

Reducing early-stage Cleantech funding gaps: an exploration of the role of Environmental Performance Indicators

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Abstract

Purpose – The purpose of this paper is to explore why, despite the development of a hybrid investing logic, funding problems are so persistent for early-stage Cleantech ventures (“Cleantechs”). An institutional logics lens is adopted to analyze how key actors’ perceptions and communications of the Cleantech value proposition shape information asymmetries (IAs).

Design/methodology/approach – A mixed methods approach draws on 82 Cleantech pitch decks and 31 investment guidance documents, and insights from interviews with 42 key informants and nine Cleantech CEOs and their investors.

Findings – IAs persist, first of all, because key investor and entrepreneurial actors combine different goals in the hybrid Cleantech value proposition. Interestingly, the analysis of Environmental Performance Indicators (EPIs) as a critical communication tool reveals a further mismatch in how actors actually combine logics. The authors ultimately identify three emergent actor roles – traditional laggard, developer and boundary spanner – that present a framework of how the three most influential actor groups develop EPIs and via that a hybrid Cleantech financing logic to overcome IAs.

Originality/value – The paper enhances the entrepreneurial finance literature primarily by showing that in contexts of hybrid investing a more nuanced understanding of institutional logics in terms of ends and means is critical to overcome IAs. While prior works highlight goal incompatibilities, the findings here suggest that the (in-)compatibility of goals as well as EPI choices of the same actors is likely to be the key explanandum for the stickiness of IAs and the funding gap. The novel emerging role framework offers additional theoretical, policy and practical advances for hybrid logic development.

Keywords Cleantech, Funding gaps, Environmental impact, Institutional logics, Impact investing, Climate change

Paper type Research paper

Introduction

Climate change requires major adjustments to how we live and do business. [The Paris Agreement \(2015\)](#) addressed this with clear goals for rapid carbon reduction and delivering innovative “Net Zero” carbon reducing solutions. Cleantech companies (hereafter “Cleantechs”) are typically young ventures that develop potentially game-changing innovations in the form of

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commercial products, processes and services to nurture low carbon impact across society (Gaddy *et al.*, 2017; Cumming *et al.*, 2016a; Jensen *et al.*, 2020). Yet, although Cleantechs take on a critical role in delivering “Net Zero”, they often do not progress beyond early prototyping stages; mainly because they persistently struggle to obtain sufficient funding (Owen *et al.*, 2020).

Early-stage investing is difficult. Funding early-stage Cleantechs is particularly difficult, because they present a hybrid business case (focusing on radical commercial innovation *and* long-term environmental goals) which is often more difficult to understand and therefore risky (Gaddy *et al.*, 2017). This increases information asymmetries (IAs) for investors (Carpenter and Petersen, 2002) and as a result prevents funding (Doblinger *et al.*, 2019; Owen *et al.*, 2020). The extant entrepreneurial finance literature already offers useful insights into how to reduce IAs. Notably it suggests optimizing the funding options in the early-stage finance escalator (North *et al.*, 2013; Owen and Mason, 2019) as well as the communication of a convincing value proposition in pitch proposals (Mason and Kwok, 2010; Harrison *et al.*, 2020; de Villiers Scheepers *et al.*, 2021). Interestingly, however, although in more mature economies both of these aspects are already developed in a hybrid Cleantech investing logic (Polzin and Sanders, 2020; Cumming *et al.*, 2016b; Mazzucato and Semieniuk, 2018), IAs and the Cleantech financing gap are persistently high (Owen *et al.*, 2020; Migendt *et al.*, 2017; Polzin, 2017).

In this paper we argue that the problem may stem from the separation in theory and practice between the funding escalator and value proposition communication literature, leading to either implicitly assuming effective communication or similarity of actors. Such assumptions are however problematic. The institutional logics literature for instance shows that actors in the same stage of the funding escalator can all have diverse values and therefore different goals *and* communication strategies (Yan *et al.*, 2021; Thornton *et al.*, 2012). And while the entrepreneurial finance literature has suggested that the (in-)compatibility of actor logics as in goals can affect IAs (Fisher *et al.*, 2017; Pahnke *et al.*, 2015), it has left communication choices and their (in-)compatibility with goals largely unexplored.

Thus, to address this knowledge gap in the entrepreneurial finance literature and to better understand why IAs and the funding gap are so persistent for Cleantechs, this paper adopts a nuanced institutional logics lens (Yan *et al.*, 2021; Thornton *et al.*, 2012) and analyzes (1) the goals that the key actors in the early-stage Cleantech funding escalator (i.e. venture capitalists (VCs), business angels (BAs), government-backed funds (GFs), and Cleantechs (Polzin and Sanders, 2020)) ascribe to the hybrid Cleantech value proposition; and (2) which Environmental Performance Indicators (EPIs), the same actors choose as a crucial communication tool (Waes *et al.*, 2014; Sala *et al.*, 2015). We examine the UK, a globally leading and well established Cleantech finance market. The analysis is mixed-methods (Creswell, 2003), comprising secondary data from 82 early stage Cleantech pitch decks and 31 investor guidance documents, 42 interviews with UK Cleantech market key informants and nine Cleantech CEOs and investor pairings.

The main contribution of the paper is to the entrepreneurial finance literature on institutional logics by showing that in contexts of hybrid investing (such as Cleantech investing) it is crucial to not only look at logics as goals (i.e. ends) (Fisher *et al.*, 2017; Pahnke *et al.*, 2015; Roundy, 2017), but also to pay attention to the communication tools (i.e. means) that are used to explicate these goals. Our findings show that different key actors in the early-stage Cleantech funding escalator prioritize different goals in the Cleantech value proposition and thus intend to combine logics differently. Critically, however, our analysis of EPI usage further reveals that they also use different EPIs to communicate and develop the same value proposition. The three emerging actor roles (*boundary spanner*, *developer*, and *traditional laggard*) further explicate this by showing that some actors are in fact hindering the development of a hybrid Cleantech investing logic as they stick to more conservative EPIs than expressed in their Cleantech goals.

These insights ultimately expose hidden similarities between previously assumed different investor groups and emphasize that the operation of the so-called Stakeholder Triple

Nexus (STN) meeting point of entrepreneurs, investors and support services, is critical to develop the Cleantech investing escalator. From a practical viewpoint, the paper highlights that due to a lack of insights of entrepreneurial finance research into actor-specific goals and communication approaches that underpin values and logics, the development of a hybrid investing logic as such might, against general anticipation, not solve the Cleantech financing problem.

The paper proceeds by reviewing the literature on the early-stage Cleantech finance gaps as well as on institutional logics and EPIs in a hybrid Cleantech investing logic. We then present our findings and ultimately provide a discussion of both theoretical and policy implications, demonstrating how the entrepreneurial finance ecosystem can be managed for a more efficient early stage Cleantech finance market.

Literature review

The Cleantech financing problem

Early-stage innovation venture finance gaps are widely acknowledged (Lerner, 2010; North *et al.*, 2013; Lee *et al.*, 2015). The extant entrepreneurship literature primarily attributes finance gaps to the information asymmetries (IAs) between the finance demand-side and supplier-side (Carpenter and Petersen, 2002). A combination of long-term impact innovation development and ventures lacking track record increases adverse selection risk for investors and prevents business funding (North *et al.*, 2013). Early-stage Cleantech ventures (“Cleantechs”) that “*are commercializing [radically innovative] clean energy technologies or business models*” for long-term impact (Gaddy *et al.*, 2017, p. 4) therefore particularly suffer from underfunding, because they have costlier and riskier – often involving “deeptech” long-horizon (ten plus years) hardware development – business models and due to their hybrid goals (commercial and environmental) struggle to present a credible business case to investors (Owen *et al.*, 2020; Jensen *et al.*, 2020; Cumming *et al.*, 2016a).

Two separate literature streams deal with IA reduction. First, the more established stream is based on the premise of the funding escalator where more funding options become available at each venture’s progression stage as the business model becomes less opaque and IAs reduce, making it easier for ventures to access funding (Berger and Udell, 1998; North *et al.*, 2013). Early-stage ventures in seed (pre-trading) or venture (early trading) stages as well as deeptech sectors are therefore particularly opaque and require specialist investors such as BAs and VCs that understand their financing and market development needs (Owen and Mason, 2017). Moreover, Owen (2021) observes that deeptech remains too risky for private investors and requires additional support by government gap-funding instruments such as grants and cofinancing equity.

In Europe and North America, the funding escalator for early-stage ventures is now well established. The most important funding options are government backed funds (GFs), BAs and VCs (Gompers and Lerner, 2001; Lerner, 2010), as well as crowdfunding (Drover *et al.*, 2017). Recent studies also suggest that early-stage Cleantech funding options are well supplied (notably for shorter-horizon end-consumer products) (Polzin and Sanders, 2020). They further note that due to the deeptech focus of many Cleantechs, VCs, BAs and GFs are by far the most important funders (Mazzucato and Semieniuk, 2018; Cumming *et al.*, 2016a; Migendt *et al.*, 2017).

The *second*, more recent literature stream notes that a venture’s value proposition needs to be communicated effectively to reduce IAs (Clarke and Cornelissen, 2011; Clarke *et al.*, 2019; Martens *et al.*, 2007). The argument here is that while the availability of funding options *per se* is important, a credible and understandable business idea is paramount for reducing IAs between ventures and the respective investors. Building on such arguments, scholars have investigated the factors and communication strategies that depict a credible business idea. A key finding is that investors typically value signals of quality and competence, and ventures

need to effectively communicate these signals (Colombo, 2020). Regarding the latter, van Werven *et al.* (2019, p. 194) contend that a venture's story needs to be plausible and resonant, and de Villiers Scheepers *et al.* (2021) add that a tangible and for the investors personally relevant story is important for "talking" a new venture into existence. In the context of Cleantechs, some works also suggest that investors value green orientation and the ventures can thus benefit from specifically mentioning their environmental impact in their pitch (Roma *et al.*, 2021; Hörisch and Tenner, 2020).

While the above works have all significantly advanced our understanding of how to reduce IAs, recent research shows that early-stage Cleantechs still struggle to attract sufficient financing (Owen *et al.*, 2020; Polzin, 2017; Migendt *et al.*, 2017). Specifically, although increasingly dedicated to backing Cleantechs, early-stage investors (particularly public and private VCs and BAs) seem to struggle to integrate the hybrid Cleantech value proposition in their investment approaches (Bergman *et al.*, 2019; Doblinger *et al.*, 2019; Cumming *et al.*, 2016a; Owen *et al.*, 2020) and unsurprisingly, early-stage Cleantechs then conceal instead of embrace their environmental goals (Bjornali *et al.*, 2017).

Thus, although the funding escalator and the value proposition communication literature provide important insights into how IAs can be reduced, they do not sufficiently explain why Cleantechs persistently suffer from IAs and underfunding. A reason for this could be that the two literature streams evolved largely separate, and in doing so either implicitly assume communication as effective *a priori* or focus on communication strategies that regard actors in the funding escalator as similar. Such assumptions are however problematic. Findings from the institutional logics literature, for instance, show that actors in the same stage of the funding escalator can follow diverse values and these values can also manifest differently in both the goals ascribed to the ventures' value proposition and how it is communicated (Yan *et al.*, 2021; Thornton *et al.*, 2012).

Therefore, in order to understand why IAs and the Cleantech funding gap are so persistent, in this paper we build on the institutional logics literature and investigate in more detail the values that the most important actors in the early stage Cleantech funding escalator (VCs, BAs, GFs, and Cleantechs) ascribe to the Cleantech value proposition. As these values can manifest in both goals and communication tools, we specifically focus on values in terms of Cleantech goals and EPIs. We now briefly introduce logics and EPIs, and then review the already existing entrepreneurial finance literature on institutional logics.

Institutional logics, EPIs and the Cleantech financing problem

Institutional logics are a "set of material practices and symbolic constructions" (Friedland and Alford, 1991, p. 248) that reflect values and guide how individuals make sense of the world (Friedland and Alford, 1991; Thornton and Ocasio, 2008; Thornton, 2004). Logics therefore determine what matters most by providing pathways for both interpretation and action (Thornton *et al.*, 2012). In the case of early-stage Cleantechs, logics not only determine the goals that matter most to reduce IAs and obtain funding but also the tools that are suitable to communicate these goals (Fisher *et al.*, 2017; Pahnke *et al.*, 2015).

One of the most important communication tools are (key) performance indicators (Gallopini, 1997). They not only represent the main logics or values, but also what matters most for decision-making (Thornton *et al.*, 2012; Rottenburg *et al.*, 2015). EPIs therefore provide a crucial communication tool for Cleantechs and their investors because they help represent the logics that are relevant in the Cleantech value proposition and reflect the goals that matter most for environmental impact and for the reduction of IAs to obtain funding (Waas *et al.*, 2014; Sala *et al.*, 2015; Rodriguez *et al.*, 2020).

From an analytical viewpoint, EPI choices are particularly interesting because they also provide insights into the measurement practices (material elements) and meanings of environmental impact (symbolic elements) that are accustomed in logics. For instance, in the

market logic rigorous and quantitative measurement systems determine a performance focused definition of impact, while in the environmental logic the focus is more on qualitative estimates and best practice studies (Rodriguez *et al.*, 2020). Thus, in revealing the measurement practices (material elements) and the meaning of environmental impact (symbolic elements), EPIs also allow exploration of whether and how logics are combined in the Cleantech value proposition (Yan *et al.*, 2019; Zilber, 2008; Thornton *et al.*, 2012).

A short recap of logics and indicators in the entrepreneurial finance literature. There already are works that investigate the main actors' logics and indicators in the financing ecosystem of young ventures. The most important study is the one of Pahnke *et al.* (2015), who find that *state* logics underpin the government's desire for R&D finance (e.g. grants and cofinance) to more efficiently certificate and legitimize new technology for the public good (via economic growth and competitiveness). Comparatively, private investors (e.g. VCs and BAs) follow the *professional* logic as their goal is to encourage innovation and high returns for their clients. Fisher *et al.* (2017) add nuance, noting that BAs attend more to personal performance and return and therefore follow the *market* logic. For Cleantechs, the literature argues that they follow the *environmental* and *market* logic, because they aim to demonstrate long-term environmental impact and a viable investment (Hockerts and Wüstenhagen, 2010; Roundy, 2017).

Overall, the literature highlights the presence of four main logics in the early-stage Cleantech funding escalator (*professional*, *market*, *state*, and *environmental*) (see Table 1 below). It also highlights that traditionally the main actors (apart from Cleantechs) operate according to one of these logics. A separate literature stream furthermore notes that the actors also use indicators that follow these traditional logics (see Table 1).

The quest for a hybrid Cleantech investing logic. While the above insights are important, in this paper we argue that, with the increasing importance of Cleantech investing (Owen *et al.*, 2020), all actors in the early-stage Cleantech funding escalator are moving toward combining the traditional logics from Table 1. Besides Cleantechs, investors also increasingly combine two logics and in doing so incorporate "green" goals into their investment approaches (Yan *et al.*, 2021; Roundy, 2017) and adopt more hybrid indicators in the form of EPIs. The actors have therefore started early-phase development of a hybrid Cleantech investing logic (Yan *et al.*, 2021), in which values, as well as the goals and EPIs that reflect those values, are reevaluated and repositioned.

While this is a positive development, due to a lack of insights of entrepreneurial finance research into actor-specific goals *and* communication approaches that underpin values and

Logic	Professional	Market	State	Environmental
Primary actor	VCs	BAs	GVCs	Cleantechs
Primary goals	High innovation and client growth	Growth and short-term returns	Economic competitiveness and public good	Long-term environmental protection and behavior change
Legitimacy sources	Personal expertise	Innovation and performance	Participation	Scientific expertise
Indicators used	Technology readiness level, time to exit and RoI	RoI, technology readiness level and time to exit	Ecological footprint and well-being	Emission reduction, biodiversity loss and waste reduction
Indicative references	Fisher <i>et al.</i> (2017) and Pahnke <i>et al.</i> (2015)	Fisher <i>et al.</i> (2017)	Ness <i>et al.</i> (2007) and Rodriguez <i>et al.</i> (2020)	Hockerts and Wüstenhagen (2010)

Table 1.
Traditional logics in the early-stage Cleantech finance escalator

logics, the development of a hybrid investing logic as such might however, against general anticipation, not solve the Cleantech financing problem. Specifically, although the extant entrepreneurial finance literature demonstrates that actors need to eliminate frictions on the goal level (Owen *et al.*, 2020; Roundy, 2017; Fisher *et al.*, 2017; Pahnke *et al.*, 2015), it falls short in exploring potentially more nuanced differences at the communication level. Therefore, even if the entrepreneurial finance literature suggests that actors' goals need to be aligned in a hybrid Cleantech investing logic, there might be more nuanced problems emerging from the enactment of logics on the communication level (Yan *et al.*, 2021). After all, logics are not only manifested in goals, but also in the choices that are made to communicate these goals (Zilber, 2008; Rautiainen and Järvenpää, 2012; Thornton *et al.*, 2012; Yan *et al.*, 2021).

Against this background, this paper argues that IAs and the Cleantech financing problem are so persistent because the entrepreneurial finance literature, even to the extent that it addresses actor-specific values, focuses on logics as in goals of these actors only. What it misses is a more nuanced understanding of the multiplicity of logics that acknowledges how different actors enact values in both, goals *and* communication choices (i.e. EPIs). Thus, to better understand why IAs and the Cleantech financing gap are so persistent, we explore *first*, the goals that the most important actors in the Cleantech funding escalator (VCs, BAs, GFs, and Cleantechs) combine to elaborate on the hybrid Cleantech value proposition, and *second*, how these actors, via the use of EPIs and the leveraging of material and symbolic elements, combine logics to communicate the same Cleantech value proposition.

Methodology

To understand how actors understand *and* communicate the Cleantech value proposition, the study follows an interpretative paradigm (Burrell and Morgan, 1979; Myers, 2008). Adopting mixed methods research (Creswell, 2003) our abductive approach brings together theoretically informed questionnaires (Alvesson and Sandberg, 2011) and open coding (Glaser and Strauss, 1967) to identify communication tool choices that are connected to the socially constructed nature of a hybrid Cleantech investing logic.

Data collection

We initially scoped the previously identified main actors in the early-stage Cleantech funding escalator: VCs, BAs, GFs, and Cleantechs. During the interviews, we then realized that support agencies were highlighted as increasingly critical in linking investors and ventures. Thus, in order to understand the issues of the communication of the Cleantech value proposition, in our final sample we include private and public (impact) investors (VCs, BAs, and GFs), support agencies and Cleantechs as main actors. We will reflect more on this in the discussion section.

Once we clarified the actors, three steps were undertaken to explore how the Cleantech value proposition is understood and communication via EPIs. *First*, we collected 82 [1] recent (2016–2020) early-stage (seed and Series A) Cleantech pitch deck promotion documents to understand how Cleantechs use EPIs. *Second*, a series of qualitative semistructured (Kaplan and Maxwell, 2005) one hour online [2] interviews were undertaken with 42 key informants (Table 2 selected purposefully and iteratively to represent a cross section of public and private Cleantech investors, policymakers and support agencies); and nine in-depth Cleantech CEOs (Table 3 purposefully selected to reflect relevant Cleantech sectors (Gaddy *et al.*, 2017) and seed to Series A funding stages), paired with their (separately interviewed) investors. We focused on UK early-stage Cleantechs; and pre- or early-trading micro enterprises with under ten employees. Questions were flexibly developed (Coffey and Atkinson, 1996). The topic guide is in online Appendix 2.

As such, the interviews primarily gave us insights into the actors' goals and interpretations of the Cleantech value proposition. They also helped us to identify which EPIs were used and

No	Type		Contact
0101	Public impact investors and policymakers	Venture Capital (VC)	Innovation funding managers
0102	Private impact investors	Business Angel (BA)	Director, CEO and nonexecutive
0103	Public impact investors and policymakers	Grants	Evaluation lead
0104	Public impact investors and policymakers	VC and BA	Access to the finance manager
0105	Private impact investors	BA	CEO
0106	Private impact investors	VC	Director
0107	Private impact investors	VC	Partner
0108	Cleantech market support	VC	CEO
0109	Market analysts		Editor in chief
0110	Cleantech market support	All	Director of agency
0111	Private impact investors	VC	Policy manager
0112	Market analysts	All	Head of research and consultancy
0113	Cleantech market support	All	Engagement lead
0114	Cleantech market support	All	Emerging giants lead
0115	Cleantech market support	VC and BA	Managing partner
0116	Public impact investors and policymakers	VC	Investment manager
0117	Private impact investors	VC	Managing partner
0118	Private impact investors	Investment bank	Head of enterprises
0119	Private impact investors	Institutional investors	Head of engagement, portfolio manager
0120	Cleantech market support	All	Impact valuation lead
0121	Public impact investors and policymakers	VC	Managing partner
0122	Cleantech market support	All	Energy innovation partnership manager
0123	Cleantech market support	All	Innovation fellows, associate dean and the head of business partnerships and enterprise
0124	Cleantech market support	All	Executive chairman
0125	Market analysts	All	Business development
0126	Private impact investors	VC	Managing director
0127	Private impact investors	Crowdfunding	Investment director
0128	Public impact investors	HM Government	Policy officers
0129	Academic expert		Professor
0130	Academic expert		Professor
0131	Private impact investor	VC	Director
0132	Cleantech market support	All	Manager

Table 2.
Key informants (note that codes refer to organizations, not to individuals)

why. As part of the interviews, we also asked our partners to share relevant guidance documents that they use and share for a coherent impact assessment and measurement. Most of our partners were willing to share those documents and, in the end, we collected 31 of investor guidance documents to further analyze the EPI usage of all relevant actors.

Third, to evaluate our findings on EPI usage and the presence and combinations of logics we triangulated our insights from the above steps with a series of practitioner and academic workshops (Creswell, 2003).

Data analysis

Interview data were recorded (where permitted), notated, transcribed, checked with the informants and cross-referenced with Internet searches (e.g. company website) for accuracy

Case	Descriptor	Established	Category	Funding stage	Main funding sources	Revenue stage	TRL	Main funding issues
0201	Transport app	2016	Energy efficiency	Pre-Series A	Grant and private equity	Prerevenue	7/8	Data insufficiencies and missing investor confidence
0202	Online retail	2016	Waste management and recycling	Seed	Private equity	Early revenue	7/8	Data insufficiencies and varying investor requirements
0203	P2P energy trading	2013	Renewable generation	Series A	Grant and private equity	Early revenue	7/8	Fund availability due to COVID
0204	Green laundry	2017	Clean energy use	Seed	Private equity	Early revenue	7/8	Duality of impact versus market innovation
0205	Plastics recycling	2012	Waste management and recycling	Series A	Grant and private equity	Prerevenue	7	Different spatial investor foci
0206	Alternative refrigerator	2003	Clean energy use	Series A	Public/private cofinance equity	Revenue	8	Sector agnostic investors and communication problems
0207	Battery storage for EVs	2017	Energy efficiency	Seed	Private equity	Prerevenue	6	Duality of impact (specifically the funding horizon) versus market innovation
0208	Energy awareness via smart meters	2006	Energy efficiency	Series A	Public/private cofinance equity	Revenue	9+	Duality of impact (specifically the funding horizon) versus market innovation
0209	Air purification system	2019	Energy efficiency	Seed	Seeking grant and private equity	Early revenue	8-9	Lack of experience and communication problems, fund availability due to COVID

Table 3.
Summary of the case
study of Cleantechs

(Miles and Huberman, 1994). Together with the secondary documents all interviews were given a unique (e.g. 01 for investor and support agencies and 02 for Cleantechs) and a running number and then transferred into NVivo.

Data were analyzed by two separate researchers to eliminate interpretive bias (Kaplan and Maxwell, 2005; Gioia *et al.*, 2012). In the *first* step of the analysis, we started by coding according to actors, and the goals that they mentioned when talking about Cleantech investing. By then allocating their statements and goals to specific logics, this step allowed us to see what actors mean when they refer to the Cleantech value proposition and which logics they address.

In a *second* step, we then extracted the EPIs chosen by the different actors and simultaneously openly coded for the explanations around their indicator choice (Glaser, 1978). By analyzing EPI choices, we wanted to understand which logics the actors actually combine in the communication of the cleantech value proposition. Moreover, from the literature we knew that material and symbolic elements of logics were reflected in the explanations of how EPIs were used and these explanations could help us gain insights into how logics were actually combined (Thornton *et al.*, 2012; Zilber, 2008). We thus combined the EPI codes with open codes that capture the EPI explanations as well. In another coding round we then screened the EPI and EPI-explanation sets specifically for material and symbolic elements of different logics. This enabled us to explore not only which logics were combined in the communication of the cleantech value proposition, but also how they were combined and why certain logics were more dominant in the hybrid Cleantech investing logic than others. As three actors (private investors, public investors and support agencies) emerged to be particularly important and distinct in how they combined the elements, we ultimately clustered for their three emergent actor roles to capture how they develop the hybrid Cleantech investing logic.

Findings

We structure the findings as follows. *First*, we outline the actors' goals in their interpretations of the Cleantech value proposition and with this how they intend to combine logics. *Second*, based on the analysis of EPI usage, we show how actors actually combine logics in their communication of the Cleantech value proposition. This also includes the efforts of the three actors that take on particularly important and distinct roles in developing the hybrid Cleantech investing logic.

The (misleading) unity of environmental impact goals

Our analysis suggests that all actors recognize the need to include environmental impact goals in their investment and business approach (Owen *et al.*, 2020). This indicates that Cleantech investing is already seen as a hybrid investment practice that comprises the environmental and other logics. However, we also find actor-specific differences in how logics are combined and prioritized. For instance, Cleantechs mostly refer to their value proposition as follows:

The real impact is delivered by our products when they initiate a change in the consumption behavior of our clients. [0207]

For Cleantechs, the value proposition therefore is strongly connected to the product and its ability to induce behavior change. This suggests not only a strong focus on environmental goals and the environmental logic, but also includes an element of the professional logic that aims for client growth.

From a private investor perspective, BAs also confirm that the major screening requirement is whether the company is "green" and can deliver on a low carbon society [0105,

0111 and 0117]. Financial aspects are only considered second. One BA for instance claimed that the

Overriding investment aim is to invest in changing consumer behaviors and attitudes [0102].

BAs' interpretation of the Cleantech value proposition therefore also indicates a strong focus on environmental goals and the environmental logic but does not neglect the market logic.

In comparison, all VCs recognize environmental impact as important screening criteria, but nevertheless put their emphasis first and foremost on the traditional market and scaling aspects. Environmental impact comes second and if so is mostly considered in the form of CO₂ reduction.

[We] fundamentally rely on the usual investment criteria for early-stage companies: quality of business idea, scalability, IP [protection], quality of management team, exit potential. After that, green impacts . . . these can be wide ranging, although a fundamental is lowering carbon – so CO₂ [sic.] equivalent reduction value. [0106]

As such, our data highlight that private VCs strongly focus on a Cleantech value proposition that prioritizes the ability to commercialize and yield returns over environmental effects [0105; 0115]. For the hybrid Cleantech investing logic, the focus of VCs therefore is primarily on the market logic with a smaller focus on the environmental logic. Thus, while both private investors (VCs and BAs) want to invest longer-term (circa 10 years) [0102; 0107; 0115], and particularly BAs are willing to prioritize the environmental logic, unclear exit strategies of Cleantechs and impact measurement difficulties lead to a dilution of what environmental goals mean and as a result, particularly VCs focus more on the market logic (i.e. CO₂ reduction).

Public investors (such as GFs) also highlight their commitment to environmental goals in their desire to reduce emissions. However, for them the focus is on the scalability of the business in order to achieve a national level (societal) impact.

. . . we are seeking to invest in viable businesses and make a return. However, we also have a keen desire to invest in early-stage innovators that will make a difference to the overall [national] lower carbon. [0101]

Key is to get a [national] baseline to see the difference that they can make on a societal level, given the potential scalability of the business over time. [0101]

Public investors therefore define the Cleantech value proposition as a function of the innovative societal potential of the Cleantechs. Like private investors, they place emphasis on the Cleantech venture and its potential to deliver return while reducing CO₂ emissions. In doing so, their focus is more on the state logic while environmental goals are incorporated alongside it.

To summarize, the above suggests that all actors (private/public investors, Cleantechs) mean different things when they refer to the Cleantech value proposition and the hybrid Cleantech logic. Cleantechs focus on behavior change goals and therefore prioritize the environmental with the professional logic. In contrast, private VCs focus on commercialization of impact goals and thus favor the market logic with a minor focus on the environmental logic. Only BAs seem to converge with Cleantechs on environmental behavior goals, which might be because they often invest alone and take a more personal funding approach (Fisher *et al.*, 2017). BAs do however also combine the environmental with the market rather than the professional logic. Lastly, public investors focus on state logic goals and combine them with the environmental logic. Thus, although there is agreement on the need for a hybrid investing logic *per se*, actors express different intentions in which goals should be combined in this logic.

Dynamic actor roles in developing the Cleantech financing ecosystem

Having explored how actors understand the hybrid Cleantech value proposition and the goals they ascribe to it, we now outline, based on EPI usage, how actors actually combine logics and by that shape different versions of a hybrid Cleantech investing logic. We started with reviewing the EPI choices of all relevant actors [3]. As such, our pitch deck data suggest that Cleantechs present highly diverse stories and EPIs, depending on their sector/group (again, see online [Appendix 1](#) for a more detailed overview). In doing so, Cleantechs often present best-practice qualitative approaches that demonstrate the behavioral impact of their product (e.g. individual token systems) and focus on the environmental logic only. One reason that is highlighted by Cleantechs is that such approaches provide a simple insight into how impact goals are reached (e.g. an \times number of CO₂-tokens are sold and hence \times kg of CO₂ are saved) [0202; 0207; 0203]. This is interesting as it suggests that Cleantechs communicate environmental values, and thereby often disregard other, more traditional logics. Contrary to that, our data also highlight that investors focus less on the environmental goals when choosing EPIs than initially expressed (summarized in [Table 4](#)).

This juxtaposition of Cleantechs and investors again indicates that although all investors consider green goals as important aspects in the hybrid Cleantech value proposition (see the prior section), they seem to struggle to actually prioritize these in their communication. Notably, while in the earlier sections some actors (particularly BAs) suggested that they would prioritize environmental behavior change goals in the Cleantech value proposition, the analysis of EPI usage now reveals that all private investors regard the Cleantech value proposition as efficiency issue in the market logic. Public investors use EPIs closer to the state logic. This indicates that in the communication of the Cleantech value proposition via EPIs actors tend to prioritize their traditional actor logics (as presented in [Table 1](#)). Moreover, it suggests that the funding problem of Cleantechs persists not only because actors prioritize different goals in the hybrid Cleantech value proposition.

Investor type	Indicator	Scale
<i>Private–Business angels (market logic)</i>		
	CO ₂ emissions (reduction)	t
	Carbon intensity	%
	Reduction of (heating) cost	£
	Recycling	Energy per kg
	Capital efficiency	%
<i>Private–Venture capitalists (market logic)</i>		
	CO ₂ equivalent saved	%
	Energy savings	Mw, %
	Raw carbon material impact	%
	Food waste	t
	Water savings	M3
<i>Public investors and policy (state logic)</i>		
	CO ₂ emissions degree of change	%/qualitatively
	GHG emissions degree of change	%
	Carbon footprint	tCO _{2e}
	Energy efficiency (increase)	%
	The cost of process reduction	£
	Conversion efficiency	%
	TRL (position and progression)	Scale point
	Reduction of cost of energy	Per unit
	Reduction of energy expenditure	Mt CO ₂

Table 4.
Main indicators per investor type (developed by the authors)

Role	Boundary spanner	Developer	Traditional laggard
Main actors Activities	Private support agencies Communication development and measurement approach streamlining, investor briefings, and organization of huddles	Public investors Measurement and communication development and baseline data development	Private investors Indicator development and Cleantech pitch development
Main partners	Cleantechs, private and public investors, government bodies	Cleantechs and government	Cleantechs and sometimes other private investors (e.g. in syndicates)
Main logics addressed Leverage these logics by	Environmental, Market, State <i>Material elements:</i> borrowing existing measurement practices and EPIs from all three logics. using communication spaces that connect all actors and all logics <i>Symbolic elements:</i> borrowing impact definitions from the environmental logic	State, Environmental, Market <i>Material elements:</i> employing simple versions of state logic EPIs and measurement practices <i>Symbolic elements:</i> advocating for development of qualitative impact analysis approach from environmental logic developing environmental baseline data from the state and market logic for a more rigorous understanding of impact	<i>Material elements:</i> developing new, more rigorous and sophisticated indicators that measure environmental efficiency <i>Symbolic elements:</i> promoting market meaning of impact by focusing on financial aspect of it
Hybrid logic development by	Anchoring definition of Cleantech value proposition in hybrid logic	Developing simpler environmentally inspired but state-logic driven Cleantech value proposition	Promoting taken for grantedness of market- focused Cleantech value proposition
Current position and potential difficulties	Potential to develop ecosystem holistically as logic-spanning efforts bundled in a single organization. Currently underrecognized in ecosystem	Recognized as potential powerful player as they span all three logics. Is however yet to realize its potential as entangled in efficiency/longevity dilemmas	Highest relative importance in cleantech ecosystem and recognizes need to adapt. Potential still limited as development activities are isolated practices

Table 5.
Actor roles (developed
by the authors)

Rather the problem seems to be exacerbated by a mismatch between such interpretations and the communication via EPIs.

However, our interview partners repeatedly highlighted that they already developed their approach to better match their understandings of the hybrid Cleantech value proposition. In a second step we therefore turned to the explanations around EPI usage and wanted to better understand why they used certain EPIs. Recalling the literature on EPIs and logics, measurement practices reflect material elements of logics and the meaning of environmental impact symbolic elements. Explanations around EPI usage thus not only allowed us to see which logic the actors actually prioritized in communication, but also which elements they used to combine logics. This ultimately revealed that Cleantechs were not very influential in developing the new hybrid Cleantech investing logic (as most of them were assisted by other actors) but instead that three actors in the roles below (Table 5) were most influential in developing the hybrid Cleantech investing logic.

Role 1: Boundary spanner. First, our data show that private support agencies can take on the important role of the *boundary spanner*. Their main objective is to connect and strengthen

the link between Cleantechs and private as well as public investors. As a respondent from one of Europe's largest market support organizations mentions:

The major issue we provide support with is Cleantech communication of potential impact and briefing investors to look for this [0117]

Thus, private support agencies bring together all actor types and with it the *market, state and environmental* logic. Their intention therein is not to undermine or prioritize any actors (or logics), but instead to incorporate elements from all three logics and develop new logic-spanning approaches. This makes them particularly important for the Cleantech finance ecosystem.

For example, in order to create a Cleantech value proposition that is understandable and reliable for all actors, support agencies strongly build on Sustainable Development Goals (SDGs), Global Reporting Initiative (GRI) and other market- and government-backed standards that promote the goals of the environmental logic [0120; 0123], and then develop and publish their own guidelines that incorporate these standards [0108; 0115; 0132]. More specifically, they use impact definitions and goals from the environmental logic (symbolic elements), and EPIs and measurement practices (material elements) from the market, state and environmental logics. They then describe how to use and implement EPIs and the impact measurement approach. This enables fostering the combination of long-term and short-term indicators and an integrated analytical approach that promotes a truly hybrid Cleantech investing logic.

Besides the above, private support agencies also create communication spaces that allow investors, ventures and government bodies to develop new approaches. They do that for example by organizing huddles [0113], or by collaborating with local incubators where investors and businesses can learn from each other [0114]. The support agencies therefore use material elements that established in all logics (the communication spaces) but importantly position themselves as boundary spanner between all three relevant logics and in doing so also develop a more rigorous and useful hybrid Cleantech investing logic.

Role 2: Developer. Second, our data reveal that government backed funds potentially take on the role of *developer* from within the investment market (Owen *et al.*, 2019; Lerner, 2010). They not only advocate a simpler impact measurement, for instance by adopting a case-by-case investment approach,

We look at each case individually The principle [of impact investing in Cleantech] is simple, but the reality is more complex because each business is different and is assessed case by case. [0103]

but, although the primary EPIs used to measure impact were eco-efficiency indicators in relation to economic productivity, they also show flexibility to accept that a prioritization of the environmental logic necessitates qualitative processual elaboration instead of "hard" indicators. One public investor for instance notes the following:

Where no [. . .] relevant or applicable standards exist the Sector Expert will suggest a suitable methodology to be used [. . .]. [This] assessment will assume that the investment succeeds in its targets for commercial development as stated in its business case [0121]

and another one states the following:

Where possible, KPIs will also attempt to measure wider system impacts. The [qualitative] KPI will be relevant when there is a lack of quality data available to complete a quantitative analyse of the carbon reductions. [0103]

Public investors therefore prefer to promote more qualitative understandings of impact measurement (symbolic elements) from the environmental logic. At the same time, they bring in simple measurement practices and EPIs (material elements) from the state logic. By doing

so, public investors leverage material elements from the state and symbolic elements from the environmental logic. These qualities make them particularly relevant to act as a *developer* of simpler logic spanning environmental impact measurement approaches, which focus on progress rather than accuracy. This in turn also helps the developer to validate policy agendas (e.g. to deliver local and national economic growth, jobs, and socio-environmental aims) [0207].

In their relationship with Cleantechs the role of government backed funds is to support the Cleantechs in adopting and developing the above-mentioned simpler impact measurement approaches and EPIs. And indeed, the CEO of a home-automation venture highlights that this support is important, particularly because private investors do not seem to provide it to the same degree:

We [the venture] were very frustrated with private investors [...] until we met LCIF [...] we wouldn't have done it [the indicator and measurement approach development] without them. [0207]

Besides such direct involvement, the developer role also becomes visible in government-backed funds' efforts to develop baseline data for EPIs [0201]. In this case they bring together information from both private and public bodies and therefore support the development of environmental impact by bringing in the interpretations of this impact (symbolic elements) from both the market and state logics.

Although often overlooked, these indirect market development roles are crucial for Cleantech investing. As public investors experience higher pressure to use EPIs from policy requirements, such as European Union and UK [Government's Clean Growth Strategy \(2017\)](#) policies, their influence on a coherent market can be quite substantial. One public investor for instance notes the following:

As a public backed VC, bound by EU priority access 4, we have to demonstrate green impact on CO₂ and greenhouse gases on our investment decision making, whereas the private sector angels and VCs [probably] do not. [0101]

Role 3: Traditional laggard. Third, our analysis suggests that private impact investors often perform the role of the “*traditional laggard*” VC and angel investors. This role demonstrates that, even with increased syndication ([North et al., 2013](#)), investors do not necessarily share their newly developed “green” evaluation and selection processes to develop the wider market. Rather, private investors seem to leverage the “*traditional*” *market* logic to develop their own impact measurement frameworks (e.g. specific impact scores [0107; 0111] that foster a meaning of impact according to this *market* logic). As one investor compellingly notes the following:

Ultimately, the main thing is looking at financial data and distill this down to a simple message [0102]

One reason for this behavior is that private early-stage investors perceive higher uncertainty from a lack of regulatory guidance [0105; 0107] and increasing pressure to develop coherent environmental reporting from institutional investors [0102; 0106; 0107]. Private investors thus tend to refrain from adding more uncertainty to an already risky investment ([Cumming et al., 2016a](#)). One VC for instance states the following:

Our new low carbon fund is driven by investors China is fixated on compliance and greening their economy, so there is huge funding and rapidly increasing interest in cleantech there . . . also international PE investors like Blackstone [\$36bn in funds] and Capital Dynamics which also invests in local government pension funds, as well as Cambridge University and Suffolk County Council. [0107]

Another reason is that private investors simply tend to be secretive about their approach and know what they are looking for ([Mason et al., 2016](#)):

Angel and seed investors in general are known to be quite restrictive and secretive [0108], [...] their [the investors'] mind is already made up [0207], or

At the moment everyone seems to be doing their own thing. [0132]

To summarize, although private investors (VCs and BAs) are important facilitators for Cleantech innovation by providing the majority of early stage finance (Mason and Harrison, 2015; Gaddy *et al.*, 2017), their impact may be limited due to the incompatibility of their approaches with other logics. Thus, despite adopting EPIs, private investors promote a market focused definition of impact (symbolic elements) and market focused measurement practices (material elements). Through this they remain *lone wolves*, typically unable to adapt the meaning of environmental impact so that investment approaches also account for the long-term behavior change aspirations of Cleantechs [0202].

Discussion and future research

The paper's goal was to understand why IAs and the funding gap are so persistent for Cleantechs. Although the literature shows that early-stage development of a hybrid Cleantech investing logic has begun and the necessary funding options and communication benefits for early-stage Cleantechs are available (Polzin and Sanders, 2020; Cumming *et al.*, 2016a; Migendt *et al.*, 2017; Hörisch and Tenner, 2020; Roma *et al.*, 2021), Cleantechs still struggle to access the available funds (Owen *et al.*, 2020).

Adopting an institutional lens on how actors understand and communicate the hybrid Cleantech value proposition we find that this difficulty persists, first of all, because key actors in the Cleantech funding escalator (i.e. VCs, BAs, GFs and Cleantechs) prioritize different goals in the hybrid Cleantech value proposition. Crucially though, the findings further highlight that, in addition to a mismatch in their goals, the actors also use different EPIs to communicate the same value proposition. We therefore postulate that this stickiness of traditional actor logics in the use of EPIs makes it more difficult to develop a coherent hybrid Cleantech investing logic, resulting in persistent IAs and funding gaps.

The paper thus highlights that in order to understand why IAs and the Cleantech funding gaps are so persistent, it is necessary to go beyond the two main literature streams that discuss IA resolution (i.e. the finance escalator (Berger and Udell, 1998; North *et al.*, 2013) and the communication of the value proposition (Colombo, 2020; Martens *et al.*, 2007; de Villiers Scheepers *et al.*, 2021)) and emphasize a more nuanced and actor-specific understanding of the values that are ascribed to the hybrid Cleantech value proposition. As we outline this more nuanced understanding in our findings, we offer three distinct contributions to the entrepreneurial finance literature.

The *first* and main contribution is to the entrepreneurial finance literature on institutional logics by highlighting that logics consist of goals (ends) *and* communication tools (means), and both can create frictions that increase IAs and funding problems. This is particularly the case when two logics are combined, for instance when a new hybrid investing logic is being developed. Such insights enhance previous works which have only noted that institutional logics as values translate into potentially conflicting actor goals (see also Table 1) (Pahnke *et al.*, 2015; Fisher *et al.*, 2017; Roundy, 2017). Notably our findings highlight that when values are renegotiated for a new hybrid investing logic, the frictions that cause IAs and the funding gap not only manifest in different goal-combinations of the actors, but also in different EPIs choices.

The actors in our sample (VCs, BAs, GFs, and Cleantechs) not only disagreed on how goals are to be combined in the Cleantech value proposition, but most importantly also followed different approaches in how they engage with EPIs as a key communication tool for this value proposition. For example, BAs and VCs showed the highest divergence in goals and EPI

usage, as they claimed to prioritize green goals (over market-logic goals) in the Cleantech value proposition, but in practice then referred to EPIs that developed the material and symbolic elements of the market logic only (see *traditional laggard* role). Therefore, as actors make explicit how they actually combine logics in their EPI usage – which is often contradictory to their own intended Cleantech goals – we postulate that the divergence between goals and EPI choices is the reason for persistently high IAs and funding issues for Cleantechs.

Our findings thus extend previous works by showing that if the entrepreneurial finance literature wants to truly understand and reduce the IAs related to early-stage ventures, particularly to those that follow hybrid business models such as Cleantechs, it needs to more carefully investigate logics in terms of both means *and* ends (communication tools *and* goals). If the focus remains on just one of these constructs and levels, then all harmonization efforts and implementation of IA-reducing strategies might be ineffective. Future research should therefore investigate more carefully how actors in other impact investing areas differ in means and ends choices and how this affects the overall investing ecosystem. If, for instance actors in the sphere of social investing show similar frictions as the one in the early stage Cleantech escalator (and works such as those of [Lehner et al., 2019](#) indicate they do), then such insights might be particularly helpful in developing a functioning communication approach early on.

Our *second* contribution builds directly on the first one. It is to the entrepreneurial finance literature that discusses the distinction between VCs and BAs as the most important investor groups for early-stage ventures and reveals that taking a nuanced perspective on means *and* ends of logics also indicates that private investors (i.e. VCs and BAs) in the early-stage Cleantech financing escalator are more similar than previously assumed. Recent works have shown that VCs and BAs, although in the same investor group, follow different logics (professional vs. market – see [Table 1](#)) ([Fisher et al., 2017](#); [Pahnke et al., 2015](#)). Our analysis overall supports this, for instance by highlighting that VCs and BAs ascribe different goals to the Cleantech value proposition. It however also adds more nuance by revealing that this difference is mainly due to different goal prioritizations, where BAs tend to prioritize environmental goals stronger than VCs. On the communication level, interestingly, VCs and BAs seem to very similar as they both choose and develop EPIs that follow the market logic (see Role 3). This is interesting as it suggests that the theoretical goal-communication (ends–means) distinction not only emphasizes that actors aggravate IAs by prioritizing and developing different aspects of the communication (Contribution 1), but that some actors might in fact also “hide” their similarities underneath the goal level. This can create even further frictions and IAs because it provides a somewhat false impression of investor (in-)compatibility with Cleantechs.

Our findings therefore add more nuance to the distinction between VCs and BAs in the entrepreneurial finance literature by drawing attention to the ends *and* means (goals and communication tools) that these actors use and prioritize to evaluate Cleantechs ([Yan et al., 2021](#)). Future research could explicitly focus on these aspects of means and ends and explore the similarities and communalities between VCs and BAs in more detail. It might also be interesting to explore the differences between other investor groups such as VCs and government-backed VCs.

Third, we also contribute to the entrepreneurial finance literature on institutional logics by introducing the term STN between Cleantechs, (private and public) investors *and* market supporters to highlight that logic (in-)compatibilities and IAs are not only shaped by investors and ventures, but also by support agencies. Prior studies have demonstrated the effects of logic (in-)compatibilities between investors and ventures ([Owen et al., 2020](#); [Fisher et al., 2017](#); [Pahnke et al., 2015](#)). Studies in the entrepreneurial finance ecosystems literature ([Mason and Kwok, 2010](#); [Owen and Mason, 2019](#)) and related fields such as impact investing

also show the interconnectedness of those two actors with supporting actors when it comes to investing in sustainable innovation (Lehner *et al.*, 2019; Roundy, 2017). Interestingly, in the entrepreneurial finance literature on institutional logics, however, studies have not yet included support agencies as important mediators between Cleantechs and their investors.

Specifically, while the activities of the *traditional laggard* (private investors) currently shape the market by focusing on the development of rigorous but conservative EPIs within the *market* logic (Polzin, 2017; Bergman *et al.*, 2019; Pahnke *et al.*, 2015) and thus risking that these indicators are not accepted by actors that are less conservative in their impact definition as they adhere more strongly to other logics (Rautiainen and Järvenpää, 2012), the *boundary spanners* (market support agencies) can foster a holistic EPI development approach that spans over *environmental*, *market* and *state* logics. By combining EPIs and measurement practices that speak to all logics and coupling it with an environmental logic understanding of impact, the boundary spanner can effectively anchor a unified understanding of a hybrid Cleantech value proposition and logic. Moreover, *market developers* (government bodies and public investors) develop the hybrid investing logic primarily by promoting environmental-logic understandings of impact while bringing in simpler state-logic EPIs. Hence, looking at the powerful roles of both the market developer and boundary spanner, we posit that if boundary spanners are acknowledged more actively by the developer and gain more market presence, further diffusion of fully accepted, holistic logic-spanning EPI approaches may be promoted and a harmonization of a hybrid Cleantech investing logic may occur.

Our analysis thus adds to the entrepreneurial finance literature on institutional logics by highlighting that in the early-stage Cleantech funding escalator support agencies are increasingly crucial to moderate the logic (in-) compatibilities between investors and ventures. The term STN therein explicitly introduces support agencies to the mainly dual investor–venture perspective in the literature to understand Cleantech funding issues. Future research should explore dynamics within and around the STN and their impact on the entrepreneurial ecosystem. It can also build on our insights and explore in more detail how the roles shape the Cleantech value proposition over time and whether the relative importance of actors shifts based on these dynamics. As the understanding of (Cleantech) value proposition evolves, it will be possible to explore how the roles themselves change and evolve, through for example increased interactions between actors.

Conclusions and limitations

Cleantech funding is crucial for a successful transition to “Net Zero”. Yet, although investors are aware of this and already change their investment approach, Cleantech funding remains difficult. Our study demonstrates that the issues stem from an “un-reflected” use of communication tools, such as EPIs, to develop the hybrid Cleantech investing logic. Based on our data we explore the Cleantech STN and describe how emerging actor roles, via their efforts to create and transform EPIs, influence the development of the Cleantech investing logic. The key finding is that while all actors intend to follow more progressive and green investment approaches, they often stick to one-sided and relatively conservative EPIs, via which they unknowingly foster a more conservative investment approach as well. Thus, based on our insights we suggest that a careful analysis of EPI usage can improve our understanding of the communication problems related to the hybrid Cleantech value proposition, potentially also helping to resolve early-stage Cleantech financing shortfalls.

Our research has however also limitations. *First*, it is necessarily limited by temporal and financial resource considerations. Our study focuses on EPIs as a key communication tool (Waas *et al.*, 2014) and builds on an initial review of the kinds of indicators used. However, as our study focuses on the processes of indicator engagement, it may fall short in providing guidance on indicator choice as such. Moreover, we acknowledge that EPIs constitute a

narrow set of performance indicators. The usage of EPIs might therefore be influenced by other (potentially financial) indicators as well. Future research could thus extend the sets of indicators and potentially even test the interactional effects of different indicators.

Second, we present cross-sectional, qualitative UK data and clearly more research is required to explore the evolution of STN interactions over time and determine the effectiveness of the roles in their efforts to change the dominance of certain logics. An exploration of these issues on larger, cross-country datasets seems appropriate. Future research could thus develop this research framework, geographically and temporally, to explore the impacts of for example economic cycles and different types of policy interventions. By outlining the problems in the example of EPIs as a crucial communication tool we believe that their interactor development has great potential to help improve Cleantech funding.

Notes

1. This represents around half of UK Cleantech Small and Medium Enterprise (SME) pitch decks; Beauhurst data (2017–2019) show 162 that received first seed investment.
2. COVID-19 restrictions prevented face-to-face meetings.
3. see [Appendix 1](#) for a comprehensive list of all EPIs we extracted.

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Appendix

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