
The Homogenization of Carbon Management Practices: How Organizations Response to Isomorphic Pressures to Reduce GHG Emissions

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Abstract:

Purpose: Many companies are facing an increasing pressure exerted by governments, shareholders and other stakeholders to reduce their CO₂ emissions in order to mitigate climate change. The importance of managing CO₂ emissions by introducing adequate practices has increased for the affected companies. The present paper discusses the results of studies pertaining to the homogenization of carbon management practices.

Design/Methodology/Approach: With 122 responses from 3 European countries, we applied structural equation modeling to test our hypotheses.

Findings: Our findings revealed that the source of the homogenization of carbon management practices can be traced back to the mimetic and normative pressure. On the other hand, the impact of coercive pressure was found to be insignificant. The homogenization is also influenced by the success of the model organization and the similarity of carbon strategy. The results were outlined in relation to inter and intra CM practices.

Originality/Value: This study makes the following contributions. Firstly, it analyses threefold isomorphic mechanisms in carbon management practices. Secondly, it examines which practices are imitated, and whether the features and success of the model organization are significant in the imitation process. Third of all, it assesses the significance of CM practices' imitation for the adjustment of organizations to the expectations of stakeholders.

Keywords: Carbon management, homogeneity, environmental management.

JEL Classification: L2, M1, Q53.

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1. Introduction

At the Paris Climate Conference (COP21) in December 2015, 195 nations made ambitious plans to reduce their carbon emissions. Principles concerning the implementation of these plans were adopted in subsequent years (e.g. during the COP 24 in Katowice, 2018). The carbon emission objectives generate new challenges and needs regarding measures for carbon management within sectors and organizations (Wright *et al.*, 2011). Because business organizations represent 40% of the world's largest economic entities, with greenhouse gas emissions dwarfing many national economies (Heede, 2014), the measures can act as facilitators for reducing carbon emissions.

As the reduction of the emission brought about new challenges, academics have attempted to gain a better understanding of organizations' responses to these. Advances in understanding how organizations respond to climate change have been made within the scholarly field of business and the natural environment (B&NE). Research was conducted in carbon strategies (Kolk and Pinkse, 2005; Eleftheriadis, 2017), the potential benefits (Hoffman, 2006) and corporate climate change options (Sprengel and Busch, 2011; Weinhofer and Bush, 2013). Several studies have contributed to the impact of low-carbon operations on the economic performance (Bottcher, 2015), the impact of corporate carbon management practices on the environmental performance (Gimenez *et al.*, 2012), and improvements in energy efficiency (Liu, 2012).

However, very few studies examined the following relations, carbon management drivers - practices - outcomes, albeit only a few times simultaneously using integrated research frameworks (Zailani *et al.*, 2012; Bottcher, 2015). As a consequence, the subject matter remains under-developed and under-researched (Robinson *et al.*, 2018). This stems from several premises. First, management research concerning this topic is still a relatively new endeavor. Hitherto research focused primarily upon stimuli/barriers and strategic aspects of carbon management in organizations. Few studies have simultaneously examined the impact of various factors upon carbon management practices (Abreu *et al.*, 2017). Secondly, notwithstanding the necessity for firms to take action, there is limited progress in offering insights into mechanisms enabling organizations to adjust to the emission-related objectives (Gasbarro and Pinkse, 2016).

In this paper, we adopt the institutional theory to explain how institutions (in a broad sense of the term) influence carbon management practices. In order to do so, we adopted the concept of isomorphism (homogenization). According to DiMaggio and Powelle (1983), homogenization can be synonymous with the concept of isomorphism. They suggest organizations evaluated in the same organizational area tend to be alike because since they develop increasingly common norms, they have to achieve progressively similar behaviors.

This study makes the following contributions. Firstly, it analyses threefold isomorphic mechanisms in carbon management practices. It seeks to establish answers to the following question: Do coercive, mimetic and normative pressures exert an impact upon the homogenization of CM practices? Secondly, it examines which practices are imitated, and whether the features and success of the model organization are significant in the imitation process. Third of all, it assesses the significance of CM practices' imitation for the adjustment of organizations to the expectations of stakeholders. In general terms, the paper examines whether the management of emissions is beneficial from the point of view of managers.

The remaining part of this paper proceeds as follows. The next two sections provide a brief review of prior research on CM practices and present a research framework to define and identify the phenomenon of isomorphism. The subsequent section develops research hypotheses. The fourth section describes the research method, and the fifth presents the results of the empirical analysis. The final part discusses the study's implications and limitations and provides certain interesting avenues for future research.

2. Literature Review

2.1 Carbon Management Practices - Literature Study

Carbon management practices (CM practices) address the particular issue of climate change caused by the emission of CO₂ from a company's core business processes. According to Porter and Reinhardt (2007), business leaders need to carefully assess the cost of emissions in their operations as well as a firm's vulnerability to physical, economic and social impacts of climate change. This will allow to structure and manage its business practices so that the pursued results are achieved in response to climate change.

According to the definition, carbon management practices are those activities in which companies engage to respond to climate change. First studies concerning CM practices viewed these in terms of limiting the emission in production processes. Subsequent studies built upon this to include the design of low-emission products, the issue of emission in supply the chain, and actions aiming to curb the emission. The following issues were studied, direct and indirect emission, and conversely low-carbon products, low-carbon processes and low-carbon logistics (Bottcher, 2015). One of the most extensive typologies of carbon management practices was developed by Lee (2012). The author distinguishes six categories of measures, emission reduction commitment, product improvement, process and supply improvement, new market and business development, organizational involvement and external relationship development.

According to Hoffman (2006), carbon management practices revolve around efficiency enhancement, technology shift, the acquisition of assets which balance a

company's production facilities portfolio, development of new products and technology solutions, forest sequestration, purchase of emission offsets and sourcing of renewable energy. As a direct reference to the issue of emission, Weinhofer and Hoffmann (2013) divide carbon management practices into three groups, CO₂ compensation, CO₂ reduction, carbon independence. Similar practices (sans the division) were distinguished in the Carbon Disclosure Project. With regard to the external orientation, additional activities associated with reporting (Saka and Oshika, 2014) and reduction of emission in the supply chain (Zhu and Geng, 2013) ought to be indicated.

The level of a firm's carbon management activity represents how proactively the firm adopts and implements these practices. The intensity of measures points to the corporate carbon strategy. Studies conducted by Gasbarro and Pinkse (2016), Berkhout *et al.* (2006), and Hertin *et al.* (2003) revealed that responses to climate change depend on previous experience, perceived threats or opportunities for business performance, adaptive capacity, and the institutional context of the organization. From the institutional standpoint, it is believed that business engagement in carbon management practices can be accelerated by interventions at the institutional level. They are discussed in more detail in the subsequent section.

2.2 Isomorphism in Light of Carbon Management

To acquire the necessary legitimacy to operate successfully within the society, an organization must respond to expectations emerging from the external environment. The expectations may pertain to products, processes and practices. The institutional theory is based upon the premise that organizational behavior is determined by the surrounding environment it operates in- the framework of social norms, values, and beliefs about what is considered acceptable and appropriate (DiMaggio and Powell, 1991). When adjusting its operations to the external expectations, many organizations recreate already accepted practices. This phenomenon results in the decreasing heterogeneity of responses to the institution known as isomorphism.

The present paper focuses upon institutional isomorphism which stems from social expectations and institutional pressure. It can be created by three types of pressures, coercive, mimetic and normative (DiMaggio and Powell, 1983). Coercive isomorphism results from both formal and informal pressures on organizations to reflect the cultural expectations of the society. These pressures refer to outlined regulative processes such as rule setting, monitoring, and sanctioning activities (Amor-Esteban *et al.*, 2018; Demirbag *et al.*, 2017). While coercive isomorphism is associated with governmental and regulatory requirements, the institutional and social pressures for reducing CO₂ emissions do not depend solely upon public policy and relations between companies and governments. Various stakeholders can also exert significant influence on the implementation of emission-control measures (Boiral, 2012).

As a consequence, mimetic pressures emerge. It results in the fact the companies imitate the behavior and practices of successful counterparts within the same industry. Normative isomorphism originates primarily from the professionalization of certain disciplines. DiMaggio defines it as being interpreted by members within a particular occupation collectively defining appropriate ways in which to act.

Organizational response to climate change is based upon the premise that organizations may reduce their negative impact upon the climate via their operation. The issue of emission reduction has become increasingly “institutionalized”. First of all, public interest in GHG emission, as well as climate change in general, has increased. The growth of awareness translates into specific expectations towards organizations’ operations.

Moreover, organizational response has become of strategic significance. Codification into law is another important area of institutionalization. In Europe, the boost in the interest in standards and regulations pertaining to climate change has been clearly observed. This fact was acknowledged by the change in the 2003/87/EU and the 2012/27/EU directives. The third premise behind the institutionalism can be seen in the modification of reporting systems (Dyer *et al.*, 2008). This constitutes a response of stakeholders manifested in individual reporting of emission performance, as well as the application of international reporting standards. Last but not least, carbon management operates at multiple levels, from the impacts felt within organizations by individuals to the expectations of investors, to industry-wide initiatives, to partnerships and collaboration with governments. While it is not yet clear how ‘institutionalized’ carbon management currently is, it is clear that it is subject to both incremental and discontinuous (or evolutionary/ revolutionary) change.

As far as CM practices are concerned, isomorphism may stem from an unclear regulatory framework, short-termism and uncertainty-avoidance behavior (Slavinski, 2017). Several models share an acknowledgement that organizations engage in imitative behavior to reduce risk or achieve efficiency, either in response to information asymmetries or rivalrous competition (Ordanini *et al.*, 2008). Such behavior emerges in the conditions of uncertainty as well. Leiter (2005) argues that an organization imitates the behavior of organizations which were successful or those attracting public approval. Initially, organizational response to climate change stemmed from the pressure of the surrounding environment. The lack of pressure resulted in no action being undertaken (Kolk and Mulder, 2011).

Reid and Toffel (2009) suggest that firms become engaged in climate change strategies when they share an institutional field. They are faced with identical restrictions in the form of emission standards. As a consequence, they move towards homogeneity over time. Washington and Petterson (2011) indicate that organizations seek determinants (examples) of adequate measures and behaviors in their

immediate surroundings. Firms imitate or copy practices and structures which have been embraced by the majority of firms.

Based upon the literature, we make a premise that the homogenization of practices is understood through isomorphic pressures emerging from the institutional environment. If so, homogenization can be synonymous with isomorphism (DiMaggio and Powell, 1983; Bourkha and Belfellah, 2017).

2.3 Hypothesis Development

The pressure exerted by the European Union to reduce the industrial emissions of GHGs has led some companies to revise their strategies to comply with new regulations or to benefit from new carbon emissions allowance market (Pinkse and Kolk, 2009). Almost all of the companies surveyed by Okereke (2007) admit that they are pursuing their carbon management under the purview of existing national and international climate regulations. This proves the impact of coercive pressure upon companies in the region. In contrast, in countries which have not ratified the Kyoto Protocol or put in place substantive measures to address emissions, companies appear more inclined to adopt a 'wait and see' approach (Kolk and Pinkse, 2007; Pinkse, 2007). As a consequence, coercive pressure determines the homogenization of attitudes- organizational strategies- in the fields influenced by the pressure.

According to Demert *et al.* (2018) and Luo *et al.* (2017), the decision of suppliers in supply chains to implement low-carbon practices is determined by the stringency and effectiveness of climate change policies in their home country. This may prove the existence of coercive isomorphism. On the other hand, Glover *et al.* (2014) indicate the significance of powerful players' environmental policies. These results indicate that powerful players in the supply chain use coercive isomorphic drivers to exert pressure on less powerful players to implement practices including the reduction of energy consumption, carbon foot-printing activities, installing renewable energy sources. Coercive drivers involve organizations integrating new rules and legitimate practices, which originate from the main players in the supply chain.

H1: There is a significant positive relationship between the coercive pressure and the homogenization of CM practices.

The second source of the homogenizations of CM practices is the maintenance of competitiveness (Agan *et al.*, 2013) and avoidance and minimization of adverse and unexpected outcomes (Yang, 2012). In this way, mimetic isomorphism emerges (Kauppi, 2013). It pertains primarily to companies operating in the same industry (Amor- Esteban, 2018). This stems from their belief in the impact of reducing carbon emission upon competitiveness (Boiral *et al.*, 2012). It is associated with the improvement of reputation (Subramanian, 2017), risk reduction, cost effectiveness,

and stakeholder demands, consistent with corporate ethics (Chu, 2010). When expecting such benefits, enterprises imitate solutions observed in other companies. Taking inter-organizational practices into consideration, Glover *et al.* (2014) argue that organizations perceived cost reduction as the dominant logic of practices to reduce energy consumption. According to Zhang and Wang (2014), a significant role is played by market tools. Organizations might model themselves after other firms, e.g. emulating the low carbon activities or low carbon management systems of other firms (Galbreath, 2010; Liu *et al.*, 2018). Therefore:

H2: There is a significant positive relationship between the mimetic pressure and the homogenization of CM practices.

The homogenization of CM practices is determined by the normative pressure as well. The pressure is derived from the professionalization (Zhu *et al.*, 2007) or cultural values of business environment (Gallego-Álvarez and Ortas, 2017). According to Scott (2008), normative systems include both values and norms together with the construction of standards to which existing structures or behaviors can be compared to or assessed against. The normative pressure results in the establishment of a management department for CO₂ emissions and low-carbon behavioral rules for employees, and assessing the exposure to climate change risks (Song and Lee, 2010). Studies by Abreu *et al.* (2016) show that companies which have a high level of climate change disclosure are subject predominantly to normative isomorphism. It is related to appropriate behavior internalized as a code of conduct and confers institutional legitimacy on a company.

Escobar and Vredenburg (2011) claimed that oil and gas companies are among industries which are subject to the normative pressure the most. They found that potential impact of climate change was the main reason for them to develop mitigating strategies and actions. The significance of the normative pressure upon the implementation of carbon disclosure or perception of the climate issue was highlighted by Schaltegger and Csutora (2012), and Rose *et al.* (2016).

H3: There is a significant positive relationship between the normative pressure and the homogenization of CM practices.

Apart from the direct external pressure, we argue that carbon management practices have three nodes of interaction: the similarity of identity of the model organization, the achievement of success by the model organization, and the similarity of carbon strategy.

The literature concerning strategic groups stresses that organizations look to their peers – those of similar size, status, resources, geographical location, etc., (Reger and Huff, 1993). They tend to cluster in sets, called strategic groups, which share similar characteristics and behaviors. Current scholarly literature finds that organizations imitate those who have similar identity characteristics (Labianica *et*

al., 2001). Strategic group theory suggests resource limitations prevent the imitation of the most powerful and prestigious organizations in a field (Caves and Porter 1977). Companies differing with regard to the resource base may not be able to imitate others, even in the same environment. As a consequence, the imitation is pursued primarily by organizations manifesting similar characteristic features-similar resources.

Lane and Lubatkin (1997) found that the similarity between firms' knowledge bases was an important determinant of imitation success. Using a simulation model, Gavetti, Levinthal, and Rivkin (2005) observed that the value of analogies (transferring ideas from one context to another) decreased as the similarity between the contexts declined. Csaszar (2010) argues: "it may be profitable for firms to find similar peers before starting any imitative effort".

H4: In relation to CM practices, organizations imitate other organizations which have similar identity characteristics to their own.

New institutionalism offers a different approach. The approach posits that organizations copy those who are perceived as successful or more legitimate (Lieberman and Asaba, 2006). Such behavior is rational because it economizes on search costs to reduce the uncertainty an organization is facing. The main advantage of the approach is the implementation of solutions tested by others. This, in the conditions of uncertainty, enables risk reduction and cost-saving concerning the exploration.

With reference to climate changes, Sullivan (2008) observes that an uncertainty associated with the development of novel technologies, markets, and regulations, may result in the convergence of strategies. This stems from organizational tendency to imitate the behavior of successful competitors. To be specific, the conditions of climate change give rise to mimetic pressure at the institutional level as organizations seek to emulate companies considered as innovative and successful (Borzel and Hamann, 2013). A directional or unilateral leadership emerges. The model organization demonstrates the superiority and value of certain solutions/actions for climate change. Profitable organizations which perceive these actions as opportunities for growth and innovation can be regarded as models (Hardcastle, 2015).

H5: In relation to CM practices, organizations imitate firms which achieved success.

The delivery of CM practices can also be internally driven by an environmental strategy. It is significant for two reasons. First of all, environmental strategy represents a managerial interpretation of stakeholder demands, and thus acts as a mediator between external pressures and internal practices. Secondly, the strategy constitutes an expression of external motivation for carbon management. Cadez *et al.* (2019) emphasize that the level of GHG reduction efforts in a particular firm

depends on the degree of its environmental strategy focus. Firm's environmental strategy focus positively influences corporate GHG reduction strategy which, in turn, enhances GHG-related performance. Several authors confirm that carbon strategy is a pattern of action over time leading to carbon reduction practices (Cadez and Czerny, 2016; Kolk and Pinkse, 2005; Lee, 2012; Wahyuni and Ratnatunga, 2015). At the same time, management sciences indicate that organizations predominantly imitate solutions of companies characterized by similar strategies (Buchko, 2011). With regard to climate change management activities Damert and Baumgartner (2018) confirmed that production companies exhibiting similar strategy patterns tend to implement similar product and process improvements. As a consequence, we may posit the following:

H6: In relation to CM practices, organizations imitate other organizations which have a similar carbon strategy.

The delivery of practices aiming to reduce GHG emissions is expected to deliver desired outcomes. Looking at the impact of CM practices on environmental performance, proof for a positive effect is usually found (Gimenez *et al.*, 2012). The second objective, not less significant, is the improvement of economic performance. Several studies acknowledged that actions undertaken in response to climate change are positively related to economic performance (De Abreu *et al.*, 2017; Doda *et al.*, 2016; Cadez and Guilding, 2017). As far as intra- and inter-organizational CM practices are concerned, we believe that their imitation will lead to an improved adjustment to stakeholders' expectations and needs.

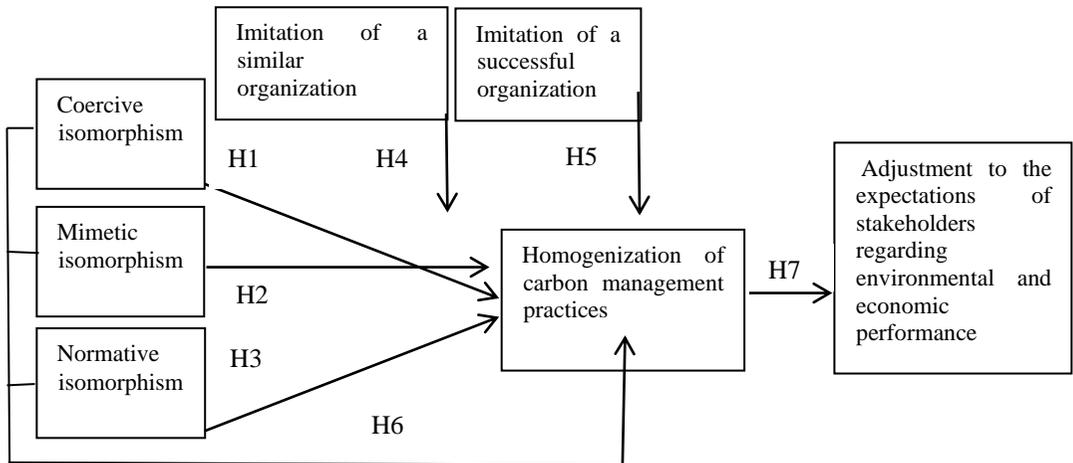
Sprengel and Busch (2011) observe that the stakeholder pressure constitutes one of the fundamental causes behind GHG reduction. Clark and Crawford (2012) and Talbot and Boiral (2015) present a similar position. An important source of pressure comes also from external stakeholders (Okereke and Russel, 2010). By the impact upon environmental strategies, stakeholders positively influence CM practices, which in turn, enhances GHG-related performance (Cadez, Czerny, and Letmathe, 2019). As a consequence, there emerges an improved adjustment of organizations to stakeholders' expectations in terms of environmental and economic performance.

H7: The homogenization of carbon management practices will have a positive influence on the adjustment of organizations to the expectations of stakeholders regarding economic and environmental performance.

Figure 1 illustrates our conceptual model. There are four relationships in the model. The initial three pertain to the influence of isomorphic pressures (coercive, mimetic, normative) on the homogeneity of carbon management practices (Hypotheses 1-3). We made a premise that the pressure functions as a homogenizing force. In addition, these relations are moderated by two moderator variables: the similarity of identity of the model organization (Hypothesis 4) and the achievement of success by the model organization (Hypothesis 5). The variables determine the strength of the

relationship between isomorphic pressures and the homogenization of CM practices. In the relationships we examined, carbon strategy performs as the mediator (Hypothesis 6). The final relationship deals with the influence of carbon management practices upon the adjustment of organizations to stakeholders' expectations with regard environmental and economic performance (Hypothesis 7).

Figure 1. Research model



Source: Own study.

3. Methods and Materials

3.1 Survey Development

This research framework incorporates the strategy research paradigm, which generically proposes that both external and internal conditions result in the adoption of certain strategies, which in turn lead to results. Our studies feature the pressures as factors determining the delivery of CM practices. We applied strategic groups literature in order to explain the homogenization of practices. We selected the countries of East-Central Europe as the empirical context (Poland, Hungary, the Czech Republic). In recent years, governments of these states have been tightening the stringency of their emission regulations.

However, at the same time, they oppose more ambitious climate protection objectives (The Guardian, 2019; Financial, 2019). This means that organizations in these countries are an ideal setting to observe how sensitively local firms respond to external stimuli such as isomorphic pressures. Quantitative research was utilized which seeks to provide numerical and statistical compilations of specific behaviors.

A total of 300 questionnaires (100 in each of the countries) were distributed for the purpose of data collection. 146 were returned which represents a 48.6% response rate. Two types of errors emerge in studies. Unit non-response is the first. To assess whether this issue was present in our study, we compared the first wave of respondents with the last wave. We used the Kruskal–Wallis test because of the nonnormality of our data; this found no significant differences between the two data sets ($p < 0.05$). Item non-responses constitute the second type. In this case, we decided to discard questionnaires containing partial responses. Ultimately, 122 questionnaires were examined, yielding an effective final survey response rate of 40.6%.

The sample was dominated by medium-sized organizations- 45%. Large organizations amounted to 32% and small to 23%. Industrial sectors represented in the sample are outlined in Table 1.

Table 1. *Division by sectors*

Organizational activity type	Number of firms	Percentage of sample
Steel	6	4.9
Cement	6	4.9
Glass and ceramics	5	4.1
Pulp and paper	11	9.1
Refineries	2	1.6
Power	16	13.2
Textiles	13	10.7
Machine-related	27	22.1
Chemicals	3	2.4
Pharmaceuticals	4	3.2
Food-related	3	2.4
Services	26	21.4
Total	122	100

Source: Own study.

3.2 Variables

The questionnaire consisted of a 5-point Likert scale type of questions, partly operationalized based on former works. Mimicry isomorphism was measured through scales adopted from previous studies (Liang *et al.*, 2007; Liu *et al.*, 2010; Masocha *et al.*, 2018). In order to examine coercive and normative isomorphisms, own, purposefully developed scales were applied. They were assessed through a list of pressures, which were identified as key pressures concerning the issue of carbon emissions (Sprengel and Busch, 2011; Boiral *et al.*, 2012; Kolk and Pinkse, 2007; Murillo-Luna *et al.*, 2008). Respondents were asked to what extent their carbon management practices were affected by each of those pressures. The variables were operationalized in 1-5 scale (from 1 for „very low” to 5 for „very strong”).

In order to examine the similarity of CM practices, the division into intra- and inter-organizational practices was employed. Intra-organizational practices are systems and procedures that primarily target internal activities related to the reduction of emission involving product and process improvement and employee engagement.

Inter-organizational practices are those focusing on developing and exploiting relationships with stakeholders. The group features reporting emission performance, ETS market share, cooperation with suppliers in order to curb emissions in the supply chain. Respondents were queried on the extent to which they imitated other organizations when introducing individual practices. Responses ranged from 1 (“Did not imitate”) to 5 (“Fully imitated”). Further variables pertained to organizations the practices were copied from (model companies). Questions pertained to the extent to which model companies: a) are similar to the organization (with regard to structure, size, market share, b) are more successful and prestigious.

The choice of carbon strategy was based upon the strategies offered by Lee (2012). Six strategies were characterized by means of their main features. Finally, questions regarding the adjustment of the organization to stakeholders’ expectations were posed by the following, Kolk and Pinkse (2005); Hoffman (2007) and Lash and Wellington (2007). Managers are open to offering their perceptions about their organizations’ match to the expectations regarding economic and environment results (scale 1-5). The expectations of internal stakeholders, clients, suppliers, investors, and shareholders were taken into consideration.

We also use control variables including the size of the company, sector and country of origin. To detect logical errors, avoid different interpretations and ensure the validity of the survey instrument, the questionnaire was pre-tested with five practitioners. The psychometric properties in these scales were deemed satisfactory as they were greater than the threshold of 0.6 and acceptable with Cronbach’s alpha values ranging between 0.66 and 0.68.

3.3 Data Collection

The survey technique was utilized in this study and self-administered questionnaires were distributed personally and electronically. The two techniques were chosen because of their convenience and effectiveness in communication. When IT tools were employed, invitations and reminders were sent automatically using Survey Monkey, an online survey software tool. Email invitations were personalized for each organization. This study targeted individual, well-informed respondents who were well acquainted with their activities in reducing carbon emissions. These were typically chief environmental managers (35%), chief executive officers (20%) or the managers of energy departments (14%). The questionnaire was translated into English. Native speakers edited the translation, double-checked and back-translated where deemed necessary to ensure conceptual equivalence. The invitations and

reminders were sent out at intervals of approximately 15 days. The mailings were followed by a telephone reminder.

3.4 Data Analysis

Pairwise comparison was applied in order to assess the homogenization of practices. The relationship between two organizations is dyadic, meaning the relationship between two observations constitutes the object of inquiry. Dyadic analysis proves most appropriate when dealing with large quantitative data where the underlying concern is a relation between observations. It has been used previously with great success in identifying underlying drivers of mimetic behavior (Guler, Guillen, and Macpherson, 2002). Using the comparison groups of the remaining organizations, we constructed a 122x122 matrix for each of the practices. Each matrix compared one organization with the remaining ones (pairwise comparison). Organizations constituted columns and rows of the matrices. Homophily statistics were given 1 if both organizations implemented the specific practice at a similar level (values differed ± 0.5) This denoted that organizations assimilate with regard to the implementation of individual practices; otherwise the score was 0.

Empirical methods include a factorial analysis and structural equation model. In a preliminary analysis, we applied an exploratory factor analysis (EFA) to each construct using the principal component method followed by the varimax rotation to establish the factors. The factors retained were those having eigenvalues >1 . To assess the validity of the application of factor analysis, we used the criterion of Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity. Factorial validity was verified by the standardized factor loadings, convergent validity by the average variance extracted (AVE) and composite reliability. Reliability was checked by composite reliability and Cronbach's alpha coefficients. Subsequently, we used structural equation model (SEM) to examine the research hypotheses. Calculations were conducted by means of IBM SPSS Statistics 24 and Amos Graphics.

4. Discussion and Results

4.1 Validation and Reliability

Table 2 presents the results of the exploratory factorial analysis. It can be observed that all constructs had KMO values higher than 0.5 and correlation matrices significantly different from the identity matrix (p values of Bartlett's sphericity test lower than 0.001), proving the adequacy of the EFA to these data.

The EFA grouped the mimetic pressure under three factors named as Competition, Competitiveness, Image with eigenvalues >1 . These factors explain 55.49% of the variance in the data. Similar results were obtained in relation to the coercive pressure: 3 factors (Suppliers, Regulations, Society) explaining 55.13% of the variance. The normative pressures were grouped under two factors namely Values

and Perception which explain 77.53% of the variance. For these variables, all constructs had good factorial validity (all standardized factor loadings above 0.5), and good convergent validity (AVE above 0.5). In the case of intra CM practices, EFA grouped items under ten factors which explain 81.23% of the variance. For the inter CM practices variable, 5 factors were isolated. They explain 56.89%.

The reliability of the constructs and scales was appraised by examining composite reliability and Cronbach's alpha. As shown in Table 2, both measures exceed the recommended value of 0.70 (Hair *et al.*, 2009) for all constructs. Convergent validity was assessed by analyzing the average variance extracted (AVE). As recommended, the variance extracted was above 0.50 for all constructs except intra CM practices. For the "Adjustment" variable, the score was slightly below the recommended value (0.46). Considering the aforementioned aspects we conclude that the measurement model has a good overall fit.

Table 2. *Constructs and indicators*

	Loading	% variance	KMO	Bartlett' s Chi-square	AVE	Composite Reliability	Cronbach' s alpha
Mimetic pressure (Mimetic)		55.49	.573	51.147***	0.555	0.787	.589
M: Competition	.677						
M: Competitiveness	.836						
M: Image	.713						
Coercive pressure (Coercive)		55.13	.631	44.57 ***	0.555	0.789	.598
C:Suppliers	.781						
C:Regulations	.730						
C:Society	.723						
Normative pressure (Normative)		77.53	.500	52.59 ***	0.776	0.873	.710
N: Values	.881						
N: Perception of environmental problems	.881						
Homogenization Intra CM practices		81.23	.836	465.93***	0.241	0.731	.813
CMP Intra1: Design energy	.563						
CMP Intra2: Design emissions	.737						
CMP Intra3: Technologies	.733						
CMP Intra4: Process improvement	.572						
CMP Intra5: Renewable Energy Sources	.348						
CMP Intra6: Performance	.442						
CMP Intra7: Risk assessment	.108						
CMP Intra8: Control of emission volume	.347						
CMP Intra9: Energy	.385						
CMP Intra10: Trainings	.313						
Homogenization Inter CM practices		56.89	.81	219.33***	.569	.868	.807
CMP Inter 1: Supply chain	.682						

CMP Inter 2: Reports	.758						
CMP Inter 3: Cooperation with clients	.799						
CMP Inter 4: Emission market	.760						
CMP Inter 5: Outsourcing	.768						
Adjustment to stakeholders' expectations		58.53	.851	352.22***	.467	.915	.83
D 1: Internal stakeholders' expectations	.561						
D 2: Clients' expectations	.677						
D 3: Suppliers' expectations	.674						
D 4: Investors' expectations	.739						
D 5: Government institutions' expectations	.751						
D 6: Effectiveness-related expectations	.519						
D 7: Objective-achievement-related expectations	.732						
D 8: Society's expectations	.727						

Note: *** coefficient statistically significant at $p < .001$.

Source: Own study.

Table 3 provides correlations between the constructs in the measurement model. Of the 28 correlations, 19 are significant at the 5% level. Furthermore, all but one hypothesized relationships, are significant (these correlations are highlighted with bold in Table 3).

Table 3. Descriptive statistics and Correlation Matrix—Measurement model

	Mean	SD	Mimetic	Coercive	Normative	Similarity of the model	Success of the model	Carbon strategy	Homogen. CMP Inter	Homogen. CMP Intra
Mimetic	3.576	.724	1							
Coercive	3.488	.766	.406**	1						
Normative	3.758	.912	.294**	.498**	1					
Similarity of the model	.3972	.491	-.164	-.053**	-.147*	1				
Success of the model	.3617	.482	.194*	.050	.083**	-.611**	1			
Carbon strategy	3.080	1.387	.134	.222**	.310**	-.127	.104	1		
Homogen. Inter CMP	3.357	.685	.452**	.373**	.528**	-.242**	.242**	.401**	1	
Homogen. Intra CMP	3.035	.831	.318**	.366**	.478**	-.108	.172*	.307**	.652**	1
Expectations	3.549	.664	.355**	.465*	.521**	-.179*	.194*	.313**	.680**	.617**

			.000	.000	.000	.035	.022	.000	.000	.000
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Note: * coefficient statistically significant at $p < .05$ (two-tailed); ** coefficient statistically significant at $p < .01$ (two-tailed).

Source: Own study.

4.2 Results of the Structural Equation Model

Similar to the measurement model, the overall fit of the structural model proved to be acceptable as most absolute and relative indices were above and/or below the recommended thresholds ($\chi^2 = 701.4$, CMIN/DF = 1.67, CFI = 0.94; RMSEA = 0.05; IFI = 0.94; TLI = 0.93), with the exception of the χ^2 (below the conventional cutoff value of 0.05). Hence, no re-specification to the initial model was made.

The homogenization of CM practices (inter and intra) was adopted as the dependent variable. The analysis was conducted in four steps. Model 1 features pressures and control variables. Model 2 features variables specifying the characteristics of the model organization, Model 3- carbon strategy. Results emerging from these models are outlined in Tables 4 and 5. Model 4 featured in Figure 2 encompasses all variables.

The results of the analysis for Model 3 indicate support for Hypothesis 2, with the mimetic pressure positively related to the homogenization of CM practices of both intra CM practices ($\beta = 0.113$, $p < 0.05$) and inter CM practices ($\beta = 0.209$, $p < 0.05$). Hypothesis 3, positing that the normative pressure is positively and significantly associated with the homogeneity of intra CM practices ($\beta = 0.29$, $p < 0.05$) as well as inter CM practices ($\beta = 0.32$, $p < 0.05$), is also supported. However, this study does not offer support for H1 positing a significant positive relationship between the coercive pressure and the homogenization of CM practices (coefficients $\beta p > 0.05$).

A positive and statistically significant coefficient estimated (0.66, Model 4) for the path between the homogenization of inter CM practices and organizations' adjustment to stakeholders' expectations provides support to confirm H7. The hypothesis regarding the influence of the homogenization of intra CM practices upon stakeholders' expectations was also confirmed by the path estimated coefficient (0.49, Model 4).

Table 4. Results of the dependent variable analysis- homogenization of inter CMP

	Model 1				Model 2				Model 3			
	B	B state	T	P	B	B state	T	P	B	B state	T	p
Mimetic	.256	.268	3.53	.001	.189	.205	2.55	.012	.193	.209	2.76	.007
Coercive	.027	.030	.352	.725	.066	.075	.843	.401	.040	.045	.533	.595
Normative	.298	.413	5.08	.000	.280	.404	4.73	.000	.222	.320	3.84	.000

Sector	-.052	-.025	-.364	.716	-.166	-.078	-1.08	.28	-.171	-.081	-1.185	.238
Size	.145	.160	2.21	.028	.117	.131	1.74	.033	.119	.133	1.871	.064
Similarity of the model					-.124	-.091	-.985	.326	-.113	-.083	-.949	.344
Success of the model					.079	.057	.614	.045	.059	.042	.481	.006
Carbon strategy									.134	.278	3.854	.000
	F=17.088 *** R=0.634 R ² =0.402				F=12.067*** R=0.649 R ² =0.421				F=13.677*** R=0.698 R ² =0.488			

Source: Own study.

Table 5. Results of the dependent variable analysis- homogenization of intra CMP

	Model 1				Model 2				Model 3			
	B	B state	T	P	B	B state	T	P	B	B state	T	p
Mimetic	.172	.146	1.85	.066	.127	.109	1.29	.020	.132	.113	1.356	.010
Coercive	.131	.117	1.32	.189	.145	.131	1.382	.17	.123	.110	1.181	.240
Normative	.314	.354	4.189	.000	.302	.344	3.802	.000	.255	.290	3.144	.002
Sector	.118	.046	.629	.531	.032	.012	.157	.876	.029	.011	.142	.887
Size	.229	.205	2.708	.008	.216	.189	2.35	.020	.219	.192	2.434	.016
Similarity of the model					.087	.050	.505	.615	.102	.059	.601	.549
Success of the model					.239	.137	1.375	.172	.230	.132	1.345	.018
Carbon strategy									.107	.174	2.18	.031
	F=13.493*** R=0.58 R ² =0.345				F=8.673*** R=0.584 R ² =0.345				F=8.426*** R=0.606 R ² =0.368			

Source: Own study.

4.2.1 Suppression outcomes

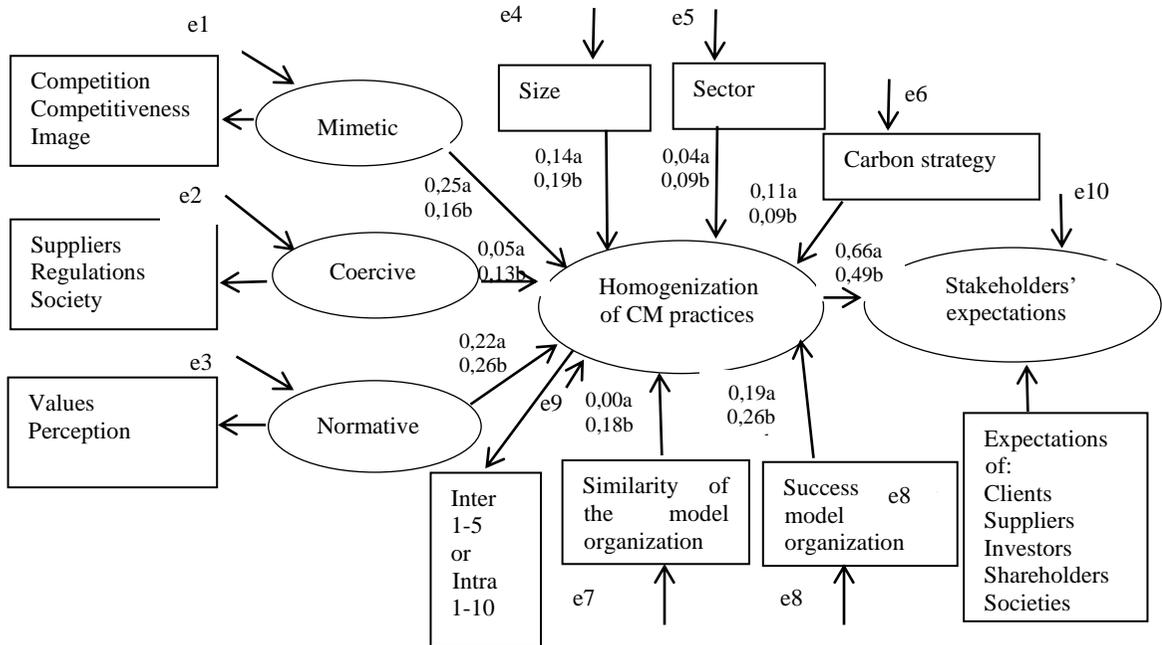
In order to verify the outcomes of suppression (H4-H6), the Levene's test of the homogeneity of variance was applied. Values of $F=4.411$, $p<0.05$ were obtained for the relationship between the homogenization of inter CM practices and the success of the model organization. This enables the hypothesis regarding the equality of variance in groups to be discarded. In addition, it may indicate the existence of suppression. These results seem to be confirmed by the t -test= 3.129 , $p<0.05$. With regard to the remaining relationships, a premise concerning the equality of variance ought to be made.

4.2.2 Moderator variable- similarity of the model organization

The impact of the isomorphic pressure upon the dependent variable (practices) is statistically significant. However, the impact of the moderator is significant only in relation to the homogenization of inter CM practices. When the relationship between the pressure and similarity is considered, the relationship becomes irrelevant. As a consequence, the similarity of the model organization does not affect the homogenization of inter- and intra-organizational practices, which allows for H4 to be discarded.

Figure 2. Results of the process for estimation for measurement Model 4

a) Homogenization of Inter CM Practices, b) Homogenization of Intra CM Practices



Source: Own study.

4.2.3 Moderator variable- success of the model organization

In relation to inter and intra practices, the results of the UniAnova analysis indicated a statistically significant relationship (Table 6). The impact of the isomorphic pressure upon the dependent variables (homogenization of inter CM practices, homogenization of intra CM practices) is statistically significant ($p < .05$). On the other hand, it is insignificant when the impact of the moderator is isolated. With regard to the interaction of pressure and “Success of the model organization” variable, the relationship is insignificant for intra-organizational practices. For inter CM practices, relationships become significant at $p < .10$. This allows for H5 to be partly confirmed.

4.2.4 Mediator variable- carbon strategy

Regression coefficients in Model 3 and 4, as well as the results of the Sobel test were examined in order to verify whether the carbon strategy variable performs as a mediator. The Sobel test confirmed H6 (Sobel=3.39, $p = .000$). The introduction of this variable into the homogenization models of inter CM and intra CM resulted in the increase of variance explained by these models.

Table 6. Inter-object effect test

	Inter CMP	Intra CMP
Variable – successful model organization		
Pressures	F=3.671 p=.043**	F=9.537 p=.001***
Success of the model organization	F=3.487 p=.082*	F=.873 p=.355
Pressures*success interactions	F=1.832 p=.087*	F=.444 p=.873
Variable – similarity of the model organization		
Pressures	F=8.244 p=.002**	F=9.879 p=.000***
Similarity of the model organization	F=6.142 p=.020**	F=1.016 p=.320
Pressures*similarity interactions	F=.642 p=.721	F=.423 p=.886

Note: * $p < .10$, ** $p < .05$, *** $p < .01$

Source: Own study.

4.2.5 Practices determined by homogenization

Table 7 outlines the percentage of organizations which homogenize the individual practices. With regard to internal practices, the following undergo homogenization: limiting energy consumption (70%), emission volume control (58%), practices serving to improve emission efficiency (59%). For external practices, homogenization pertains to limiting emission in the supply chain (45%).

Results indicate that the improvement of energy efficiency remains the priority. This is compatible with domestic legislators' intentions², as well as cost-related motivation for the organization. Practices undergo homogenization in the cooperation in the supply chain. In this case, the source can be traced back to the mimetic pressure, which was indicated by e.g., Chu *et al.* (2017), Luo *et al.* (2017).

Table 7. Percent of organizations introducing homogenous practices

Intra CM practices		Inter CM practices	
Design energy	46	Supply chain	45
Design emissions	51	Reporting	36
Technologies	45	Cooperation with clients	35
Process improvement	59	Emissions market	24
Renewable energy sources	32	Outsourcing	32
Performance	38		
Risk assessment	40		
Volume control	58		

²In Hungary it is Act No. LVII of 2015 concerning energy efficiency. In Poland - Ustawa o efektywności energetycznej (The Act on Energy Efficiency) (Journal of Laws of 2011 no. 94). In the Czech Republic – Energy Management Act (Act No. 406/2000 Coll.).

Energy	70		
Trainings	38		

Source: Own study.

5. Discussion

The development and validation of the SEM made it possible to examine important relationships pertaining to the homogenization of CM practices. Our conceptual model indicates that there exists a relationship between isomorphic pressures and the homogenization of the practices. Bottcher and Müller (2015) confirm that reduced carbon emissions are driven by stakeholder pressure. We are inclined to partly agree with their results.

However, this does not apply to each of the pressures. Our results indicate that the coercive pressure is insignificant for the homogenization of inter- and intra-organizational practices. This seems contradictory to Levy and Kolk (2002) and Elijido-Ten (2017). For these authors, the regulators of expectations and norms are the main sources of GHG emission reduction by organizations. The lack of significance for the coercive pressure may result from two premises. First of all, organizations do not pursue the homogenization of their behaviors. On the contrary, they aim for their diversification. As a consequence, they introduce a variety of practices enabling them to stand out. Due to the above, the source can be traced back to the mimetic rather than coercive pressure. Secondly, the applied practices result from the environment friendly attitudes of managers (normative pressure). As a consequence, organizations are not limited to practices required by regulations or those expected by suppliers/societies but introduce a broader, voluntary scope of practices.

Our results indicate that the main source of homogenization can be seen in the mimetic and normative pressure. Most companies were heavily engaged in observing, mimicking and slightly adapting practices of their competitors not only to ensure they reflected the expectations of government institutions by engaging in the reduction of GHG, but to keep pace with and/or exceed competitor activities to maintain a competitive position within the marketplace. As for the normative pressure, the homogenization of CM practices emerges due to the managers' attitude towards climate changes (as indicated above). This confirms the role of CEOs who have a greater willingness to undertake long-term actions in response to climate change due to the professionalization and to ethical values. Such results confirm previous studies by Abreu *et al.* (2016).

To some extent, our results suggest that organizational features are significant in the imitation of CM practices. This is valid for inter-organizational practices where solutions mimicking the successful organization are implemented. Organizations imitate practices pertaining to the supply chain, reporting and cooperation with clients. With regard to internal practices, the success of the model organization is

significant, but slightly less so. It seems that a greater freedom in the selection of the model is dominant. The selection of the model organization is determined by its image or market results. The existence of successful models and solutions pertaining to climate change leads to the mimetic isomorphism. Identity characteristics of organizations proved to be insignificant for the imitation of CM practices. The similarity of organizations is not sufficient to be a potential imitation target. The conditions under which organizations are most likely to imitate is the size of the organization, its renown and market success.

The study also contributes to the debate concerning carbon strategy by demonstrating the impact of the variable as a mediator. Consistent with previous evidence when pressures for reducing GHG emissions are more intense, firms strengthen their environmental strategy (Cadez *et al.*, 2019). Also, carbon strategy has a positive impact on carbon reduction practices (Wahyuni and Ratnatunga, 2015).

The impact of two control variables also warrants some interpretation. The homogenization of practices depends upon the size of the organization. The literature indicates that larger companies were more likely to undertake a spectrum of activities than smaller ones (Weinhofer and Hoffmann, 2010). In our studies, the homogenization of practices pertains to smaller organizations more frequently. These firms have difficulty considering and implementing various practices in response to climate change mainly because they lack awareness and resources. The sector of activity remains without influence with regard to the homogenization. This confirms the results of Amor-Esteban *et al.* (2018) pertaining to CSR practices. The selection of the model organization is not restricted to one specific sector.

Organizations seek emission-reducing solutions outside their sector as well. Finally, one ought to ponder on the impact of the homogenization of CM practices. We highlight that they are indeed beneficial for the company. The process of seeking ways to reduce GHG emissions can represent, in itself, a source of increased legitimacy and acceptance by stakeholders, which has already been observed by Abreu *et al.* (2017). Results of studies confirm that the homogenization of CM practices (both inter- and intra-organizational) determines the adjustment of the organization to the expectations of internal and external stakeholders.

Our findings have implications for corporate executives and public policy. Knowledge regarding the homogenization of CM practices can be utilized to formulate procedures and practices which indirectly encourage their implementation. As far as the significance of the mimetic isomorphism is concerned, the publication of the benefits and positive outcomes associated with CM practices will automatically result in their dissemination. Managers need to consider the surveyed relationships more proactively. The study established that there are two distinctive types of firms in the realm of homogeneity and carbon management. These are firms which are imitated and those which are pacesetters. As such, firms which are not

going to occupy any of these positions will find it hard as carbon management redefines the rules of business.

Furthermore, the results indicate that the stronger the pressure, the more organizations will pursue the homogenization of CM practices. Expectations pertaining to a certain level of the homogeneity of practices, if the practices are missing, will result in the emergence of consequences for non-conformers in the form of outpace and ill-fit as to the stakeholders' expectations.

Secondly, managers ought to consider the consolidation/ development of the carbon strategy as significant. We posit that the level of carbon management in a particular firm depends on the importance of carbon strategy. If the external pressure is missing, the strategy may offer a rationale for the introduction of carbon-reducing practices, even if these solutions have been developed by other organizations.

For policy-makers, the results of the study orchestrating the role of stakeholders in pushing CM practices have proven to be crucial. Their impact ought to be based upon market-based and voluntary solutions. The expansion of available market-based instruments (i.e. carbon taxes, emissions trading initiatives) will drive the implementation of CM practices.

This study is not without limitations. First of all, the concept of carbon management is still new to most companies. As climate change issues become more salient to business circles over time, corporate management is expected to change more rapidly. This is especially valid for countries which are not in favor of reducing GHG emission (countries surveyed in the study). As a consequence, the companies may be at an early stage in their introduction of carbon management concepts.

Secondly, the assessment of the organizations' fit to the stakeholders' expectations was subjective. It was conducted among respondents whose perception may strongly differ from the perception of stakeholders. As a consequence, results concerning this particular variable ought to be approached with caution. Third of all, we have only looked at 3 isomorphic pressures. Building on the resource-based view and in line with recent research on energy management (Liu *et al.*, 2012), other sources like internal capabilities and resources might also result in fruitful avenues to provide insights into the homogeneity of CM practices.

Further studies may pertain to the effectiveness of CM practices. By the use of case studies, a deeper comprehension of the benefits of homogenization of low-carbon practices is likely to be gained. The issue of why and when organizations diversify their actions concerning the reduction of emission may also become the object of the study. The assessment of diversification of CM practices and the examination of the negative impact of homogenization will contribute to a deeper understanding of their determinants.

6. Conclusions

This study advances the knowledge concerning the homogeneity of CM practices by providing and testing an integrative framework of pressures, homogenization of practices and outcomes (adjustment). The study contributes to the literature by directly discussing the possibility of an institution of carbon management based on the institutional theory literature, by also providing empirical evidence of the existence of this institution in the form of the homogenization of CM practices.

Our results indicate that organizations apply the imitation of practices applied by other organizations, which leads to their homogenization. This is determined by the mimetic and normative pressure. In line with previous studies, the key significance of the coercive pressure upon the source of carbon management cannot be confirmed. The development of isomorphic forms of CM practices is derived from social values and market pressures, and is based upon the imitation of practices applied by successful organizations.

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