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Counting before acting? The performativity of carbon accounting called into question - Calculation acts and *dispositifs* in a big French construction company

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Abstract. The emerging field of carbon accounting, a system based on conventions and designed to measure greenhouse gas (GHG) emissions in companies and organizations, is currently generating interest both in industry and among researchers. The literature has however highlighted the fact that companies' use of carbon accounting has often been limited to public relations practices and has failed to result in low-carbon strategic collective action by companies. This article explores how carbon accounting practices could be performative, that is to say, able to deeply transform companies' practices and strategies. In order to do so, a case study of one specific company, "company V," is examined. In particular, the process of performation through elementary calculation acts – in other words, managerial situations where speech acts are based on a calculation – is considered. We show that calculations based on carbon accounting, if repeated and integrated into a broader strategic *dispositif*, are performative. The contribution is twofold, for we show: first from an empirical standpoint, little-known phenomena pertaining to the actual use of carbon accounting in organizations; and second from a theoretical standpoint, the role of calculation acts in the launching and maintenance of the new form of collective action that a strategic *dispositif* is.

Keywords: performativity, felicitous conditions, calculation acts, *dispositif*, carbon accounting

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INTRODUCTION

> *We responded to a call to tender by "city X" about innovating construction. The aim was to explain the concept of the innovation, but also how to assess it and how to apply it. [Thanks to all the work accumulated on carbon], we told ourselves 'we could propose a zero-carbon building project'. The first thing we wondered was: 'what does zero carbon mean for this specific project?' From that step, our project staff called on a low-carbon consulting company, the company's carbon manager and the R&D managers who were already interested in the stakes around carbon and we began to work on that project…* ("Zero-carbon" project manager of a subsidiary of company V)

This quote is about a building company's attempts to respond to a call to tender for an innovative construction project. The zero-carbon innovating concept was not chosen by chance. Low-carbon transition has become a major societal challenge in order to reach international goals on climate change[1]. The building sector is at the forefront of this issue because it accounts for about 20% of all GHG emissions in France. The project manager was referring not only to an unclear objective about climate change, but also to a numerical value: "zero-carbon." One could implicitly infer that this ambitious project's value depended on how it was measured and verified. The end of the story paid tribute to this initiative because the project was eventually chosen by city X, above many others.

This quote is however not entirely explicit and we had to add the following: "Thanks to all the work accumulated on carbon", found in another interview with the same project manager. This sentence highlights the fact that the "zero-carbon" project is the result of ten years of work in the company to establish low-carbon activities based on carbon accounting for building projects and the exploration of new low-carbon innovations.

The key role that calculation tools play in the initiatives undertaken by company V reflect the international development of carbon accounting. In order to make companies feel more concerned about climate change, for ten years one of the solutions was to create tools and methods to calculate their GHG emissions. The implicit ideas behind the creation of carbon accounting were that, before being able to act, it was first necessary for companies to measure their GHG emissions, and that well-designed measures were necessary if this issue was to be put on the agenda. However, carbon accounting, like social and environmental accounting more generally, seems to have spread primarily because of reporting demands by policy makers, investors and non-governmental organizations, without being a strategic issue for companies (see for instance Bebbington & Larrinaga, 2014; Cho, Laine, Roberts & Rodrigue, 2015)

Before going any further, consider the question of how we define "carbon accounting." More than referring to a corpus of well-defined methods and institutionalized practices such as financial accounting, the term carbon accounting encompasses a set of heterogeneous methods (Stechemesser & Guenther, 2012) whose uses by companies have been studied very little (Gibassier & Schaltegger, 2015). Because of the inability to directly measure GHG emissions, the idea of carbon accounting is to calculate GHG emissions by means of estimations, conventions and conversions between heterogeneous quantified data (from energy to carbon for example). GHG emissions are in fact measured in terms of tCO2e and then shared between different companies' activity parameters. The carbon issue is therefore one of the very few sustainable development subjects that proposes a generally-accepted metric and specific accounting tools.

Accounting calculation tools therefore have a priori an essential property: they mobilize actors through the use of numbers and calculation (Miller, 2001; Revellino & Mouritsen, 2015; Vollmer, 2007). But when it comes to carbon accounting the question remains open because even if there are accounting tools, they tackle an issue whose importance is uncertain for companies. The effects of carbon accounting are therefore

1. Climate change is often summarized in companies by the term "carbon" that refers to the metric used to assess GHG emissions.

unexpected. This question raises the necessity of a precise analysis about the making of strategic practices (Rouleau, 2013; Whittington 2011), which in turn will further our understanding of how actors choose to use carbon accounting's tools and what their concrete effects are. More broadly, the question is linked to one about what is constituted and "enacted" inside organizations through the use of this form of communication: numbers and calculation (Fauré & Rouleau, 2011; Michaud, 2014; Musca, Rouleau & Fauré, 2014). The rare studies that have been done on the actual practices of companies, through the lens of carbon accounting's tools, mention a lack of take up of the tools by companies, specifically when standard advice is given by consultants without any accompanying support (see for example Riot, 2013).

The aim of this article is therefore to study the collective action dynamics of carbon accounting practices inside and outside companies. More precisely, it is to understand whether carbon accounting is able to make climate change present in companies' strategies, that is to say, whether carbon accounting is performative. This problem is closely linked to ADEME's[2] own questions because its objective is to rally practitioners around this issue and to diffuse carbon accounting tools and understand the conditions under which they are appropriated by companies. Carbon accounting is an interesting analytical object because of its potential performativity: it could manage or fail in generating a low-carbon strategy because of the presence or absence of "felicitous" conditions that enable a statement or an object to be performative (Austin, 1975). Its performative potential is a priori undetermined: is its power to mobilize companies enough to overcome political and economic uncertainty? Without having used the performativity concept, cases of failure of carbon accounting have been reported in the literature. Some authors present cases where felicitous conditions were not present (Bowen & Wittneben, 2011; Burritt & Tingey-Holyoak, 2012). While a few studies describe success stories of the performativity of carbon accounting, they fail to fully explain what the felicitous conditions might have been in such cases (Schaltegger & Csutora, 2012; Wahyuni & Ratnatunga, 2015), even when the explicit project was to study the performativity of carbon accounting (Vesty, Telgenkamp & Roscoe, 2015).

This article examines the process by which a low-carbon strategy is performed through the use of carbon accounting tools. The aim is to study the performation process built through calculation acts (Fauré & Gramaccia, 2006, 2006; Fauré et al., 2010) by emphasizing their felicitous (or infelicitous) conditions.

In order to do so, we first present a literature review on performativity, calculation acts and performation. We then provide details about our empirical case study methodology, and following that we explain the results, which describe the process through which carbon accounting has been performative. Finally, we discuss these results and conclude.

LITERATURE REVIEW: PERFORMATIVITY, CALCULATION ACTS AND PERFORMATION

We will first explain the definition of performativity that we have chosen in this article. It is closely linked to the communicational approach to performativity and, more precisely, to work on calculation acts. We will then focus on the study of performation, that is to say, the process by which performativity happens.

2. *Agence de l'environnement et de la maîtrise de l'énergie*, a French public agency whose aim is to spread sustainable practices in companies by acting directly with them (subsidies, ongoing support). It can be seen more or less as an equivalent of the Energy Public Agency (EPA) in the United States. We carried out a form of intervention research with them (David, 2012).

A CONCEPTUALIZATION OF PERFORMATIVITY: CALCULATION ACTS

The performativity concept, first developed in communication work, has evolved considerably from its initially formulation by J.L. Austin (Austin, 1975). At the time, performativity was associated with "speech acts" and more precisely with the ability of some statements to transform reality rather than describe it. The statement's performative dimension thus replaced its solely "assessmentive" one. Currently, five conceptualizations of performativity have been defined (Gond, Cabantous, Harding & Learmonth, 2015), including the communication conceptualization (Cooren, 2004, 2015). From this conceptualization the "communication as practice" (Cooren, Kuhn, Cornelissen & Clark, 2011; Cooren, F., Taylor, J.R. & Van Every, E.J., 2013) approach has emerged, which is the one closest to Austin's work. Whereas Austin was only interested in performativity through speech acts (Fraenkel, 2006), in this communicational approach to the performativity concept, distinctions are made between pure speech acts, writing acts (Fraenkel, 2006) and calculation acts (Fauré & Gramaccia, 2006). Calculation acts are "speech acts based on a calculation" (Fauré & Gramaccia, 2006: 1); in other words, calculations constitute a reality (Fauré 2007; Fauré & Gramaccia, 2006; Fauré & Rouleau, 2011; Taylor & Van Every, 2010). These authors describe the way in which numbers that are used by different actors in calculation, either enunciated orally or written[3], constitute the organization (Taylor & Van Every, 2010). However, only a few scholars in this "communication-as-constitutive" approach have specifically studied calculation acts, and most of their work is based on texts or conversations. If we are to understand narratives and communication process in organizations, we need to consider calculation-based communication, which is key in organizations where tools and numbers play a core role.

Unlike work on financial accounting's performativity (Miller & Power, 2013; Revellino & Mouritsen, 2015; Vollmer, 2007), where the accounting system, numbers and calculation are at the core of the analysis, the emphasis here is on the communicational situation in a broad sense (oral and writing) around calculation acts. It is when they are used in a discourse or text, pronounced in a specific context, with specific actors, that they will take part in the constitution of the organization. More precisely, which role do they play in an organization? They seem to play a role in determining the ratio of power (when they define who has the right to draw up a budget) (Fauré, Brummans, Giroux & Taylor, 2010), in the orientation of action (through the establishment of a unit of measure which serves as a basis for action in an extreme situation) (Musca, et al., 2014), and in mediation (when they create a consensus in the strategic choice) (Denis, Langley & Rouleau, 2006). Their role is, however, still largely unknown in the constitution of an organization (Fauré, et al., 2010): what do they constitute and how? The question is then to reveal the performation during which calculation acts constitute a reality.

CALCULATION ACTS' PERFORMATION IN PRACTICE

After having ignored them for a while, Austin recognized the importance of felicitous conditions (Austin, 1975) and studied them as a key concept for the analysis of performativity, through the analysis of performation processes. Studying performativity has therefore become an inquiry where the goal is less the demonstration of what performs than the

3. For example, during meetings between a management accountant and an engineer, where the pronunciation of the calculation makes either one of the two right.

emphasis on how the performation occurs in practice (Muniesa & Callon, 2009). Today, the performation process still lacks analytical research (Dumez & Jeunemaître, 2010), and none of the work on the subject highlights the difficulty of identifying performation or proposes an analytical framework for doing so.

As regards the calculation acts stream of work, the implicit framework is based on dialogical process analysis (Fauré & Gramaccia, 2006; Musca, et al., 2014) that can be studied in a broader framework if it is not possible to do *in situ* observations. The benefit of performation analysis of calculation acts is that it resolves the current issue of showing how communication concretely constitutes the organization in practice (Ashcraft, Kuhn & Cooren, 2009; Cooren, et al., 2011; Taylor & Van Every, 2010). In order to study performation inside organizations, an analytical framework has recently been proposed to analyze how elementary acts (calculation, writing and speech) mediated by management tools are articulated to strategic and organizational processes forming a "strategic *dispositif*"[4] (Aggeri, 2017). From this perspective, this article focuses on calculation acts only, looking at them in relation to the tools, models and *dispositifs* that enable them to exist, and that they in turn transform.

Revealing performation by way of calculation acts will therefore be highlighted in the article. The research question is thus: what kind of roles do calculation acts play in the performation process inside organizations?

METHODOLOGY

We will successively present the goal of the empirical analysis, the case study that has been chosen, the data collection, and the general analytical process.

GOAL OF THE EMPIRICAL ANALYSIS

The aim of this article is to identify the mechanisms at play when a company has managed to perform a low-carbon strategy with the help of carbon accounting tools. The case study chosen enables us to analyze these practices in depth. Our aim was to select one carbon cutting-edge company that has developed a low-carbon strategy, in order to show how such a strategy was able to be set up. After exploring carbon accounting practices in various companies, with the help of ADEME we identified one because it appeared that carbon accounting in this company was linked to a broader strategic *dispositif*. To be sure of that, we held six preliminary interviews with carbon managers in several companies, in order to confirm the existence of different levels of maturity with regard to carbon, that is, the level of control and diffusion of the carbon issue in the company. We finally selected a mature company that we have called V[5] (see the testimony below of members of ADEME, who confirm that), and conducted an in-depth inquiry on its practices with regard to carbon.

CASE STUDY PRESENTATION

V is a transnational French company in the building sector with about 50,000 employees and an annual turnover of €10bn in 2015. Carbon issue and carbon accounting have existed in this company for ten years.

4. Network arranged toward a strategic aim. The concept will be further explained below.
5. The real name of the company has not been disclosed.

Like other big companies, V began carbon management activities because the building sector is the second biggest GHG emitter (if transportation caused by building is excluded, the industry is the biggest emitter). The stakes are particularly high insofar as this issue is globally disconnected to that of energy (because half of the GHG emissions come from building materials and not from energy used in building), and is therefore new to the company. Yet there is no specific regulation to date that could force building companies to reduce their GHG emissions, even if various regulations are planned at a French and European levels.

In most of the companies that we studied in recent exploratory research with ADEME[6], carbon accounting is more constative than performative. GHG emission calculations rarely lead to concrete steps by companies to reduce emissions. Most of the time, there is little take-up of carbon accounting's tools, which are used only by the carbon manager for public relations purposes. V is one of the only companies that has succeeded in implementing a strategic plan and experiments resulting in coordinated and planned GHG emission reduction activities that override business-as-usual. There truly is a kind of low-carbon strategy at V. The next question is: how has carbon accounting participated in the performation of such a low-carbon strategy?

DATA COLLECTION

ADEME has participated in the diffusion of carbon accounting since the early 2000s, and to that end it has surrounded itself with companies which it closely supports. During the exploratory research done with ADEME, we attended eight meetings between various actors (carbon managers in companies, officials from the French ministry of the environment, members of ADEME), with whom we held twenty interviews. This enabled us to assess the different levels of maturity regarding the carbon issue. As one of our ADEME interviewees explained:

> *There is a dichotomy between companies, some of them are very advanced and have understood very well that the carbon issue is much more than only a senseless regulatory constraint, whereas others have not yet understood the stakes. You'll see that during our next working group meeting on carbon accounting. At companies V, W and Z, for instance, there is real internal expertise.* (Carbon expert at ADEME).

We were able to confirm this assessment by attending the meetings over a period of eighteen months: from October 2014 to February 2016. The purpose of these meetings was to discuss new regulations about carbon accounting, the transfer of good practice concerning carbon accounting and management, and the take-up of carbon accounting in various industries. During these meetings, we met executives from companies that we were told were cutting-edge in terms of carbon accounting's strategic use. We thus identified V as one of the most advanced in terms of strategic practices. After a few interviews with the carbon accounting manager, he put us in contact with other members of the company who had played a role in the process, and we met with all of them. To date, we have held semi-structured interviews (that have been fully transcribed) with seven individuals who have taken part in the process (the carbon manager in a subsidiary, carbon accounting's first creator and

6. This research started in April 2014 and is still ongoing on various issues.

expert, the R&D project manager in a subsidiary and carbon referent, a sales manager in a subsidiary, the head of environment strategy in the sustainable development department, a "low-carbon" project manager, and the carbon reporting manager: see Table 1). We also had access to documentation on the subject, especially various types of softwares that model carbon accounting for different subsidiaries, presentation documents for carbon strategy, and training documents about carbon issues.

We met the manager of V's main materials supplier, who explained how a partnership between V and his company had led to the development of a low-carbon concrete. We furthermore interviewed the manager of a low-carbon label in the design of which V had taken part, V's main carbon consultant, a carbon expert at the CSTB (the scientific and technical center of the French building industry)[7], and some of V's customers (those that had asked for low-carbon projects).

7. Centre scientifique et technique du bâtiment

Actors interviewed	Date	Duration
Carbon accounting manager in a subsidiary of V, who first instituted carbon accounting and convened the carbon committee	14th October 2014 3rd December 2014	60 min 120 min
Carbon manager in a subsidiary of V	12th March 2015	90 min
R&D project manager and carbon referent at V	12th March 2015	90 min
Head of environment strategy in the sustainable development department at V	16th April 2015	90 min
Sales manager at a subsidiary of V	13th May 2015	90 min
Carbon accounting manager in a subsidiary of V, who first instituted carbon accounting and convened the carbon committee	13th October 2015	60 min
"Low-carbon" project manager in a subsidiary of V	12th February 2016	120 min
Sustainable building manager at a supplier of V	2nd March 2016	100 min
Corporate carbon reporting manager at V	7th September 2016	80 min
Manager of a low-carbon label for the building industry	29th September 2016	40 min
Town councilor for town planning in a big French city	6th October 2016	60 min
Project manager for town planning in a big French city	11th October 2016	35 min
Sustainable development referent at the town planning department in a big French city	11th October 2016	30 min
"Low-carbon" project manager in a subsidy of V	12th October 2016	60 min
Carbon consultant of V for the "zero-carbon" project	21st October 2016	105 min
Carbon expert at the French scientific and technical center for the building industry	8th November 2016	60 min
Carbon accounting manager in a subsidiary of V, who first instituted carbon accounting and convened the carbon committee	8th March 2017	60 min

Table 1 - Key actors interviewed to understand the low-carbon strategy process at V

By the end, we had held 15 semi-structured interviews to understand the case of company V. Prior to that we had taken part in eight meetings involving ADEME and about fifteen other carbon managers, which enabled us to compare different practices.

We then presented our understanding of the process to the initial carbon manager at V, who approved it. We additionally sat in on about 20 meetings organized by ADEME, attended by carbon experts, and interviewed more than 20 other carbon experts (NGO members, consultants, researchers, company experts, regulation actors). This context enabled us to make an assessment of the carbon management ecosystem and to be aware of other private or public initiatives, some of which had had consequences on V's activity (changes in reporting standards, future regulations, etc.)

GENERAL ANALYTICAL PROCESS

In order to study the performation of calculation acts (the way in which calculation acts' performativity occurs), we need to explore the process by which a statement based on a calculation could have produced a reality (but could not have happened without felicitous conditions), starting from calculation practices and oral use of these calculations. The notion of "process" implies temporality and an inquiry has to be made to understand what has been constructed between the actors and between the different levels of the organization.

To do so, we have used the "management situations" concept that "*occurs when participants are gathered and have to accomplish, in an allocated time, a collective action leading to a result subject to an external assessment*" (Arnaud, 2007; Girin, 1990: 2). This has enabled us to select and describe situations where calculation acts are made. We have thus paid attention to situated discourse analysis, particularly when calculations were stated, and to the documentation and tools where calculations were used.

We have used this method to shed light on the way in which carbon accounting was used to make the carbon issue important in a company; in other words, how it enabled a low-carbon strategy to be implemented.

RESULTS: CARBON ACCOUNTING'S PERFORMATION INTO A LOW-CARBON STRATEGY AT V

In order to recount the performation process at V, we have reconstructed the history of the process in which carbon accounting was implemented in the company, and its effects. We have broadly identified three main steps for three management situations involving carbon accounting: a first step of carbon accounting's *bricolage*; a second step consisting in the creation and deployment of a strategic *dispositif*; and a third and last step of growth of this strategic *dispositif* inside and outside the company (see Figure 1).

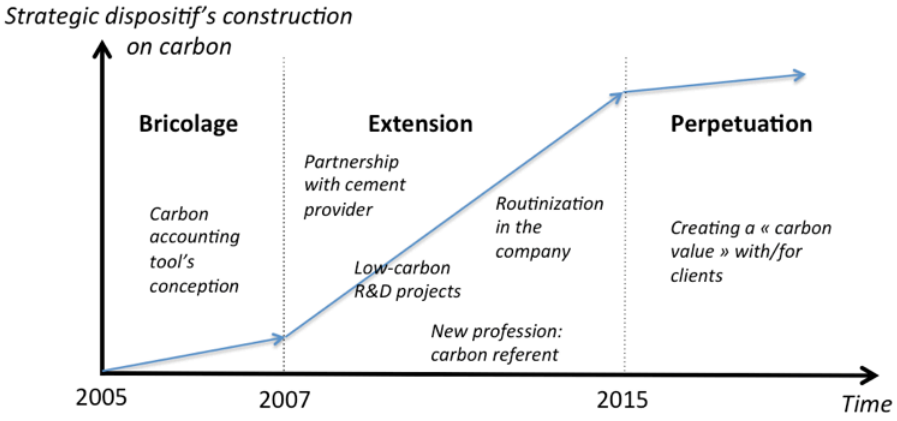

Figure 1 - Performation's steps for the carbon issue at V

BRICOLAGE OF CARBON ACCOUNTING

Since the 2000s, V, like other building companies these days, has been concerned about sustainable development. It has therefore hired employees with the skills to undertake projects to deal with this issue. One of V's subsidiaries in the provinces, whose core trade is building (as opposed to other public works for instance), decided in 2005 to hire a carbon accounting expert, even if his mission was not directly dedicated to carbon accounting because he was asked to work on sustainable construction more broadly. At the time, the carbon issue did not exist as such at V, or at its subsidiaries. There were therefore no tools that could be used to measure carbon. But following an engineer's logic where calculation helps in decision-making, the expert began to create a small internal tool based on that of ADEME[8]. Using an R&D budget that had been allocated to him, he began to do carbon accounting for a few building projects. Then, in 2007, worried about the levels of GHG emissions in the industry, and expecting future regulations in this respect, the general management of the holding company to which V belongs decided to encourage all its companies[9] to take an interest in this issue. The newly hired expert was therefore noticed for his competencies in carbon accounting and was put in charge of setting up a carbon accounting system, from the initial diagnosis of GHG emissions to its systematization to all subsidiaries. After an extensive inquiry in all the subsidiaries, designed to understand each one's individual situation (individual or collective new premises, renovation, offices, tunnels, bridges, etc.), the expert concluded that in order to reduce GHG emissions in a company where activity could be divided into many construction projects, it was necessary to mobilize field workers and particularly project managers. The idea was that they be invited to propose building projects that would release fewer GHG emissions than a traditional project. To do so, they needed an appropriate tool. The carbon expert had understood that the main characteristic for such a tool was that it had to be job-oriented, easy to use, and implemented quickly.

8. The Bilan Carbone on which he had previously worked extensively before being hired by V. The idea rests on being able "to count in order to act".
9. Not only those in the building industry.

> *The average project turnover at V is a few million Euros and we have about 300 projects a year. If it took 15 days for the engineer to do his carbon accounting, this idea would have been given up immediately. In order to ensure that the tool was used, it had to be simple.* (Carbon accounting manager in a subsidiary of V, who had first instituted carbon accounting)

In order to develop the first carbon accounting tool[10], the expert surrounded himself with about 20 volunteers from different subsidiaries and one consulting firm. The experimental work carried out for pilot projects lasted a year and aimed at configuring the tool with existing figures, particularly for activities that represented too small a proportion of GHG emissions, and therefore did not warrant time spent on calculation. This pedagogical process thus enabled the volunteers to define calculation conventions (e.g. the volume of GHG emissions to be used per ton of concrete) and learn where the main GHG emissions came from on a typical construction site. All the tool design efforts were directed at its simplification to make engineers use it in the shortest time possible. Therefore, in order to calculate the GHG emissions of the construction materials, which were the main source of GHG emissions (as V workers has discovered, thanks to the tool), users had only to input categories and quantities of materials (concrete type, steel, wood, etc.) that they had quantified during the design stage of the project in order to get an overall assessment of the building project's GHG emissions. They were therefore able to think about GHG emissions before the construction and were thus able to reduce them.

The tool was then tested on a broader scale, and subsequently improved. The calculation time of GHG emissions was gradually reduced to 30 minutes for trained workers. This meant that calculations could be done at different maturity stages of the project, depending on customers' needs.

"*The first time that we tried to do carbon accounting, it took six months to get the data: 'this truck comes from…*" (Carbon accounting manager in a subsidiary of V, who had first instituted carbon accounting).

After this first stage, at the end of 2007, a carbon accounting tool prototype was ready for testing throughout the company.

DESIGN AND EXTENSION OF A STRATEGIC *DISPOSITIF*

From that time, in early 2008, once the tool had been implemented, the expert and his colleagues were asked to propose solutions to reduce GHG emissions. They therefore set up training on use of the tool for volunteers in each operational unit of each subsidiary. This had the effect of spreading the approach at V. It was not only project managers and R&D managers, but also salespersons who were trained in the method and shown how to complete missing data in the tool by using the price list drawn up during the design stage of the construction project. They could thus at this early stage assess the GHG emissions of the construction project. About 120 employees underwent the three-day training in the first two years. The first results released on new projects' carbon accounting showed that one of the main GHG emission sources was materials in general, and concrete specifically. V therefore decided to buy concrete that would emit less than the average, and to that end it worked with its main provider on designing a new material to meet this requirement:

10. This design followed the work already begun in his subsidiary of origin.

> *We worked with a concrete provider on low-carbon concrete. We went to see them and said: we have to work together on the issue, and then we waited for a year for our lawyers to agree and once that was sorted out we were able to introduce low-carbon concrete in pilot projects.* (Carbon accounting manager in a subsidiary of V, who first instituted carbon accounting)

As noted above, training sessions also catered for salespersons. The importance of introducing them to the approach was that it enabled them to objectify their discourse about carbon, based on carbon figures, to make potential customers aware of the variant's design effects. In doing so, V could stand out compared to competitors that did not use this type of approach. Salespersons did indeed confirm that calls to tenders usually had one "environment/quality" criterion that accounted for about 15% of the total score used to classify the different proposals, but very few asked for quantified data on carbon. Before submitting their commercial proposals, salespersons usually carried out consistency tests proposed by the tool, by comparing the construction project for which they had calculated GHG emissions with a standard construction site, to check if the amount of GHG emissions calculated was similar to the standard calculation. If the customer insisted on the importance of environmental criteria, V salespersons could thus propose low-carbon options at the meetings held before the submission of the commercial proposal. In order to do so, they relied on the competencies of the operational unit's technical manager and on the R&D manager to study the technical feasibility, the expected GHG emission reductions, and the extra costs induced by the low-carbon options that could be proposed to customers. The salesperson therefore began a discussion with the customer by submitting a commercial proposal in which he or she had to demonstrate that the proposed building project would be the best in terms of the customer's requirements. As each differentiating element was necessary, the arguments on carbon were developed from the salesperson's knowledge on the subject. In this respect, he or she knew which customers would be more sensitive to this issue and on whom the carbon-related arguments might have the greatest impact. The goal of this discussion was to differentiate V from competitors, by having figures that could push the commercial proposal:

> *We have very few signals from customers. On the sustainable development side, they usually say: 'explain to us how you suppose to reach the twelve targets?' And so we explain for example in the proposal what we do about construction site acoustics, water management, carbon management, etc. To be differentiated, we stated in a proposal that we'd use only low-carbon concrete because we technically had the possibility to do so on this specific issue. It was an R&D initiative, they assessed the project and told us that it was possible for the same cost. So we proposed that to the customer. The carbon criterion doesn't matter a lot but for some customers it does, and for these we try to be differentiated.* (Sales manager at a subsidiary of V)

In 2009, V tried to diffuse its internal tool outside the company in the hope that it would acquire the legitimacy necessary for approval of the method by customers, who would then be more likely to approve the conclusions based on the tool in the commercial proposal. V asked

ADEME and CSTB for their support, and a sectorial working group was formed to define calculation conventions used in the construction industry.

At the same time, a new organizational level was created at V: carbon referents were designated in each of the 50 operational units constituting V. Their role was to facilitate the carbon approach and they all chose this activity on a voluntary basis. This was a result of the decision of carbon accounting's creators to delegate on a local scale the day-to-day implementation of this approach, so that it would be taken up in the field. As for carbon accounting's creators, they also decided to monitor general indicators, improve the tool's database, and experiment with low-carbon solutions for construction, at the general management level. They thus created the most relevant indicators possible in terms of monitoring and day-to-day management, such as $kgCO_2/m^2$, business trips for employees, and indicators per material: concrete, wood, etc.

> *Our role at the general management is to maintain the tool up to date, to develop the carbon activity, to train workers, to hire new workers on that subject, but the daily monitoring is left to the carbon referent.* (Carbon reporting manager in general management at V)

In addition to their operational activity, carbon referents meet a few times a year at carbon committee meetings. The carbon committee, under the aegis of the innovation division, consists of carbon management and accounting experts from the sustainable development division, and managers from public relations. The aggregation of GHG emissions of all the operational units is presented, as well as innovative solutions that some operational units might have proposed in projects. For instance, one project that used low-carbon concrete was presented at a carbon committee meeting both for being able to inspire other carbon referents and for being introduced into V communication. R&D projects were presented with a view to obtaining grants from the general management. In particular, the question of the use of new materials such as wood or steel was introduced, as they would require profound changes to the traditional building process at V, which relied mainly upon concrete. One carbon committee member explained their own experience:

> *We have to be persuasive on an issue where signals are not very constraining: regulation does not help us, we don't have strong signals from the international context; energy prices are low, so the carbon issue is no longer as fashionable as it was in 2009. So the carbon committee has to pass the message to field workers that 'this is important, we have to take that route'. Even if we don't have the legitimacy to continue now, we're beginning to notice weak signals that are put out by carbon referents. We rely on these weak signals and we try to innovate. There has been this work about low-carbon concrete. We dared to do that! We had to insist: 'we will make low-carbon concrete and we will decrease GHG emissions by 2% a year thanks to that!' Even if it's not easy, we have to keep on having a carbon committee when we don't have any regulatory constraints or any strong demand from customers. We have to look for weak signals and anticipate because we've noticed that investors are a little interested in the issue, a few customers already want to have low-carbon projects. And in Great Britain for example, they're ahead of the times in this respect.* (Head of environment strategy in the sustainable development department at V).

> *For R&D, we've studied wood and steel projects, all those kinds of solutions. We've calculated and looked at the benefits of these solutions, in relation to construction techniques, project costs and tons of carbon saved.* (Carbon accounting manager in a subsidiary of V, who was the first to institute carbon accounting)

The carbon committee has thus become a place where new low-carbon R&D projects are discussed and where the discourse is constructed in order to prove that the company will keep on counting carbon and proposing low-carbon solutions to customers, hoping that this criterion will differentiate V from its competitors. The carbon committee also takes part in the construction of discourse for the general management, in innovation, marketing and public relations division.

Public relations management has therefore been considered an important part of the development of a strategic *dispositif*. The repetition of carbon accounting information legitimizes the discourse that distinguishes V from competitors in customers' eyes. The importance of carbon figures has such potency that communication strengthens the salespersons' discourse in their commercial proposals. These two scales (field level and management level) complement each other in making the carbon issue exist:

> *We're an engineering company for which figures are important but they're so surrounded by uncertainty that we first needed to keep improving carbon accounting. And the best way is to count each year. Even if the assessment is blurred, it is relevant. From one year to another, we can see that we haven't been mistaken and so the source we have to consider in order to reduce GHG emissions is the right one. And we communicate on that, on the GHG emissions that are consistent with our job. And it matters. For instance, low-carbon concrete, if we hadn't done communication on GHG emissions due to materials, we wouldn't have spoken of low-carbon concrete and no customer would have asked us for low-carbon concrete in their project. We try to be as transparent as possible in spite of the uncertainty but overall we try to be consistent with our sector issues where all our GHG emissions are largely contained in materials. This enables us to have the same discourse with the customers: 'we want to sell solutions to reduce your carbon footprint', and we can do that only if we calculate GHG emissions correctly.* (Head of environment strategy in the sustainable development department at V).

A regulation on the carbon issue was passed in 2012: law L 225-102-1 in France's commercial law that requires all major listed companies to communicate in their external reporting on at least one carbon indicator. This regulation prompted V's management to ask for formal reporting of data. For construction projects, the work was mostly done because all project managers already had the possibility to assess the construction project's GHG emissions, thanks to the tool. The only additional step was to make it compulsory if the call for tenders was awarded. And because V's subsidiaries' construction projects accounted for 90% of all of its GHG emissions, the same kind of assessment had to be done for the remaining 10%, that is, GHG emissions released by the parent company.

By the 2010s the approach had largely spread across the company: calculations were done routinely (a diffusion indicator had been created for measurement: the turnover covered by projects for which carbon accounting was carried out was over 90%), and the various strategic links in the *dispositif* chain (carbon committee, carbon referents, general management) maintained strategic urgency around the issue. An R&D manager testified to this routine and take-up:

> *The tool that I presented to you is the one that I developed myself from the one proposed by the general management. I wanted to become familiar with it. GHG emissions release in the form of little synthetic records. Because we do GHG emission assessment before the choice of the building project, we generally give customers the conclusions of the records with the commercial proposal. We do that optionally because I thought that customers were unaware of what these emissions could represent. For instance, if we tell them that there is 200kg of CO_2 for one m^2, that's not meaningful to them, it doesn't speak to them. So I've adapted my records by doing a graph that represents better the proposed construction project's emissions with their criteria. Salespersons implement the data and assess the GHG emissions, and I know that they do that because they come and ask me questions when they can't manage to implement it or if it gives an unusual result. But apart from that point, I don't have much feedback on what the customers want, I don't even know if they're sensitive to this issue. But there have been major projects in our operational unit where customers have asked for low-carbon concrete and have demanded justifications once the project has been completed, to prove the reduction of GHG emissions. We've then talked about that during the carbon committee meetings. (*R&D project manager and carbon referent at V)

This R&D manager developed his own tool so that he could really be familiar with it and discuss GHG emissions levels with salespersons when there was an abnormal figure, to explain it. Assessments were popularized and integrated into the commercial proposal so that discussion with customers would be based on calculations. Even when there was no initial demand for carbon reduction, the sales staff sometimes managed to convince customers of the importance of the issue and to introduce GHG emission targets for projects. At this point the tool was used to choose between low-carbon options that enabled the company to comply with the GHG emission levels set.

By 2015, after 12 years, we can consider that the approach had been institutionalized at V. But after experimentation and its application in projects and throughout the organization (see Figure 2), the goal was to move forward by setting a new challenge: big actions that give relevance to the existing low-carbon strategy and maintain it. This is the third stage: the perpetuation of the strategic *dispositif*. The following testimony sums it up:

> *The initial idea behind the carbon accounting project was to have an approximate size of what we were talking about. We had two goals: to know the global amount of GHG emissions, project by project, in order to define relevant indicators, and also, to know the repartition of the GHG emissions by source: are materials or energy or transportation the biggest emitters? We have to count before*

> *knowing and to know before acting. Without that, we can undertake actions but do things that don't matter. The use of the tool has been more important: it is no longer used only by R&D technicians but also by production units. It's really something that's anchored throughout the process, for each project, GHG emissions are calculated. Now that we've done that, we absolutely want to make the approach keep on existing and people using it routinely. (*Carbon accounting manager in a subsidiary of V, who has first instituted carbon accounting)

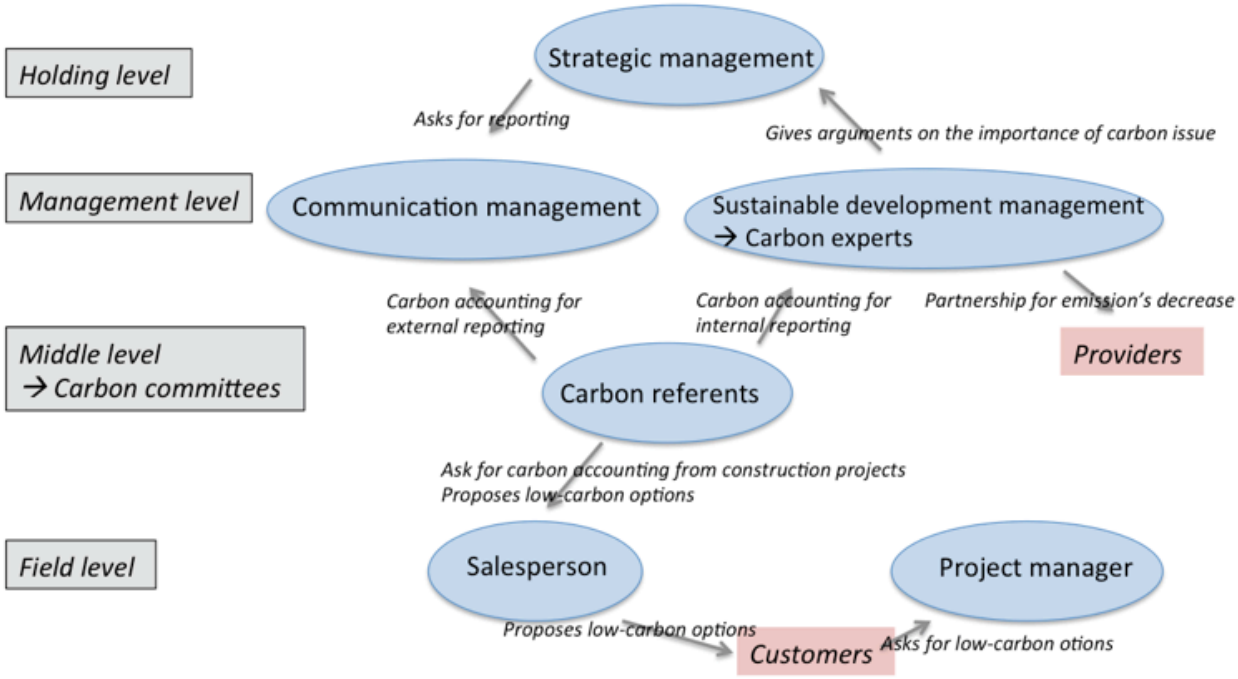

Figure 2 - Link with the different management situations where carbon accounting is practiced

THE CHALLENGE OF THE PERPETUATION AND EXTENSION OF THE STRATEGIC *DISPOSITIF*

In 2015 the new strategic orientation adopted by V's main carbon approach actors was to maintain the approach by stimulating the various links in the *dispositif*. The goal was to continue to fuel interest in the carbon issue and therefore internal competencies in that respect, and to transform weak signals into strong ones. The questions facing the company were: How to go further in the implementation of low-carbon projects? How to extend the strategic *dispositif* inside and outside the company? In order to do so, the company launched several initiatives. First of all, carbon experts tried to boost the creation of new R&D projects in which new low-carbon innovative solutions could be tried and tested. An internal carbon tax project was devised in order to stimulate GHG emissions reduction between subsidiaries. The amount gained could be redistributed to the different subsidiaries or could subsidize low-carbon options for customers.

Carbon managers also envisaged extending the strategic *dispositif* outside the company by making stakeholders more interested in the project. If V was the only company with a low-carbon approach, it had little chance of remaining in business. That was why two of V's stakeholders were identified by the company as crucial: regulators and customers. V had to convince regulators to adopt strong regulations on carbon, and had to make customers demand low-carbon projects.

At the regulatory level, V took part, with other companies in the building industry, in the creation of a label (the BBCA[11] label), for the purpose of certifying low-carbon emission projects. This label was officially registered in 2015 and was intended not only as a sign of quality for future building projects, but also to prepare future regulations, which are now being drawn up by the CSTB. V thus not only monitored regulations but was also proactive in their creation.

At the customer level, V wished to identify "advanced" customers that wanted to undertake ambitious low-carbon projects and that would therefore have a snowball effect on other customers. It was crucial to make such customers interested in the carbon issue if they were to be convinced of the strategic value of carbon, both outside and inside the company. V therefore set up co-development pilot projects with customers in order to explore low-carbon value. Customers do not yet know the technical and methodological dimensions of GHG emissions assessment, so one of the projects was to train them in that respect and to structure a discussion on technical solutions based on figures and calculation.

In 2016 an opportunity appeared: a huge call for tenders from the government of a big French city was launched. The goal was to select about 30 big architectural projects, and the call was very broad as the only criterion was to propose an innovation. V decided to propose a zero-carbon project. This breakthrough project was a showcase for V: remarkable design efforts were made to test technical solutions devised by the R&D department. Various low-carbon options were explored and calculated, using the carbon accounting tool. Results were discussed with projects stakeholders (consulting firm, investors) before being integrated into the proposal submitted to the customer. The selection committee was finally convinced by the project that had been chosen. For carbon managers, it was a big success with huge symbolic value, summed up by the zero-carbon project manager as follows:

> *The only criterion was to be innovative. There was inevitably an environmental issue on which we had to say something. And we'd thought that in order to be differentiated, we had to specify it in the title of the project directly, because of course every project will propose a plant-covered roof, energy efficiency, biodiversity, in any case. We really wanted to show our will, which is why we announced a zero-carbon project, then there were discussions with the customer and before the final commercial proposal, they told us: 'Ok, we've understood your intention to do zero-carbon but you have to give details about how you plan to go about doing that'. From that date, we really clarified things and we did practical things. We defined inside the project team the perimeter of what we had to count to reach a zero-carbon project. So the first thing we wondered was 'what does it mean for our building project to be zero-carbon?' I'd been helped by the first carbon expert of V and by a consulting firm. The two main sources of GHG emissions were building*

11. "*Bâtiment bas carbone*" = low-carbon building whose label is a reference to the BBC label which means low-energy building. In France, the BBC label has been a big success.

> *materials and energy consumption during the building process. We thought of ways we could reduce GHG emissions for the construction stage, then for the use stage. The problem was concrete, which caused a lot of GHG emissions, so we wondered what we could do about that. We worked on construction with wood and low-carbon concrete that enabled us to reduce GHG emissions. We went inside the calculation model on which we'd worked with the consulting firm, we worked with rough estimates to see the amount of reduction we could obtain for each GHG emission's source, and we tested options, for example solar panels. Investors trusted us by agreeing to finance the project. And finally, we were awarded the project.* ("Low-carbon" project manager in a subsidiary of V)

The French city was particularly interested in V's building project for two reasons: first it was an exemplary model that had never been done before and which symbolized commitment to tackling climate change; second, the city hoped to learn from this experiment. It had committed to a very ambitious climate plan where GHG emissions reduction in building projects was a major aim. Through this experiment, it hoped to learn how to assess low-carbon projects in order to write building specifications better in future calls to tender and contracts. The question of the GHG emissions calculation methodology was therefore an important choice criterion in the selection of the zero-carbon project proposed by V.

Through this important example, V hopes that the media coverage of this project will generate snowball effects for other private- or public-sector customers. The company hopes that carbon will be an important new value for building projects.

DISCUSSION

On the basis of an examination of all the management situations we can affirm that carbon accounting is a practical phenomenon that is present in many decentralized calculation acts at V. Calculation is used in discourse, written or oral arguments and commercial proposals through which the company makes commitments to its customers. Calculations have been spread and routinized, and have produced concrete strategic effects, for example when they induce a change in the choice of materials (from concrete to wood): calculations thus enact low-carbon strategy. We note that initially calculation acts were kept up despite the lack of strong signals that could legitimize this approach outside the company. However, calculation acts are not free-standing. From our point of view, what gives them their performative force is their repetition over time, and their arrangement in a system of interdependent consistent activities. This article thus proposes a significant contribution on the role of calculation acts in performation (Fauré, et al., 2010), and a secondary methodological contribution about how to analyze strategizing (Rouleau, 2013).

THE ROLE OF CALCULATION ACTS IN THE PERFORMATION OF CARBON ACCOUNTING

The presentation of the routinization of the carbon accounting approach at V enables us to highlight the importance of calculation acts in strategy performation. Calculations made by means of the carbon accounting tool become performative because they perform at three levels: first, calculation acts *make the carbon issue exist* in field workers' actions (by being repeated at different times, in different management situations of

commercial proposals, discussions with customers or contracts); second, calculation acts have effects on customers and other stakeholders by performing GHG emission reduction actions (when they enable low-carbon projects to be demanded or practical targets on the issue to be set); third, calculation acts have effects at a strategic level insofar as they *transform the company's strategy* by taking part in the emergence of a low-carbon strategy.

With their repetition, calculation acts play a role that is both static and dynamic, first in the introduction and then in the maintaining of the strategic *dispositif*.

This second role (maintaining the strategic *dispositif*) can be observed when calculation acts stimulate the strategic *dispositif*. The empirical analysis has enabled us to show that, in addition to calculation acts, an arrangement of heterogeneous elements (discursive, material, organizational, human and cognitive) has been formed towards a strategic goal. Thus, calculation acts may be more than spoken or written acts, integrated into a materiality that is central in the organization's constitution in which tools and figures are highly structuring. Being interested in calculation acts enables one to study the role of materiality in communication (Ashcraft, et al., 2009). From Michel Foucault's perspective, which has been followed by others, we propose to call this activity of agencing an elaboration of a "strategic *dispositif*"[12](Aggeri, 2014, 2017; Foucault, 1994; Moisdon, 1997). Once this activity of agencing has occurred, the strategic *dispositif* can be developed in time and space, that is to say, in many management situations. The extension of the strategic *dispositif* from inside the company (calculation by project managers, salespersons, carbon referents, R&D projects, carbon committees, carbon reporting, etc.) to outside of it (low-carbon label, sectorial working group, CSTB and ADEME initiatives and regulation, relationship with customers and providers, etc.) reinforces the strategic dispositif, as well as calculations. The strategic *dispositif* frames calculation acts and provides them with cognitive and discursive resources that enable them to have meaning. As Foucault said, a *dispositif* is a fragile construction because it results from many initiatives built step by step by many actors facing new problems. The elaboration of a *dispositif* consists in a vision of strategy making, not as a planned activity by directors, but as an engineering activity by many actors at different levels. The strategy is created from strategic emergency; it is initially vague and then evolves in relation to the effects that can be observed once it has been experienced[13].

This arrangement or *dispositif* creates felicitous conditions for decentralized and repeated calculation acts to perform a low-carbon strategy instead of being meaningless. Conversely, we can assume that the reason why carbon accounting does not lead to a low-carbon strategy in other organizations is the lack of a *dispositif*. The answer provided by our analysis to the question "what is the role played by calculation acts in the performation process?": calculation acts play the role of originator and upholder of the strategic *dispositif*. Performation occurs thanks to a dual process: repetition of calculation acts during management situations, and creation of a strategic *dispositif* that gives them meaning. Without repeated calculation acts, the *dispositif* is a hollow shell, but without a *dispositif*, calculation acts are meaningless for the actors.

12. The strategic *dispositif* is formed by discursive elements (directors and experts' discourse, mission statements, strategic notes, R&D files, legal and commercial documents, tool instructions) that make explicit the conditions upon which carbon can be important for customers and for various activities of the company or other stakeholders. The strategic *dispositif* also includes material elements (places where committees meet, databases, computers, tools and models) that are the infrastructure of calculation acts, as well as organizational elements (structure, job instructions, formal process and all practical relations between actors). Finally, the strategic *dispositif* integrates cognitive and human elements (actors involved in the making of this carbon strategy, competencies about carbon accounting tools).

13. This strategy creation vision is linked to that theorized by the strategy-as-practice approach. See for example: Whittington, (2011) and Rouleau, (2013).

HOW TO MAKE THE PERFORMATION PROCESS VISIBLE?

One interesting point is that several actors at V do not consider that carbon is a strategic priority in their company. There are two reasons for this: a strategic *dispositif* about carbon is still fragile and can disappear if not maintained by the repetition of calculation acts; and its visibility is not easy to notice without the work of researchers. Giving visibility to this performation process and felicitous conditions is therefore important (Fauré & Gramaccia, 2006; Musca, et al., 2014). This problem is linked to that of the "as-practice" approach concerning the trickiness of revealing practices (Rouleau, 2013). We have to know how to observe practices of strategy that take part in strategy performation. On a methodological level, we propose describing this performation process by identifying management situations (Girin, 1990) during which performation occurs, and that enable us to accurately describe practices.

CONCLUSION

First of all, this article shows a new link between studies on "strategy-as-practice" (see for example Whittington, 2011), and those about "communication-as-constitutive" (see, for example, Cooren, et al., 2011), by showing that calculation acts are involved in strategy making through the elaboration and maintenance of a strategic *dispositif*. Unlike previous works on calculation acts (Fauré & Gramaccia, 2006; Musca, et al., 2014, etc.), this analysis is based on interviews that reconstruct past events in the form of management situations instead of dialogical processes. This methodology broadens the usual methods in this approach.

The analysis of calculation acts at V has enabled us to highlight two main points. First, we have been able to observe many different calculation acts, whose performativity depends on their repetition over time, in relation to a low-carbon strategy. Second, these calculation acts are not free-standing; their performativity relies on internal or external felicitous conditions. Obviously, the predominance of weak signals over strong signals is a weakness in the development of low-carbon strategies. We have identified that these external fragilities can be offset by a strategic *dispositif* that aims at framing and giving meaning to calculation acts. These *dispositifs* thus constitute a compulsory felicitous condition for the performativity of calculation acts, without which they would be meaningless and lack the legitimacy and resources required for their realization.

The performativity of carbon accounting is a huge problem with regard to the heterogeneity of the methods, tools and practices concerned. In this article we have limited the inquiry to the study of calculation acts implied by carbon accounting in practice. As reframed, the research question consists in wondering what the effects of these calculation acts in companies' practices are, and their ability to make carbon exist in commercial proposals, R&D projects, customer decisions or companies' strategies. We have thereby shown that under certain conditions (the repetition of calculation acts and the fact of having a *dispositif*), carbon accounting actually is useful in the creation of a low-carbon strategy. This conclusion could in a way cause us to reconsider assumptions on organized hypocrisy (Cho, et al., 2015) or, more broadly, on the unhinging of discourse and action (Neu, Warsame & Pedwell, 1998), which is often equated to the fact that GHG emissions are constantly increasing worldwide. This article therefore invites other scholars to deepen the

analysis (Gibassier & Schaltegger, 2015), inside and outside of companies, of carbon accounting practices, in order to understand their actual effects and, more broadly, the concrete actions that they involve.

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