The fact that we started our business here was less because we thought that this is the best cluster for social entrepreneurship. Rather, we thought it's the best cluster for digital start-ups." (BSF1) "In [...] Silicon Valley, these [sustainability] topics are currently extremely hyped [...]. In Berlin, on the other hand, I have to admit, I haven't encountered this kind of thing in the normal start-up field." (BCT1) "It's not like the start-up world is such a homogenous community. The individual start-up probably doesn't even think about their responsibility to society. I don't think that there is this kind of political element. I have never seen or heard anything like it." (BIT2)
	Sustainability lighthouses inspire other sustainability start-ups	"Lighthouses help; so, if you have one case in the media that people talk about, that influences, motivates people, inspires people to do the same. The problem is, I don't know yet of any large German lighthouse case." (BSF7) "The whole point is, if you can see an example of what you are probably conceptualising, I mean, what you have been thinking around, when you see somebody living it, it makes it easier to step up and do it." (LCF2) "I think, us winning competitions and sharing our successes on social media influences other people to say: 'Oh, wow, I can do this'." (LSF5) "Because of the social start-ups CcHub started with initially, from BudgIT to Wecyclers [...] Those start-ups gave the mindset for people to start thinking around their environment, coming up with business ideas that can be integrated with social objectives. Start-ups like Prepclass came out of this idea. [...] What really happened was that people started thinking around problems within society." (LSF2)

Table A.2 Social Factors

Second order codes	First order codes	Representative quote
Social attributes reinforce existing structures in EE impacting the share of sustainability start-ups we see	Successful sustainability entrepreneurs as mentors in Lagos	"When we started and whenever we needed help, we'd go to his place, we'd go to his house or go to his office, and he helped us out in a lot of ways." (LSF4)
		"So, right now we are looking for a co-founder and I am going through Andela [a social start-up] to find them." (LSF5)
	Investors care about sustainability aspect in Lagos	"So, when you're building a business plan, you have sustainability in it. If you don't build it in, you don't get the funding. So, it's actually enhancing some of these investments. And for businesses that don't have it, they don't get investment … this is especially true for start-ups." (LNF1)
		"I think [businesses with a social mission receive more funding]. To give an example, I know for a fact that if your business is around agriculture and helping to create social impact, also in the health sector, in the educational sector, yeah, you have a very good chance of getting funding." (LST2)
		"I know a lot of international funds that are now trying to consider impact; I know a lot of international endowment funds and large pools of capital who want to see impact embedded in their investors." (LIF1)
		"Externally or internationally it is probably easier if you have a social enterprise, because the perception for most funders is like: 'Oh, we are looking for a business that has social impact and that's where we want to invest in'." (LCF1)
		"Yes, many of [the investors] focus on job creation, so the SDGs, many of them insist in fact that if you are going to be part of their programme, you must be solving one of the 17 SDGs. […] So almost all of them insist on one of the goals." (LSF1)
	Few supporters of sustainability start-ups in Berlin	"Yeah, there's no real advantage to founding a social enterprise in Berlin compared to somewhere else." (BIF2)
		"There were never any touchpoints where being in Berlin was an advantage. It probably would have been better to be somewhere in the countryside, away from all the distractions." (BSF6)
		"The Impact Lab was being used quite a lot but it's not supported that much any more. While I was there, they actually got rid of the co-working space, which kind of broke the neck of many founders, because that was the real value-add of the whole thing." (BSF4)
		"At the Axel Springer accelerator which supported us, there were basically no other social or care start-ups in the last three years." (BST2)
	Investors do not care about sustainability in Berlin	"Well, we always struggled to find investors who say: 'Yes, the social mission is also important to me and it's a reason for us to invest'." (BSF1)
		"When we are talking to traditional investors on the commercial market, there are a lot of things that are nice to have but in the end it's all about return-on-investment and everything else is secondary." (BCT2)
		"So far the financial support is minimal. If you look at the public resources available to social enterprises you find almost nothing in Germany." (BIF1)
		"In conversations with investors I always got different kinds of questions. They ask how much revenue you make every month, what proof of this you have and how well-inclined your customers are to you, not about your sustainability." (BCF1)
		"Social responsibility is not one of the primary criteria in our funding programme. It plays a role but only in relation to the goals of the European Social Fund which co-finances our programme." (BIT1)
		"Actually the investor base is not that strong in Berlin for impact investments […] And for social enterprises, there is nothing special about the ecosystem here, I would say. The money is not here anyway." (BIF2)
		"The orientation in these programmes is definitely not reduced to social factors. Rather, such orientation is often being called into question because they are often seen as unstable business models." (BSF4)

Table A.3Material Factors

Government not supportive of sustainability start-ups	Government and regulatory environment not supportive of sustainability start-ups in both ecosystems	"Yeah, well, in the news and in the papers, I read [that the government supports sustainability start-ups] — but in reality … [laughs]. I realised that I don't want to chase support but continue to develop the team. Now, If I need to get support from the government or somebody out there, I need to keep chasing them. I will always be out there and not here, where it really matters." (LST3) "Sometimes the government shies away from talking with other support providers, because they know they haven't done a whole lot." (LNF1) "I think the issues are known to government, but we have issues peculiar to business. The agri-space needs help. Are we going to wait for the government? No! What can we do? We seize the moments.**" (LSF3)** **"I think, the typical barriers for doing anything** in Nigeria are just the regulations, getting registration, bureaucracy, maybe some elements of corruption." (LHF1) "Well, tax has not been good for us, no tax holiday, so what has been good for us? " (LSF4) "Years ago, there was an initiative launched by the ministry of labour which was supposed to make funding available to social entrepreneurs. But that topic has died completely. And I wouldn't really know of any examples where the government is actively supporting this issue today. It's possible that they exist but I'm not aware of it." (BSF1) "We currently don't have the big tools for change like our own legal form, tax regulation or a reform of the legal framework for charitable organisations." (BNW1) "If you are at the point where you place any hope in politics as a start-up founder, you are really lost." (BSF6)
	Government actively trying to hinder sustainability start-ups in Lagos	"So, Lagos is very notorious for stealing ideas. So, you go to the government and then they tell you, 'Oh, we like your idea, give us your proposal', and then they give it to their friends to implement. I have kind of given up on trying to lobby … I think it is a waste of time." (LSF5) "Last year we started a fight. What was the fight? The government wanted to pass a bill regulating the number of social entrepreneurs that can exist." (LNT1) "So, in Lagos, for example, right now and if you're doing anything and if you clash with the Lagos government, you need to go." (LHF2)
	Government sees start-ups as means to economic ends, not sustainability	"Okay, so basically when my office was created […] we wanted to encourage [young people] to become job creators, become entrepreneurs, instead of just waiting for the government to give them jobs. And also, we wanted them to help build the economy of the country and change Nigeria." (LGT1) "Berlin supports start-ups because they offer the potential of creating jobs here in Berlin, also for the long-term and to secure those jobs." (BIT2) "Social responsibility is not one of the main factors in our programme. When assessing start-ups we first look at innovativeness, market opportunities and the team. […] We only take sustainability and social factors into consideration in a second round and actually it is rarely the case that they are being violated. They would, for example, have to explicitly write that they are planning to discriminate against people in their venture in order to be excluded." (BIT1)
Presence of opportunities as important factor for development of sustainability start-ups	Having a lot of problems in Lagos creates opportunities for sustainability start-ups	"Many others are just tired of seeing people suffering and not being able to do anything about it. You can't live in this much neglect and just stuff not being right and not wanting to fix anything, it's only rational." (LHF1) "There are a lot of problems here, a lot of things that are wrong, but before now, people just complained and complained, but there has been a paradigm shift in that: I could actually do something to change the state of things." (LSF1) "Lagos is the place where you have got the population, you got a lot of problems that only technology can actually address. It is a place where there is opportunity for you to do what you want to do." (LST3) "So if you want to do a social project — because your target is actually people from the lower class that is actually having a lot of impact in terms of social projects — because you have a large number of people on this side, that is why I think Lagos is a really good place to test your social ideas." (LSF2) "Technology is solving a lot of the things that the government is supposed to solve, and like private sectors as well, and that is where a lot of businesses are coming in as well. Like the things that people are just generally supposed to have, whether it be subsistence or whether it be so that they can compete globally, the government is totally inapt. The private sector is really taking over." (LIF1)
	The strong welfare state in Germany hinders development of sustainability start-ups	"All in all, I also think that the philosophy in Germany is still that everything that has something to do with social matters should be handled and indeed is often handled by the state." (BSF1) "I think, if we looked at the statistics and compared Germany with India (even if they are difficult to compare), we would probably see that there are actually more social enterprises in India than in Germany. That is because the German state is much more active in the social space and simply offers certain services that are not really there in India or in many other countries where the state is less strong." (BIF1) "Because in the UK, the state doesn't take care of social aspects that much any more, so there's a high need for social start-ups and a high demand as well. I guess that's different to Germany. And sometimes people try to solve social problems entrepreneurially, but we ask, 'Why you would do that?', because it's the job of the government to do it actually — especially in education." (BSF2) "Well, of course in Germany, given the welfare state, I mean that has an influence on how strong our social enterprises are seen. " (BIF2)

B — Semi-structured interview guide start-up founders

Good morning/afternoon Nice to meet you and thank you so much for agreeing to do this interview with me. My name is Sarah Tiba. I am an innovation scientist at the Copernicus Institute of Sustainable Development at Utrecht University, the Netherlands. I am currently conducting research on start-up ecosystems and factors that shape these. The purpose of this interview today is to better understand your firm's role in Berlin' s/Lagos's start-up ecosystem and how this role has developed. I am also interested in your general views regarding this ecosystem. The interview consists of approximately 15 mostly open-ended questions. It will take around 25—45 min.

If possible, I would like to record the interview. While the results of this research will be published in an academic and thus public journal, you will always remain anonymous, i. e. anything you share with me in this interview remains confidential and your name or the name of the company will never appear on any public record.

Do you have any questions about this? If not, let us start.

1) Could you please tell us more about yourself (name, role in the firm)?
2) What is it that your business does? What do you sell?
3) We would also be grateful if you could share with us the latest figures regarding your start-up's annual revenue and number of employees.
4) *[If this hasn't been answered yet]* **To what extent do you consider that your firm is delivering something good to the world? Please explain.**
5) **Please tell us a bit more about the history of your company. We are particularly interested in understanding why you decided to launch this specific business.**

Why are you in Berlin/Lagos?

6) a. What makes Berlin/Lagos a good place for businesses like yours?
   b. What makes it hard to develop a business like yours in Berlin/Lagos?
7) Looking at the founders in Berlin/Lagos, what role would you say
   a. Education plays
   b. Experience abroad plays
   c. Gender plays?
8) About your firm, we are keen to learn whom you interact with most to set up and run your business (e. g. a specific incubator or other start-ups) and what this interaction entails.
9) Has the choice of your business idea been influenced by any other people? If so, how?
10) Has your start-up been supported financially or otherwise by anyone (e.g. investors, incubators, government)? How has this influenced your business?
11) Do you have any touchpoints with social/sustainability entrepreneurs/investors/incubators in Berlin/Lagos? Do you have an idea what their motives were in starting a sustainable enterprise? How, if at all, do they differ from yours?
12) Are you aware of any cases where the orientation of a start-up towards sustainability was impacted either positively or negatively by any other firm or group in the ecosystem?
13) **We estimate that around (6% of start-ups in Berlin/12% of start-ups in Lagos) are what we call sustainability start-**

ups — this is a relatively (low/high) share of sustainable start-ups when compared to other cities, e. g. Boston/ Berlin. Do you share that impression? Please explain.
14) *[If this hasn't been mentioned before]* Are there any government policies that particularly support or provide barriers to (sustainable) start-ups in Berlin/Lagos or any specific factors that drive sustainability, in your view?
15) What policies could the local (city) government adopt, in your view, to further increase the share of sustainable start-ups in this ecosystem?
16) Are you, as a company or personally, taking any actions (e.g. through interactions with policy-makers) to improve the conditions in Berlin/Lagos for start-ups like yours?
17) 6%/12% start-ups in Berlin/Lagos are sustainable now. What do you think the share will be 10 years from now? Please explain your opinion.

Thank you very much for all the information. This is most appreciated, and it will greatly help us with our research. We will share with you the papers that are developed from this research, once they are published.

Just a couple of general questions:

Is there any other organisation you know of that may be relevant for us to interview for this research? If so, we would be more than grateful if you could refer us.

Would it be okay if we contacted you again for a quick follow-up if any more questions come up regarding your firm and your views on this ecosystem?

Always feel free to contact us for questions!

Goodbye!

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