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SUSTAINABILITY STANDARDS AND STAKEHOLDER ENGAGEMENT: LESSONS FROM CARBON MARKETS

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Abstract

Stakeholders play an increasingly active role in private governance, including development of standards for measuring sustainability. Building on prior studies focused on standards and stakeholder engagement, we use an innovation management theoretical lens to compare stakeholder engagement and standards developed in two carbon markets: the Climate Action Reserve (CAR) and the U.N.'s Clean Development Mechanism (CDM). We develop and test hypotheses regarding how different processes of stakeholder engagement in standard development impact the number, identity, and age of stakeholders involved, as well as the variation and quality of the resulting standards. In doing so we contribute to the growing literature on stakeholder engagement in developing sustainability standards. (107 words)

Keywords: Sustainability standards, inclusivity, stakeholder engagement, carbon markets, crowdsourcing

Abstract

Stakeholders play an increasingly active role in private governance, including development of standards for measuring sustainability. Building on prior studies focused on standards and stakeholder engagement, we use an innovation management theoretical lens to compare stakeholder engagement and standards developed in two carbon markets: the Climate Action Reserve (CAR) and the U.N.'s Clean Development Mechanism (CDM). We develop and test hypotheses regarding how different processes of stakeholder engagement in standard development impact the number, identity, and age of stakeholders involved, as well as the variation and quality of the resulting standards. In doing so, we contribute to the growing literature on stakeholder engagement in developing sustainability standards. (107 words)

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INTRODUCTION

Researchers are increasingly attending to the societal impact of market-based organizations (Husted, 2003; Millar & Hall, 2013). Despite the existence of questionable practices (Delmas & Burbano, 2011; Furrer, Hamprecht, & Hoffmann, 2012), researchers and practitioners alike seem optimistic that organizations can find innovative ways to both create and measure value for stakeholders (Kroeger & Weber, 2014). Indeed, crucial to progress in creating more stakeholder value is developing sustainability standards. Understanding voluntary social and environmental sustainability standards is important to a number of academic fields including environmental studies (Sprengel & Busch, 2011; Truffer, Markard, & Wüstenhagen, 2001), management (Delmas & Pekovic, 2013; Dowell, Hart, & Yeung, 2000), and business ethics (Aguilera-Caracuel, Aragón-Correa, Hurtado-Torres, & Rugman, 2012). Prior work has addressed such topics as the formation (Botzem & Dobusch, 2012), diffusion (Berkhout & Rowlands, 2007; Corbett & Kirsch, 2001), and impact (Delmas & Montes-Sancho, 2010) of these voluntary sustainability standards.

Research has also begun to explore the role of stakeholders themselves in the development of such standards. This research has found, broadly speaking, that effective stakeholder involvement in development of sustainability standards can contribute "effective consensus building, knowledge sharing, interest representation, and the achievement of legitimacy" (Balzarova & Castka, 2012). Other findings explain how the type and extent of stakeholder engagement can influence the outcomes of the standards-development process (Ponte, 2014). While this research has helped to broaden our understanding of stakeholder involvement in the development of sustainability standards, many prior studies rely solely on case-based qualitative evidence or theoretical arguments (Dolan & Opondo, 2005; Forrer & Mo, 2013; Fransen & Kolk, 2007). Less research has used quantitative empirical data to explore whether and how various processes of stakeholder engagement can influence which stakeholders are likely to be engaged in standard development, and the degree to which those sustainability standards are adopted. Additionally, although prior research has acknowledged that inclusivity in stakeholder engagement can vary across standards-development processes (Baumann-Pauly, Nolan, van Heerden, & Samway, 2016; Fransen & Kolk, 2007), prior research has not adequately developed theory for describing stakeholder engagement processes for development of sustainability standards.

We seek to address these limitations by applying concepts from innovation management research to explain configurations of stakeholder involvement in two prominent carbon markets: the California-based Climate Action Reserve (akin to a closed source process) and the United Nations' Clean Development Mechanism (akin to a crowdsourced process). In doing so we also answer recent calls for a shift in focus toward process-based questions in sustainability research (Zollo, Cennamo, & Neumann, 2013). Using such hand-gathered data from two different contexts allows us to more clearly isolate the tradeoffs of various stakeholder engagement choices in the development of sustainability standards.

This paper proceeds as follows: First, we review the literature on stakeholder involvement in the development of sustainability standards. We then build on that literature to develop a set of testable hypotheses which explore how the process used for achieving stakeholder engagement affects 1) the involvement of various stakeholder groups, and 2) the adoption of the standards. Using data on over 500 unique sustainability standards developed within carbon markets, we then undertake a preliminary empirical test of our hypotheses. Finally, we conclude with a discussion of limitations, implications and future directions for research.

THEORETICAL BACKGROUND

The role of stakeholders in organizational activity is a longstanding research topic. Broadly conceptualized as a constituency worthy of firms' attention (Dawkins, 2014; de Graaf, 2016; Freeman, 2010), stakeholders have been identified in other scholarship as playing several different roles (Bingham, Nabatchi, & O'Leary, 2005; Cook, 2014), and stakeholder involvement in organizational activities is often referred to as stakeholder engagement (Greenwood, 2007). Stakeholders can play a particular role in developing and proliferating sustainability standards (Grushina, 2016; O'Dwyer & Owen, 2007). A sustainability standard is defined a set of "voluntary predefined rules, procedures, and methods to systematically assess, measure, audit and/or communicate … social and environmental behavior" (Gilbert, Rasche, & Waddock, 2011). The assessment, measurement, and communication made possible by sustainability standards contribute to the ultimate objective of leading (directly or indirectly) to improved levels of sustainability at both individual and collective levels of analysis.. Consequently, the effective engagement of stakeholders is a key element of developing sustainability standards (Balzarova & Castka, 2012), especially for complex problems such as climate change (Tompkins, Few, & Brown, 2008). Indeed, the failure to effectively engage stakeholders can effectively doom the ultimate objectives of a sustainability initiative or standard (Hoque, Clarke, & Huang, 2016).

In this paper we focus broadly on the engagement of stakeholders in developing sustainability standards. The literature on the role of stakeholders in sustainability standards has addressed such questions as how stakeholders can influence the formation (Botzem & Dobusch, 2012), diffusion (Berkhout & Rowlands, 2007; Corbett & Kirsch, 2001), and impact (Delmas & Montes-Sancho, 2010) of sustainability standards. Whether referred to as non-state certification (Auld & Gulbrandsen, 2010), multi-stakeholder initiatives (Fransen & Kolk, 2007), sustainability assurance (Grushina, 2016), or sustainability standards (Reinecke, Manning, & Von Hagen, 2012), prior work underscores the importance of stakeholder engagement in measuring firms' pursuit of sustainable outcomes.

For example, a study of global multi-stakeholder standard-setting articulates four types of NGO power observed in the development and enforcement of international standards (Boström & Hallström, 2010). Research also indicates that involvement of employees in environmental planning tends to improve the quality of a firm's sustainability planning and performance (Aragón-Correa, Martín-Tapia, & Hurtado-Torres, 2013). Despite the potential for stakeholder contribution to better assessing, measuring, auditing and communicating sustainability, corporations and standard-setting organizations may not always make optimal choices regarding the number and type of stakeholder groups consulted for a sustainability standard or report (Hoque et al., 2016). One study points out that although indigenous populations are perhaps the most important stakeholder group related to biodiversity, fewer than 10% of sustainability initiative reports analyzed mentioned any involvement of indigenous groups in the development or evaluation of sustainability efforts (Boiral & Heras-Saizarbitoria, 2015). In addition to the inclusion (or exclusion) of important key groups, stakeholder engagement in sustainability reporting and standard-development can also vary greatly in the number, identity, and role of the participating stakeholders (Fransen & Kolk, 2007; Manetti, 2011; Ponte, 2014), which can impact the perceived legitimacy of the underlying report or standard (Baumann-Pauly et al., 2016).

Stakeholder Engagement in Developing Sustainability Standards

In this paper, we focus specifically on the different ways in which stakeholders are engaged in the development of sustainability standards. The typical approach for developing rules and standards involves a system in which a standard-setting organization (e.g. a government agency or other rating agency) both determines policy objectives and develops the appropriate standards. A slight variation on the typical top-down system outsources the regulatory role to the private sector (Delmas & Marcus, 2004; King, Lenox, & Terlaak, 2005; Majumdar & Marcus, 2001). The development of third party standards such as fair trade standards (Jaffee, 2010; Karjalainen & Moxham, 2013), Forest Stewardship Council certification (Schepers, 2010), and the Global Reporting Initiative (Vigneau, Humphreys, & Moon, 2014) also follow a similar top-down, consensus-based process. In each case, the standard-setting organization may choose to involve other organizations in standard development.

We draw on concepts from innovation management research to describe the process of developing sustainability standards. Innovation management literature has identified different ways that organizations initiate the innovation process in contexts such as software development, medical research, and cell phone technology development (Franzoni & Sauermann, 2014; Mollick, 2016). The initiating organization, from whose perspective the innovation process is commonly viewed, can arrange the process in a number of ways, including crowdsourced or closed source configurations. Closed sourcing refers to a process in which the actor initiating the innovation process either completes the innovation task internally, or contracts it to a designated supplier. The process is closed source, in that the innovation comes from a limited set of innovators. For example, if an organization seeks to develop software, a closed source development process is accomplished either directly by the firm or a contracted third-party. In contrast, innovation management research uses the term crowdsourcing to describe "outsourcing a task to a 'crowd,' rather than to a designated 'agent' (an organization, informal or formal team, or individual)" (Afuah & Tucci, 2012). In crowdsourced innovation, innovation tasks are sourced from a crowd, which may include those of unknown identity. For example, an organization seeking to develop new software could solicit the development of different parts of the code from any software coder anywhere in the world.

In the context of closed-source standard development, the set of stakeholders that are engaged in the development process are first chosen by the standard-setting organization, who invites a group of stakeholders (e.g. industry, non-profit, university and government officials) to assist in developing the sustainability standard.[1] After the closed set of stakeholders is determined, the standard is developed. The number of stakeholders who can physically meet together, reach a consensus, and negotiate is usually limited, but these stakeholders provide needed knowledge to create effective standards (Weimer, 2006).

Crowdsourced standard development addresses the balance between access to knowledge and legitimacy in a different way. Crowdsourcing allows broad informational search (Jeppesen & Lakhani, 2010) and is used in an increasing numbers of contexts to solicit solutions from the "crowd" of interested stakeholders. Crowdsourcing allows multiple individuals, with heterogeneous capabilities and knowledge, to simultaneously create different approaches to accomplishing a task (Afuah & Tucci, 2012), which are then reviewed by the standard-setting organization to select those that meet the objectives of the standard. When applied to development of sustainability standards, crowdsourcing reduces the need for interaction between different stakeholders that seek to be involved in standard development. The Internet allows anyone in the world to feasibly contribute to developing a potential standard (Coglianese, 2004). While anyone could be involved in a crowdsourced standard development process, the

stakeholder participants (e.g. industry, non-profit, university and government officials) are likely to be similar to those participating in closed source development of sustainability standards. The key difference is that rather than the standard-setting organization selecting which stakeholders will be engaged, the stakeholders self-select into the process.

In order for standards to gain widespread acceptance, they must be perceived to be developed in a legitimate manner. Closed source and crowdsourced standard development processes gain perceived legitimacy in different ways. In a closed source process, since the standard setter chooses who will develop the standard, the standard setter may be subject to criticism for developing standards that privilege one way of thinking or particular interests (Hachez & Wouters, 2011). The perceived legitimacy of the closed source standard development process is fostered by involving various stakeholders that are perceived to have a legitimate interest in developing the standard and requiring that these stakeholders come to a consensus (Marpet, 1998). In contrast, the perceived legitimacy of a crowdsourced standard development process flows from the freedom of stakeholders to participate in developing the standards. The ability of any stakeholder to opt-in to participate in the standard development process can be viewed as one form of freedom of participation (Rothschild-Whitt, 1979; Sen, 1999). Thus, the perceived legitimacy of a crowdsourced standard development process rests on whether any given stakeholder can freely engage in the standard development process.

We summarize key differences between closed source and crowdsourced standard development processes in Table 1 below. We then illustrate these differences in two carbon offset market contexts. Subsequently, we derive hypotheses illustrating the consequences of the differences between these two processes.

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Carbon Markets – An Illustrative Research Setting

Scientists widely agree that GHG emissions may lead to climate change and other catastrophic consequences (Pielke Jr & Oreskes, 2005) including extinction of species (Thomas et al., 2004), increase in natural disasters (Schiermeier, 2011), and population displacements (Sherbinin et al., 2011). Multiple separate carbon systems or markets have been set up to achieve a mix of stakeholder objectives associated with searching for new and more effective ways to create emission reductions (Grubb, 2003). There are many gases that cause climate disruption (e.g. carbon dioxide, methane, nitrous oxide), each with different effects, lifetimes, and marginal abatement costs (Manne & Richels, 2001). Emission reductions can come from almost any industrial activity including agriculture, energy production, transportation, and manufacturing (Baumert, Herzog, & Pershing, 2005). Thus, carbon markets provide a context to observe the development of multiple carbon offset measurement standards. Each of these standards is a specific type of sustainability standard that quantifies greenhouse gas reductions (an important sustainability-related outcome) under specific industrial conditions. The carbon offsets created in carbon markets are tied to emission reductions, which are essentially public goods that only have market value if the standards by which they are created, and the process by which the standards are developed are considered to be highly legitimate. We gain insight into the process of stakeholder engagement in the development of sustainability standards in carbon offset markets because stakeholders are engaged in the development of a large number of carbon offset measurement standards in different ways across carbon markets.

In a carbon market, a buyer purchases a document certifying that a specified quantity of GHG emissions has been reduced. In other words a sustainability-related outcome has been created. The evaluative criterion is one of impact, not process. Sustainability standards must be developed first to define, measure, and monitor reductions relative to hypothetical scenarios (counterfactuals) in which emission reduction systems have not been introduced (Wara & Victor, 2008). Carbon offsets produced by different organizations, in different locations, and at different times are considered as equivalent if they are developed using the measurement standards of the carbon market. Offsets can be sold like other financial instruments, thus allowing sustainability outcomes to be exchanged for financial reward.

We rely on observations of two carbon markets to discuss the tradeoffs involved in two different approaches (we use the terms closed-source and crowdsourced from innovation management research) for developing carbon offset standards, which are one type of sustainability standard, though our observations are applicable to the development of sustainability standards more broadly. The first carbon market, which started in 2001 as a component of the United Nations' Kyoto Protocol (Michaelowa & Jotzo, 2005), is the Clean Development Mechanism (CDM). The United Nations Framework Convention on Climate Change ("UNFCCC") is the standard-setting organization in the CDM. The CDM is also the largest and most noted carbon market. Similarly, the Climate Action Reserve (CAR), was established in 2001 to provide a voluntary system by which North American companies could cost-effectively meet greenhouse gas emission goals in anticipation of future climate change legislation ("Climate Action Reserve," 2011). Below we explain the key differences in the way that CDM and CAR designed systems quantify GHG emission reductions. We provide key points of comparison between the two systems for context in Table 2. These key differences have implications for other attempts at developing sustainability standards.

--- INSERT TABLE 2 HERE ---

The carbon offset standards in both carbon markets are used to measure sustainability improvements, based on the basic principle of additionality. Additionality refers to outcomes that would not have happened without the focal intervention (Greiner & Michaelowa, 2003). Additionality is the formal concept that underlies the assumption that actions *cause* outcomes. If emission reductions would have happened without a specific emission-related project, the intervention did not cause emission reductions, and it makes little sense to create a financial instrument tied to these reductions. While there are several potential avenues by which to establish additionality, both carbon markets require detailed comparison of a proposed project to a counterfactual scenario (describing what would have happened) (Bumpus & Man, 2009). The logic underlying the need for additionality diverges from logics that often prevail in research and practice in the social sector. From the inception of carbon markets, opportunism and fraud were considered potential issues, and thus considered when designing the systems for measuring emission reductions (Lovell, 2010).

HYPOTHESES DEVELOPMENT

Crowdsourced versus Closed Source Development of Standards

We move now to deriving hypotheses based on the differences between closed source and crowdsourced stakeholder engagement in standard development, as represented in CAR and CDM. We begin with CAR, which has a measurement standard development process that is largely controlled by the standard setting organization, also named CAR. A small number of CAR employees search for and screen projects that have good potential for development of a new carbon offset measurement standard (called "protocol" by CAR)[2]. These staff members (or

their outside consultants) develop an 'issue paper' to determine if an appropriate performance standard can be developed for a particular project type. This determination includes assessment of technical feasibility (whether a performance standard is possible) and market feasibility (whether there are a sufficient number of projects that could use the measure). If the issue paper indicates that a measurement standard would be feasible, CAR staff invites a group of stakeholders, including industry experts, academics, industry associations, non-profit organizations, university and governmental bodies to join a working group to draft the standard (Levin, 2011)[3]. These stakeholders create a draft version and strive for full consensus among members of the group. However, CAR staff members make the final decision when members of the working group disagree on the details of the carbon offset measurement standard. The draft is posted on the CAR website for public comment, and finally presented to the CAR board for approval. Once a measurement standard receives final approval, carbon offset project owners may follow it to generate carbon offsets in the CAR system.

We label this process as a closed source process of developing sustainability standards, similar to the "consultation" approach to multi-stakeholder initiatives identified in prior work (Fransen & Kolk, 2007). For each specific standard, the CAR process starts with initial search efforts of the regulatory agency and the members of the cross-sectoral working group. While CAR accepts recommendations regarding potential standards from the public, these recommendations are treated only as helpful advice (Climate Action Reserve, 2010). The CAR standard development process is largely complete before the public comment period, which limits public influence (Levin, 2011).

In contrast, the UNFCCC follows a crowdsourced process for creating carbon offset measurement standards (called "methodologies" in the CDM). The UNFCCC invites any stakeholder (e.g. for-profit firms, non-profits, university, national government agencies) to propose standards that could be used to quantify and monitor greenhouse gas emission reductions produced by a project of particular type. Instead of choosing one "winner," the UNFCCC allows multiple approved methodologies, each adapted to one of the many different industrial contexts in which greenhouse gases are emitted. No one owns these measurement standards. If approved by the UNFCCC, the measurement standard is incorporated within the CDM, and can freely be applied by others to develop and quantify emission reductions for future projects. Just as new technological innovations build on prior ones, new CDM methodologies can reference, copy, or imitate parts of prior approved measurement standards, so stakeholders do not have to create standards from scratch. Each approved standard is one more specific standard for measuring greenhouse gas emissions in the CDM.[4] In some cases, standards that are similar are combined to avoid confusion. Unlike solicitations for public comment that are common in the more typical closed source standard creation process that develop partial solutions, the CDM standard development process requires the development and submission of fully-formed standards. Therefore, the scope and direction of standard development in this system is largely determined by stakeholders who are willing to develop a complete individual standard, subject to the approval of the standard-setting organization.

Trade-offs in Engagement Patterns

We first consider how closed source and crowdsourced standard development processes differ in terms of which stakeholders are involved. We focus our arguments on tradeoffs between accessing requisite knowledge and maintaining a perception of legitimacy of the development process Below we identify how and why these tradeoffs can influence which stakeholders are

engaged in developing sustainability standards. While we discuss differences between these processes for stakeholder engagement in carbon offset markets, our unit of analysis is the individual carbon offset measurement standards, rather than the carbon offset market, which allows for comparison between carbon offset markets of different scales.

A closed-source process of standard development requires a standard-setting organization to select stakeholders to help develop the standard. The standard-setting organization may select a different pool of stakeholders for each standard that is developed. As mentioned previously, the perceived legitimacy of a closed source standard development process is tied to the legitimacy of selection of stakeholders engaged in the process. A standard-setting organization can increase perceptions of legitimacy in a few ways. Typically, these involve improving the inclusivity or transparency of the standard development process (Auld & Gulbrandsen, 2010; Fransen & Kolk, 2007; Ponte, 2014). First, standard-setting organizations can involve stakeholders that are generally seen as more legitimate in the context of sustainability. For example, stakeholders from the government or non-profit sectors are widely believed to have interests that are better aligned with the public good and long-term sustainability. Second, to improve perceptions of legitimacy of the process, a standard-setting organization in a closed source process can involve multiple perspectives from various stakeholders so that the resulting standard is viewed as representing not just one interest, but multiple interests (Balzarova & Castka, 2012; Baumann-Pauly et al., 2016). And finally, perceptions of legitimacy of the process of developing sustainability standards can be improved by involving stakeholders from multiple sectors, such that the standard is viewed as the result of cross-sector collaboration (Crosby & Bryson, 2010). While involving multiple stakeholders in developing a particular standard can spread the costs of development over a larger number of stakeholders, it also potentially creates coordination issues. The standard-setting organization typically bears these coordinating costs in a closed source process by coordinating the actions of multiple stakeholders.

In contrast, in a crowdsourced process for sustainability standard development, the standard-setting organization does not select those which stakeholders will be engaged in the process. Instead, individual stakeholders make the decision of whether to engage in developing a specific standard. The perceived legitimacy of a crowdsourced process is tied to how inclusive the process is, or the degree to which any stakeholder is free to engage in the standard development process (Christensen, Karjalainen, & Nurminen, 2015). Thus, the standard-setting organization has a legitimacy-seeking incentive to promote widespread engagement in the aggregate, but lacks the ability to choose which stakeholders are engaged and does not play a coordinating role in helping multiple stakeholders work together to create a specific standard. Thus, because the standard-setting organization does not select or coordinate between stakeholders in crowdsourced standard development, and stakeholders themselves bear the coordination costs of working with others, the stakeholder engagement patterns that lend legitimacy to a closed source process (including multiple stakeholders, those that are already perceived to be legitimate, or stakeholders with divergent perspectives) are less likely in a crowdsourced standard development. Thus, we argue:

H1: The average number of stakeholders involved in generating a sustainability standard will be lower in crowdsourced standard development processes than closed-source processes.

H2: The likelihood of involving government, university and non-profit stakeholders in generating a sustainability standard will be lower in crowdsourced standard development processes than closed-source processes.

H3: The likelihood of involving cross-sector combinations of stakeholders in generating a sustainability standard will be lower in crowdsourced standard development processes than closed-source processes.

Stakeholders' knowledge also influences which stakeholders are engaged in the two different types of standard development. Large and well-established private sector actors central to an industry typically have access to closed source standard development systems (Heinz & Laumann, 1982; Scott, 2008). Large and established organizations, due to their size and prior history, are more easily recognized by those viewing the standard development process from the outside. Research has shown that humans often make decisions, such as determining the legitimacy of a process, using a recognition heuristic, which simply ascribes positive properties to objects that are more recognizable (Hertwig & Herzog, 2009). This cognitive heuristic is largely based in reality. Incumbent firms, non-profit organizations, and other governmental bodies typically are larger and have more resources (Zott & Huy, 2007). They also have established reputations and tend to have higher status (Mishina, Block, & Mannor, 2012). New organizations, on the other hand, do not have a track record and are often considered illegitimate (Aldrich & Ruef, 2006). By involving organizations that are more recognizable, a standard-setting organization can increase perceptions of the legitimacy of the process of developing standards for measuring sustainability and also access useful knowledge.

In contrast, crowdsourced processes allow any stakeholder to be involved in standard development. As discussed previously, the freedom of any stakeholder to be involved in the crowdsourced process of standard development fosters perceptions of legitimacy. This self-selection into involvement in the crowdsourced system will lead to differences in engagement patterns, relative to selection by the standard-setting organization involved in the closed source system of standard development, which would focus on the most reputable potential participants. Thus, we argue:

H4: The likelihood of involving new organizations in generating a sustainability standard is higher in crowdsourced standard development processes than closed-source processes.

Variety in Innovation

Thus far, we have focused our arguments on the legitimacy tradeoffs between closed source and crowdsource systems for developing sustainability standards. We now turn to tradeoffs related to knowledge of stakeholders participating in the development of the standards. In a closed source system, the standard-setting organization must make decisions about where to focus. This requires prioritization on the part of the standard-setting organization in applying limited resources to areas deemed most important and excludes avenues deemed less important. Yet, there is rarely complete agreement on the most appropriate path towards increasing sustainability (Zald & McCarthy, 1990).

In contrast, a crowdsourced system broadens search for different approaches to measuring sustainability by allowing any stakeholder to unilaterally work on developing new sustainability standards. While the individual stakeholder must bear the costs of developing a new standard, a crowdsourced process allows parallel experimentation, thus increasing the number of options that can be considered simultaneously. In a consensus-based closed source system of standard development, negotiation between multiple parties tends to narrow quickly to a few alternatives. Different perspectives involved in a closed source process help to avoid creating standards that might not be practical. This means that a closed source standard

development process based on consensus-making is more likely than a crowdsourced system to ignore some options that could effectively meet societal needs. The differences in access to knowledge between the two systems illustrates a basic trade-off between avoidance of costly mistakes and access to informational variety (Csaszar, 2012).

In a crowdsourced standard creation system, peripheral actors are able to create standards that are closely aligned with their ideals and possibly conflicting with the prevailing perspective of powerful actors. Without such inclusion, a narrower set of standards (those in line with powerful actors' perspectives) are likely to be considered and approved. Based on these arguments, we propose:

H5: Crowdsourced standard development processes will be more likely to generate higher variety in sustainability standards than closed-source processes.

As we argued previously, older and larger stakeholders are more likely to be selected to be involved in developing a new standard in a closed source system. Stakeholders that are more established and have social connections built through years of operation are more likely to occupy a more central position in the industry's knowledge structure. Thus, a standard developed through a closed source system is more likely to represent the core of an industry. In contrast, the stakeholders that are allowed greater access through a crowdsourced system of standard development (e.g. younger, smaller) are also likely to be on the periphery of an industry's knowledge structure, as well as different from other relevant stakeholders. Their lack of similarity enables peripheral stakeholders to create radical innovation that changes the system (Henderson & Clark, 1990). As with other types of radical leaps forward, however, the likelihood of success is low. Thus, a crowdsourced process of standard development is more likely to involve stakeholders with the potential for revolutionary change, but whose ideas may have limited practicability, or the ability to be feasibly be implemented under current conditions.

While standard-setting organization may be skilled at checking the basic fit between the proposed standard and objectives of a broader collective, they are often not in the position to know how well a standard address collective needs (Koch, 2011). Thus, it is difficult in a crowdsourced system of standard development to assess the practicability of a proposed standard. Moreover, standard-setting organizations must maintain the perception of legitimacy that is derived from allowing freedom to participate in the process of standard development. Thus, it is difficult for the standard-setting organization to reject a proposed standard based on low practicability as long as the standard does not actually violate legal or procedural principles. Thus, we argue:

H6: The likelihood of developing sustainability standards with low practicability will be higher with crowdsourced standard development processes than closed-source processes.

METHOD

Data Sources

We gathered both qualitative and quantitative data concerning the development of carbon offset measurement standards, which are one type of sustainability standard. More familiar sustainability standards classify products (as either meeting or not meeting the standard) according to a set of minimum requirements (e.g. fair trade, organic food, etc). Carbon offset measurement standards involve minimum requirements as well as designate processes for consistently quantifying greenhouse gas reductions originating from a carbon offset project. We relied on interviews with over 40 industry professionals, many of whom were involved in

creating carbon offset measurement standards (Dutt, 2011; Levin, 2011) to improve our understanding of the standard creation process in each carbon system. This qualitative work helped to uncover differences between the two systems. However, we rely more heavily on quantitative archival data to illustrate key differences in stakeholder engagement and adoption of standards.

We gathered data on the stakeholders who were involved in the creation of each carbon offset measurement standard in the CDM and CAR. In each case, we identified the specific stakeholders that were involved in creating the proposed standards, as well as the outcomes of the process. In some instances, a proposed standard failed at some point in the standard creation process to be approved. In others, the standard gained approval, and was later used (to widely varying degrees) as the basis for specific carbon offset projects. In the CDM, we gathered this data from two sources. The UNFCCC website provides extensive data on all proposed and approved measurement standards (the CDM uses the term methodologies). This data includes: the date of submission, the approval decision of the UNFCCC, the text of the methodology, and the identity of the methodology author. The UN Risoe Center was our second CDM data source; it extracted important details on each proposed and approved methodology from the UNFCCC website and made it available in its "CDM Pipeline" data (Fenhann, 2013). In the case of any missing data, we supplement this information from the UNFCCC website. Data on the development of standards (called protocols) in the CAR were obtained directly from the CAR website ("Climate Action Reserve," 2011). The CAR website includes documentation of existing protocols, protocol development milestones, dates of issuance, a list of the stakeholders involved in developing the protocol.

These data sources allowed us to assemble a list of all the stakeholder organizations involved in developing each carbon offset measurement standard in both the CDM and CAR systems. We gathered each stakeholder organization's year of founding and organization type (for-profit firm, non-profit organization, or university/governmental agency) through a search of various online sources. We report university and government organizations in a combined measure since it is often difficult to distinguish whether an organization housed at a university is really a government entity or controlled by the university. These included: the CDM Bazaar website (established by the UNFCCC), Orbis' online database of private companies, company web pages, and LinkedIn profiles of company founders. In cases where we could not find the needed information online, we used e-mail and phone numbers listed in project documents to contact the organization to ask its country of origin and founding year. In each case we documented the source of this information.

Based on the above data, we generate the following variables for use in our empirical analyses regarding the nature and extent of stakeholder engagement in generating proposed carbon offset measurement standards. Our analysis is at the level of the individual carbon offset measurement standard, which allows for comparison between carbon offset markets of much different sizes as shown in Table 2. First, a 0/1 indicator of whether a particular approved or proposed standard was generated in the CAR standard development system (*car*). Second, a variable that identifies the number of stakeholder organizations engaged in developing in a proposed standard (*stakeholders*). Third, variables that indicate the proportion of stakeholders participating in each proposed standard that is associated with different types of stakeholder organizations: Government/University (*govuniv*), Nonprofit or Voluntary Association (*nonprofit*), and For-profit (*forprofit*), and start-ups (*startup*). We use proportions rather than counts because the total number of stakeholders engaged in standard-development varies

between standards. Fourth, an indicator of whether a given proposed standard involved stakeholders across sectoral boundaries (*crossector*). Fifth, an indicator of the percentage of stakeholders that are repeat participants in the standard development process, scaled by the total number of prior participants (*repeaters*). We also generate a variable that represents the average founding year of each stakeholder participant organization as an alternative measure of the newness of organizations. Variables were generated as follows: a proposed standard that involved one for-profit stakeholder organization and one government stakeholder organization (neither of which were new organizations or repeat participants) would have a value of 2 for *stakeholders*, values of 0.5 for each of *govuniv* and *forprofit*, a value of 1 for *crossector*, and a value of 0 for *nonprofit, repeaters,* and *startup*.

We also generate usage statistics for approved standards (210 in CDM and 13 in CAR). We count the number of times each approved standard is implemented in other carbon projects (*adoption rate-continuous*), as well as a binary indicator of whether a particular standard was used beyond the first project it was associated with (*adoption-0/1*). We look at whether or not a carbon offset standard is ever adopted as an indication of its practicability. To more fully test the degree to which a standard has very little practicability to other stakeholders, we test the difference between the systems in the levels of standards with no adoption (standard was approved), but not ever used by a carbon offset project.

RESULTS

Relying on the data described above, we now perform preliminary tests of our theoretical hypotheses, using simple regressions and mean difference tests. Our first hypothesis is that, on average fewer stakeholders will be engaged in the development of a sustainability standard in a crowdsourced process of standard development than in a closed source process. The data seem to support this hypothesis. Table 3 reports that the average CDM standard involves just 1.29 stakeholders, while the average CAR standard involves 12.08 stakeholders ($p<0.001$).

--- INSERT TABLE 3 HERE ---

Our second hypothesis is that, on average, a crowdsourced sustainability standard will involve fewer government and nonprofit stakeholder in the development process than will closed sourced standard-development. The data suggest support for this hypothesis. Table 3 reports that the average CDM stakeholder involved in standard development is less than half as likely to be a government and university participant as the average CAR stakeholder (9% versus 25%, $p<.01$). Similarly, the nonprofit participant likelihood is consistent with our theoretical prediction—4% for CDM, 12% for CAR ($p<.01$). If we look at the likelihood that a given stakeholder participant is a for-profit firm, the differences are even more striking. CDM stakeholders are considerably more likely to come from a for-profit organization than are CAR stakeholders (87% versus 63%, $p<.001$).

Our third hypothesis is that, on average, a crowdsourced sustainability standard will involve less cross-sector stakeholder engagement in the development process than will a standard developed through a closed sourced process. The data seem to support this hypothesis. Table 3 reports that, on average, 12% of CDM proposed standards and 46% of CAR proposed standards involve cross-sector relationships ($p<.001$). This finding could be driven by the relatively high number of CDM standards (373) that involved only a single stakeholder group in the development process, so we recalculated (in unreported analysis) the difference in means test based on those proposed projects that include two

or more stakeholder groups. The differences between the two groups lessened (51% and 88%, respectively, $p<.01$), but the results remained consistent with those in Table 3, suggesting consistent support.

Our fourth hypothesis is that, on average, a crowdsourced sustainability standard will involve more new stakeholder engagement in the development process than closed sourced standard-development. The data seem to support this hypothesis. Table 3 reports that, on average, CDM stakeholder participants are almost twice as likely to be startups (founded post-2000) than are CAR stakeholder participants (29% versus 16%, $p<0.1$). Additionally, the average founding year of CDM participants is 1981, versus 1964 for CAR stakeholder participants ($p<.01$).

Our fifth hypothesis is that crowdsourced standard-development will generate more variety in standards than closed sourced standard-development. The data support this hypothesis. CDM stakeholders are less likely than are CAR stakeholders to be repeat participants in the standard-setting process (1% versus 3%, $p<.001$), suggesting a greater flow of unique knowledge and information and a deviation from the existing core of knowledge, supporting our hypothesis that crowdsourced standard development is associated with increased variety.

Our sixth and final hypothesis is that, on average, crowdsourced standard-development will generate a higher likelihood that standards have lower practicability than will closed sourced standard-development. The data seem to support this hypothesis. The data suggest that any given standard is much less likely to be used in CDM than CAR (21% versus 69%, $p<.001$). We also find similar results in Table 4 using a logistic regression model with a single predictor variable—CAR—which is negatively associated with the likelihood that an approved standard will be utilized at all (coef=2.13, $p<.001$). These results together suggest that crowdsourced development processes result in higher likelihood of less practicable standards than do more closely coordinated closed-source standard development processes.

--- INSERT TABLE 4 HERE ---

DISCUSSION

The process by which carbon offset measurement standards were developed in two different carbon markets provides insights for the future development of sustainability standards in other contexts. It seems clear that just as multiple carbon markets can co-exist, multiple overlapping sustainability standards can co-exist. Yet, the nature and extent of engagement by stakeholders is influenced by the need to access requisite knowledge as well as the need for the system to be perceived as legitimate (Gilbert et al., 2011). We found that, relative to CAR (a closed source system), on average, a carbon offset measurement standard developed in the CDM (a crowdsourced system) involves fewer stakeholders, and fewer non-profit and government/university organizations, but more new organizations. Our hypotheses regarding variety of standards and the likelihood of creating standards with low subsequent use were only partially supported.

Our first four hypotheses address the differences in stakeholder engagement. Based on our findings, some contexts might favor a crowdsourcing approach. One example might include contexts in which established organizations dealing with a social problem are not perceived as legitimate or contexts in which efforts to deal with a social problem suffer from a prior history of exclusion or otherwise poor governance. Such a history would suggest that stakeholders might be overly suspicious about the ideas and proposed standards developed by “experts” chosen by a standard-setting organization, greatly decreasing the perceived legitimacy of the standards

development process and end results. A crowdsourcing approach permits a stakeholder to unilaterally engage in standard development, which may help overcome a history marked by exclusion of some types of stakeholders. This is one of the concerns that drove the particulars of the CDM's approach to including developing country firms and governmental entities; developing nations bear a disproportionate share of the climate change burden but have historically lacked power in setting global policy agendas (Repetto, 2001).

Our fifth hypothesis discusses the relative ease of generating new ideas from a crowdsourced process, including identification of standards which would have been difficult for a closed-source process to identify and incorporate. For example, CDM standards were created for carbon emission reductions created by solar powered cable cars, energy-free water purifiers, biogas from alcohol wastewater, and biodiesel from Jatropa and Pangamia seeds. These standards were likely considered and approved only because of the vast diversity of viewpoints coming from different industries and different countries that is allowed in a crowdsourced process. In domains where it is clear that a variety of approaches are needed, a crowdsourced system is likely more appropriate. Examples of this situation include contexts with lower consensus on the approaches to sustainability measurement or multiple processes for measuring, communicating or auditing sustainability in a particular domain. In contrast, a high level of consensus on basic approaches to sustainability standards or widely adopted processes for creating such standards make it easier to identify the most appropriate stakeholders to participate in closed source standard-development, with fewer legitimacy concerns.

Our final hypothesis relates to relative adoption rates of standards created in these two systems. Because closed source processes allow resources to be concentrated on the development of a smaller number of proposals for sustainability standards (reducing the risk of developing measurement standards with low practicability), a closed source process might be more beneficial in a context where the cost (in money or time) to develop or review a proposed measurement standard is very high. Conversely, given the high number of standards with low adoption rate in a crowdsourced standards-development process such as the CDM, it is difficult to recommend crowdsourcing standards in a particular context unless stakeholders have a very significant interest in internalizing the cost of developing new standards, such as in the carbon market where the effort to develop a standard tends to help an organization seeking to develop more carbon offset projects.

Contributions

Our paper contributes to several areas of research. First, we provide a conceptual framework that helps to explain why different stakeholders are involved to different degrees in different systems of sustainability standard development. We agree with others that sustainability standards are crucial for collective achievement of increased global sustainability (Rawhouser, Cummings, & Newbert, forthcoming). And these advances are likely to require innovation, not only in technology and organization, but in standards that help to direct organizational activities (Orlikowski & Scott, 2013). We draw on innovation management research to describe two alternative approaches for involving stakeholders in sustainability standard development. Our work aligns well with prior research that has developed typologies of multi-stakeholder initiatives. However, our identification of crowdsourcing as an alternative method for such initiatives is an exciting avenue that future research could consider in developing how stakeholders can be involved in the standard development process.

While we have theorized more generally about the development of sustainability standards, we have focused specifically on carbon offset measurement standards. The ability to

empirically observe the development of many different sustainability standards, under differing stakeholder engagement processes, is an important strength of this study. Both the closed source and crowdsourced systems for standard development that we have featured represent a middle ground between Kroeger and Weber's (2014) "big tent" approach to generating standards that seek to span across contexts and social issues, and other approaches to measurement which are fully idiosyncratic to an organizational context or industry (Cuesta-Gonzalez, Munoz-Torrez, & Fernandez-Izquierdo, 2006). We believe that in this middle ground, individuals, organizations and their stakeholders that have an interest in a *specific* social or environmental problem can collectively work together to develop ways to quantify progress toward their shared goals.

We also add to work on private regulation and other private sector governance activities. This research has largely focused on making the case that boundaries between business, society, and government are increasingly blurred (Scherer & Palazzo, 2011; Vogel, 2008) or that these blurred boundaries have increased the political roles of the private sector and changed relationships between a firm and its stakeholders (i.e. Mena & Waeger, 2014). Our paper's theoretical exploration of stakeholder engagement in the development of sustainability standards deepens our understanding of one way in which private actors assume a quasi-governmental role and suggests implications for different frameworks facilitating private sector involvement in measuring and generating sustainability.

Limitations

Despite the contributions outlined above, we also recognize our study has limitations. We have looked at what types of stakeholders are involved in developing sustainability standards and the degree to which these standards are used. However, we are not in a position to judge whether these standards actually lead to increases in sustainability. Indeed, some researchers have questioned the usefulness of carbon offsets in achieving sustainability goals (MacKenzie, 2009; Stechemesser & Guenther, 2012). Moreover, sustainability standards may shift resources toward projects or initiatives that can more easily be measured, rather than those that are the most impactful. If this is true, the significant expense of measurement may be wasted. Moreover, we show that different types of stakeholders are involved in different systems for sustainability standard development. However, given our research limitations we are unable to know whether this variability in engagement leads to variance in sustainability outcomes. In short, although our paper addresses issues of effective stakeholder engagement in a sustainability context, we cannot say if one system (crowdsourced vs closed source) is better than another at achieving its stated environmental goals.

Our research setting also has some limitations. First, the carbon markets are unique and innovative in so many ways that one might wonder whether lessons from these markets can be extrapolated to the question of how to collectively develop sustainability standards. Second, there may be other factors aside from crowdsourced versus closed-source processes we identified, which may also contribute to our empirical results. These include differences in geographic scope (North America vs entire developing world) and organizing goals (emission reduction vs. emission reduction and economic development) between the two systems. Additional empirical observation, and perhaps formal modeling, may help to further validate our findings regarding inclusivity of stakeholder engagement.

Lastly, we have not fully addressed the initial costs of developing measurement systems and the ongoing costs of measurement that are required. Development of a detailed sustainability standard is a time-consuming and expensive process. Monitoring costs are particularly high in project-based systems like the CDM (Koch, 2011; Levin, 2011). Tremendous time and other

resources have been invested in creating the infrastructure of standards for calculating and verifying carbon offsets, and these standards are based on scientific laws that have relatively widespread consensus. Costs may be even higher in domains that are less consensus-based. Although our paper is a helpful elucidation of some standard development tradeoffs, it does not explicitly address the systemic efficiency of generating comparable sustainability standards. We leave that task to future research.

CONCLUSION

This study set out to theorize and empirically test how variation in stakeholder engagement patterns can influence the process and outcomes of sustainability standard development. Our quantitative comparative investigation in two different carbon markets shows that standard-setting organizations can engage stakeholders in crowdsourced as well as closed sourced processes of sustainability standard development, and that these system design choices influence which stakeholders are involved as well as the degree to which standards are used. We hope that this paper will prompt further investigation of stakeholder engagement in the development of sustainability standards.

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[1] A stakeholder may apply to participate in standard development, but this participation is at the discretion of the standard-setting organization.

[2] In later years CAR allowed the private sector to submit project concept suggestions, which would then be reviewed internally.

[3] CAR maintains a dialogue with stakeholders, such that stakeholders can indicate interest in participating in development of a specific standard. However, CAR still decides which stakeholders will participate.

[4] Except for minor revisions, new proposals are required for modifications to an existing CDM standard.

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Table 1: Comparison of closed-source and crowdsourced stakeholder engagement processes

Characteristic	Closed Source Stakeholder Engagement Process	Crowdsourced Stakeholder Engagement Process
Standard-Setting Organization (SSO) Involvement	Extensive. Sets objectives, chooses stakeholders, manages decision-making.	Limited. Sets up system and provides guidelines, has final approval authority.
Stakeholder participation	Selected. Work to come to consensus with other stakeholders on standard.	Self-select into process, develop standard unilaterally.
Search and evaluation process	Consensus-based search and evaluation.	Individual stakeholder-driven search, SSO evaluation.
Basis for perceived Legitimacy	Stakeholder participation pattern (stakeholders perceived to be legitimate, achieve consensus).	Freedom of participation (all are free to participate as standard developers).
Costs of standard development	Costs often borne by SSO. Costs borne by participating stakeholders are shared.	Initial costs borne by participating stakeholders. Costs of reviewing proposed standards borne by SSO .

The above table compares key elements and differences between closed-source and crowdsourced mechanisms of stakeholder participation in development of sustainability standards

Table 2: Comparison of CDM and CAR development of carbon offset standards, 2003-2012

Characteristic	Clean Development Mechanism (CDM)	Climate Action Reserve (CAR)
Structure	Crowdsourced: bottom-up from stakeholder participants	Closed source: top-down from standard-setting organization
Geographic scope	104 countries	2 countries (US and Mexico)
Number of standards	482 proposed 210 approved	24 proposed 13 approved
System Size	10858 unique carbon projects	252 unique carbon projects

The above table contains a summary of some case-specific comparisons between our two carbon markets

Table 3. Mean Comparisons by Carbon Market

Panel A. Stakeholder Participation in Developing Proposed Carbon Offset Standards

	CDM (n=482)		CAR (n=24)		*t*-test
	Mean	SD	Mean	SD	
stakeholders (#)	1.29	(0.60)	12.08	(13.19)	-17.93***
govuniv (%)	0.09	(0.25)	0.25	(0.24)	-3.03**
nonprofit (%)	0.04	(0.16)	0.12	(0.18)	-2.69**
forprofit (%)	0.87	(0.30)	0.63	(0.34)	4.41***
crosssector (%)	0.12	(0.32)	0.46	(0.51)	-7.35***
startup (%)	0.29	(0.43)	0.16	(0.28)	1.37+
foundingyear	1981.99	(32.67)	1964.84	(18.71)	2.54**
repeater (%)	0.01	(0.03)	0.03	(0.05)	-4.72***

Panel A above reports means, standard deviations (in parentheses), and F-statistics of various types of stakeholder participation in developing proposed standards. ***p<.001, **p<.01, *p<.05, +p<.10

Panel B. Adoption of Approved Carbon Offset Standards

	CDM (n=210)		CAR (n=13)		*t*-test
	Mean	SD	Mean	SD	
adoption rate (count)	53.48	(341.22)	19.38	(33.21)	ns
adoption (0/1)	0.21	(0.41)	0.69	(0.48)	-4.10***

Panel B above reports means, standard deviations (in parentheses), and F-statistics of various adoption rates of approved standards. ***p<.001, **p<.01, *p<.05, +p<.10

Table 4. Regression of Standard Use and Adoption by Carbon Market

	(1) NBReg *Adoption rate* (count)	(2) Logit *Adoption* (0/1)
CAR	-1.01	2.13***
	(1.46)	(0.63)
Obs	223	223

Table 4 above reports coefficients, robust standard errors (in parentheses). Column 1 models the number of times each approved standard is implemented, estimated using a negative binomial regression. Column 2 models the likelihood that any given standard is used more than once, and is estimated using a logistic regression model. ***p<.001, **p<.01, *p<.05, +p<.10