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The effect of clean development mechanism projects on human resource management practices in Brazil

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Abstract

Purpose – The clean development mechanism (CDM) project is a cost-effective instrument to reduce greenhouse gas (GHG) emissions and to transfer technology and capital from industrialized to developing countries. HRM practices are important sustainable development co-benefits of CDM projects and Brazil is the third largest CDM project developer in the world. The purpose of this paper is to analyze the HRM practices declared by Brazilian CDM projects and how these practices have been, in fact, implemented by the proponents of these projects.

Design/methodology/approach – A mixed methodology was developed, based especially on qualitative and quantitative methods, in the Brazilian context.

Findings – The authors found that CDM activities are improving recruitment, human resource participation and training practices in Brazilian companies, influencing the integration of environmental management into HRM practices – green HRM. In addition, the study presents hints of interesting avenues to explore in further studies. For example, why is it that some organizations are able to change the routines associated with organizational learning and/or culture while others are not.

Originality/value – The overall results suggested that there is further potential within GHG emissions reduction projects to improve green HRM.

Keywords Climate change, Brazil, Human resource management practices, Clean development mechanism

Paper type Research paper

1. Introduction

One of the most serious global challenges our societies are facing is the need to reduce greenhouse gas (GHG) emissions that lead to climate change (UNDP, 2007). The current dominant global climate policy approach relies on a framework that was generated by the Kyoto Protocol, in which clean development mechanism (CDM) projects are one manifestation (Holman *et al.*, 2009). CDM has been embraced by governments and the private sector alike, and it provides a new channel for green investment. To date, CDM has supported more than 7,500 projects in over 70 countries that represent investment that helps to lead developing countries onto a low carbon development path and away from the lock-in of high carbon technologies (Fernandez, 2014).

CDM allows entities from developed countries to carry out GHG emission-reducing projects in developing countries, and generate tradable carbon credits, called carbon

emission reduction (CER), which correspond to the volume of GHG emission reduction that the projects achieve. Within this context, CDM has gradually gained prominence as an important instrument of carbon management within the EM agenda of corporations (Kolk *et al.*, 2008; Pinkse and Kolk, 2012; Ventura *et al.*, 2012).

Even though the generation of green jobs and other HRM practices are considered important sustainable development co-benefits of CDM projects (Olsen and Fenhann, 2008; UNFCCC, 2011; Fernández *et al.*, 2012), so far, there are only few studies in the literature that analyze the relation between HRM practices and EM instruments (Renwick *et al.*, 2008).

In order to contribute to the literature, this paper tries to answer the following two research questions:

RQ1. What do CDM project proponents declare as HRM practices that would be taken into account during the implementation of the projects?

RQ2. Are these HRM practices actually being implemented by CDM projects?

Thus, this paper aims to analyze the HRM practices declared by CDM projects and how these practices have actually been implemented by the proponents of these projects. To address this goal, the research is focused on Brazil, the third-largest CDM project developer in the world. The country is characterized by exceptionally high mitigation potential, a well-organized institutional CDM capacity and good investment climate (Jung, 2006).

In order to respond to the first research question, we have carried out a desktop analysis on HRM practices informed by Brazilian companies that develop CDM projects in their mandatory Project Proposal Document (PDD). To respond to our second and last research question, case studies have been performed through triangulation among in-field observation, PDD desktop analysis, and interviews.

The paper is structured as follows. Section 2 provides an overview of the state of Brazilian CDM projects; Section 3 presents: a literature review of what has been done in terms of HRM practices concerning the environment, and more specifically, regarding climate change issues; a framework to analyze HRM practices within companies that have implemented CDM projects. Section 4 shows the research methodology; Section 5 discusses the results; whereas, Section 6 summarizes the major conclusions of the paper and the implications for future research.

## 2. Characteristics of Brazil's CDM market

Brazil has had a visible, proactive, and influential role in UNFCCC negotiations. The idea of CDM as a climate change mitigation instrument was initially proposed within the context of the international negotiations of the Kyoto Protocol by the Brazilian delegation in 1997, during COP 3, in the form of a Clean Development Fund (Cole and Roberts, 2011). Later, Brazil was one of the first countries to establish the legal basis required to locally develop projects under CDM by creating its Designated National Authority (DNA) through an executive order, dated July 7, 1999. It was the first nation to formally designate its national authority to the CDM Executive Board. The first methodology approved under the scope of CDM by the Executive Board was Brazilian (Landfills – Salvador, Bahia State). Later, the first project effectively registered under the CDM was also a Brazilian one: the Nova Gerar Project (Federal Government of Brazil, 2008).

Under the UNFCCC and resulting Marrakesh Accords, CDM projects must be approved by the host country. Its DNA issues a letter of approval, certifying that the proposed CDM project activity will assist the host country in achieving sustainable development. To guarantee the involvement of a wide range of stakeholders[1] and the co-benefits to the local sustainable development[2] of Brazilian CDM projects, the Brazilian DNA requires project developers to include, in their domestic submissions, an additional document to the PDD, the so-called Annex III. The Annex III document is a description of the project's

co-benefits to sustainable development, and it should describe the project's integration into the regional economic structure and the linkages to other sectors, the potential for energy generation, or the creation of synergic effects (CIMGC, 2003).

Since the first Brazilian CDM project was registered by the CDM Executive Board in November 2004, progress in CDM project development has been spectacular. By September 30, 2011, the CDM Executive Board had registered 194 projects, which represented 6 percent of all CDM projects registered worldwide (Fenhann, 2011). As it can be seen in Figure 1, Brazilian projects focus mainly on the following areas: methane avoidance (26 percent), biomass and hydro energy (23.7 percent each), and landfill gas (14 percent).

The amount of CER in kCERs is generated by the registered Brazilian CDM; Figure 2 shows the amount of CER generated by the registered Brazilian CDM projects, according to

Figure 1.
Registered CDM projects in BrazilA
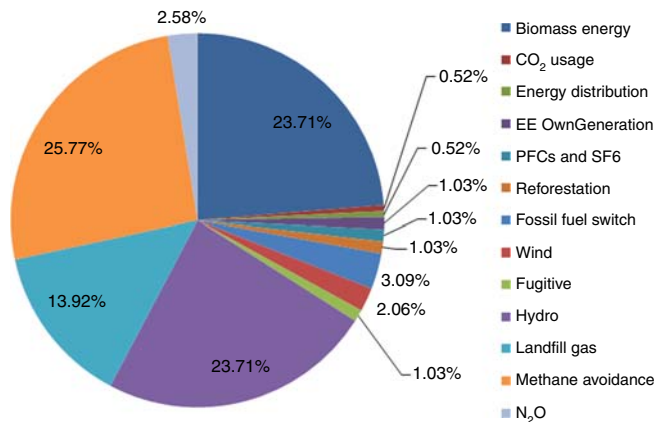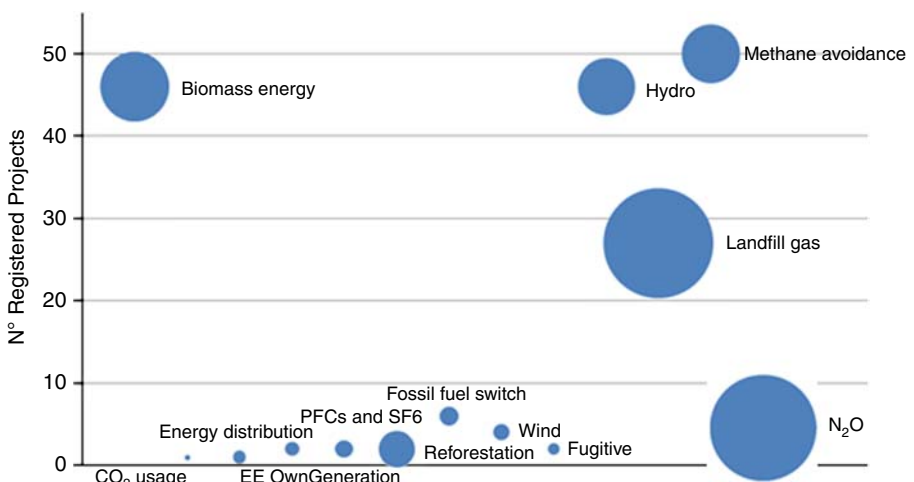
Sources: Authors; based on data from Fenhann (2011)

Figure 2.
Expected kCERs in 2012 by the registered Brazilian CDM projects

Sources: Authors; based on data from Fenhann (2011)

project type. The size of the bubbles reflects the total amount of emission reductions (CER) by project type, showing that renewable energy projects have the third largest share, despite representing nearly 60 percent of all projects. Landfill gas projects, numbering 27 (out of 194 CDM projects), have the largest share, accounting for about one-third of all CERs in 2012; whereas N_2O projects, with only five projects, account for the highest emission reductions, displaying the second largest share of projects.

Previous research regarding the Brazilian carbon market suggests that there are complex reasons behind managers' decisions to pursue CDM investments. Adding a marginal increment to a project's internal rate of return appears to be one of the primary motivations, followed by non-financial reputational factors (Silva-Junior, 2011; Freitas et al., 2011). Improving EM and diversifying the firm's activities are also identified as overall incentives by Brazilian projects (Silva-Junior, 2011). Appropriate HRM practices are essential in this context to fully achieve the expected results. Additionally, Fernandez's (2014) findings suggest that it is necessary to further examine the links between HRM practices and the implementation of CDM projects in Brazil.

3. HRM practices and environmental management: green HRM

A literature review reveals the strategic significance of well-designed HRM practices (Combs et al., 2006; Buller and McEvoy, 2012). Several research studies have demonstrated that implementing HRM practices improves organizational performance outcomes (Greening and Turban, 2000; Griffin, 2000; Bowen and Ostroff, 2004; Lepak et al., 2006; Chuang and Liao, 2010; Jiang et al., 2012); facilitates trust in management (Jackson et al., 2006); creates value for the organization (Kang et al., 2007); supports knowledge-intensive teamwork (Collins and Clark, 2003; Jackson et al., 2006); promotes result-oriented competences (Kase et al., 2009; Gittell et al., 2010); creates opportunities for employees to build social relationships, thereby encouraging efforts toward relationship development; and enhances the project's ability to do so (Chuang et al., 2012).

Many HR staff members and work organizations are recognizing the HR factors involved in environmental management (Daily and Huang, 2001), and they are embracing the EM aspects of HRM. Drawing on the studies examined in the literature review, several HR processes involved in green HRM have been identified related to recruitment, performance management, training and development, employment relations, pay and reward, and exit processes (Renwick et al., 2008). For employers and practitioners, these processes are meant to establish the usefulness of linking employee involvement and participation in environmental management programs to improve organizational environmental performance, via specific focus on waste management and recycling. As to unions and employees, these processes may help them lobby employers to adopt green HRM policies and practices that help safeguard and enhance worker's health and wellbeing.

In the environmental sector, some studies show that supporting HRM practices in organizations is essential for effective performance in EM (Jabbour and Santos, 2008; Teixeira et al., 2012; Renwick et al., 2012). The growth of environmental issues in management practices has been consistent in the past years, mainly due to the fact that it significantly improves the organization's operational performance (Campos, 2012; Pereira-Moliner et al., 2012; Teixeira et al., 2012). Researchers claim that HRM must align its practices (recruitment, training, performance monitoring, selection, participation, organizational culture, and organizational management) with the organization's environmental goals (Jabbour, Lopes Jabbour, Govindan, Teixeira, and Freitas, 2012; Renwick et al., 2012). In addition, several authors (O'Connor and Spangenberg, 2008; Orlitzky et al., 2011; Nikolaou et al., 2012; McDonald and Young, 2012) emphasize the environmental dimension of corporate social responsibility and innovative sustainable practices as the most important aspects in improving organizational performance. Closer

inspection of these practices, with performance indicators, reveals a significant level of improvement in organizational behaviors and operational efficiency.

As several authors highlight, the implementation of effective EM requires alignment with HRM practices (Govindarajulu and Daily, 2004; Wee and Quazi, 2005). In recent years, this interaction between HRM practices and the organization's environmental strategy has been studied in greater detail (Jabbour *et al.*, 2008, 2012b; Jackson *et al.*, 2011). The main contributions of the human resource dimensions adopting and maintaining an organizational EM has been analyzed from an integrative perspective.

In addition, researchers have analyzed the dynamics of the connection between HRM practices and EM, showing how the environmental dimension has been integrated into the organizational culture. In that sense, investigations demonstrate that organization's environmental commitments can deliver benefits beyond environmental considerations, such as improving labor productivity (Delmas and Pekovic, 2012), or contributing to successful recruitment, which may, in turn, improve business performance (Grolleau *et al.*, 2012; Matos and Silvestre, 2012). In this regard, some authors (Harris and Crane, 2002; Fernandez *et al.*, 2003; Johnson and Walck, 2004) consider that environmental considerations should be incorporated throughout the entire organization, to reflect the desire and/or need for a company to operate in an environmentally correct way. Other studies suggest that EM needs to be integrated into the organization's functional areas, such as finance, marketing, and production (Ginsberg and Bloom, 2004; Rothenberg, 2003; Yang *et al.*, 2011). Furthermore, some studies suggest that there is a positive relationship between EM and human resource policies (Jabbour *et al.*, 2012a). Organizational learning and creativity play key roles to achieve this positive relationship (Lozano, 2011).

In this context, it may be noted that the literature that analyze the relation between HRM practices and EM instruments is limited. Thus, in order to obtain an insight into the existing frameworks for the analysis of HRM practices regarding ecological issues, a bibliography research on the available analytical models to link HRM practices and EM and corporate social responsibility has been undertaken.

As results of this bibliography research, some models were found:

(1) Environmental management system (EMS)-HR model (Daily and Huang, 2001) – this conceptual model provides an understanding of how HR factors (such as top management support, environmental training, employee empowerment, teamwork, and reward systems) may affect EMS initiatives.

(2) A theoretical model for environmental performance, as detailed by Govindarajulu and Daily (2004) – this model looks at the motivating factors for environmental performance through evaluating the critical employer and employee factors that affect environmental performance.

(3) The model proposed by Jabbour and Santos (2008), inspired by the model proposed by Daily and Huang (2001), analyzes the relationships between HR practices and EM in companies.

Most of the HRM approaches were found to be too difficult to be applied directly within the CDM scenario since they were not meant to be applied on an individual project scale. Among the assessed framework, Jabbour and Santos's (2008) model was found to be the only one that has been already tested at CDM project level in some companies. In fact, Jabbour and Santos's (2008) framework has already been used to analyze the relationships between HRM practices and EM systems in several Brazilian organizations, such as banks, universities, paper industry, battery producer, petroleum company, and others (Jabbour *et al.*, 2008, 2013).

Thus, Jabbour and Santos's (2008) model was selected for the current research and then adapted as a framework to respond our two research questions. The Jabbour and Santos's

original framework proposes the analyses of 13 HRM practices: recruitment and selection, HR participation, teamwork, training, compensation, organizational learning, organizational culture, performance appraisal, planning, implementation and operation, checking and corrective actions, management review, and environmental policy.

In the adapted framework, six of them were excluded. Performance appraisal, planning, implementation and operation, checking and corrective actions, and management review were eliminated, because it is very difficult to verify them in a CDM project. Green HRM practices are not the main focus of a CDM project. They are considered as sustainable development co-benefits of a CDM project whose focus is to reduce GHG emissions and mitigate the climate change issue (Olsen and Fenhann, 2008; UNFCCC, 2011; Fernández et al., 2012).

The environmental policy was also eliminated in order to try not to mix the current environmental policy of the companies with the specific one brought by the CDM project. Moreover, one of the HRM practices, called by Jabbour and Santos' (2008) recruitment and short list, was renamed as recruitment selection on the adapted framework, to better express the way CDM projects operate this practice.

Table I shows the HRM practice framework adapted to the CDM context. It is composed by seven HRM practices and 15 indicators.

A set of 15 indicators cover the analysis of the seven following HRM practices: recruitment and selection, hr participation, teamwork, training, compensation, organizational learning, and organizational culture. These 15 indicators of HRM practice framework adapted to the CDM project analysis have been selected from the sustainability and empowerment framework (S&E), designed to assess sustainable development co-benefits of CDM projects, as detailed in Fernández et al. (2011) and Fernandez (2014), and empirically applied by Fernández et al. (2012) and Ventura et al. (2012).

The S&E encompasses most indicators used by other studies to assess CDM (e.g. Olsen and Fenhann, 2008; UNFCCC, 2011; Subbarao and Lloyd, 2011). To select the indicators from the S&E that suit Jabbour and Santos's adapted model for the CDM project analysis, a 194-CDM-project database was analyzed to empirically identify which indicators

Practices	Indicators
Recruitment and selection	*I1. Generation of green jobs (directly or indirectly)
	*I2. Continuity of generated green jobs (short term/long term)
	*I3. Type of generated green jobs (skilled/unskilled)
HR participation	*I4. Employee's participation in the stakeholders' consultation meeting of the CDM project cycle
	I5. Frequency of communication of environmental goals
	*I7. Stakeholders' perception of the mitigation project activity
	*I6. Adequate mitigation measures proposed by the project developer on stakeholders' environmental concerns
Teamwork	*I8. Existence of networks of teams for environmental knowledge sharing
Training	*I9. Environmental training
	*I10. Technical training
Compensation	I11. Monetary rewards
	I12. Non-monetary rewards such as recognition and praise
	*I13. Labor conditions
Organizational learning	I14. Information on failures or successes of the mitigation climate change activity is systematized and distributed
Organizational culture	I15. Employees are stimulated to acquire new values and behaviors related to climate protection

Source: Adapted from Jabbour and Santos (2008)

Table I.
HRM practices framework adapted to CDM context

accurately reflect the improvement of green HRM practices as sustainable development co-benefits of a CDM project.

When assessing CDM projects, most of the studies have used the PDD as the main source of data (Fenhann, 2011; UNFCCC, 2011; Subbarao and Lloyd, 2011). However, not all of the information required to analyze HRM practices as a sustainable development co-benefits of a CDM project is expected to be found in the PDD. Thus, it is necessary to collect primary field data. Indicators that are marked by an asterisk in Table I can be assessed both by PDD secondary data or primary field data. Indicators without an asterisk can be assessed only by primary field data, because the information that they are trying to capture is beyond the scope of the PDD. For example, it is not possible to check, in a PDD, the "Frequency of communication of environmental goals" (Indicator I5) that was adopted by the CDM project. So, only primary data collected by interviews and field observations seek to verify these kinds of HRM practice indicators.

4. Methodology

In order to answer the two research questions, the study is carried out in two phases. First, the PDD desktop analysis phase in order to respond our first research question and, second, the case study phase in order to respond our second research question. The first exploratory quantitative phase seeks to have a complete view of the HRM practices informed by the 194-PDD-database as sustainable development co-benefits of Brazilian CDM projects. The second qualitative case study phase seeks to verify whether the HRM practices informed by the PDD were actually being implemented by CDM project proponents. So, a set of 15 case studies have been carried out by triangulation among in-field observation, PDD desktop analysis, and interviews. These data triangulation used in the 15 case studies was important to fulfill the limitations associated with the 15 PDD desktop analyses (Yin, 2008; Subbarao and Lloyd, 2011).

4.1 PDD desktop analysis

To carry out the PDD desktop analysis, a database for the 194 registered[3] CDM projects in Brazil (as of September 30, 2011) was created. Identifying registered CDM projects was relatively straightforward as they are publically available and classified by host country in the CDM pipeline of the UNEP Risoe Centre (Fenhann, 2011). The publically available documents normally used for CDM assessment are the PDD[4]. As explained earlier, Brazil also has the so-called Annex III documents available and so they were considered for this first phase of research as well. The database created encompasses the key project details extracted from the PDD and Annex III documents, regarding the HRM practices as sustainable development co-benefits of these CDM projects. The collected data were tabulated in Microsoft Excel (TM). The database was analyzed project by project, using the indicators marked by asterisks in Table I to obtain the percentages of CDM projects that mentioned some improvement in each of the HRM practices examined. Assessing the statements from various sections of the documents could involve some subjectivity, because different analysts and assessment procedures may assign different indicators to a given project. To maintain as much consistency as possible, a single analyst assessed and assigned indicators for all projects. This was previously done in other studies based on a PDD desktop analysis (e.g. UNFCCC, 2011; Subbarao and Lloyd, 2011).

4.2 Case studies

After the PDD and Annex III desktop analysis was developed, a second research phase was carried out, based on qualitative case study analysis. This second phase had as its main objective to respond our second research question. In total, 12 companies

implementing 15 registered CDM projects were selected as case studies. The selected case studies were carefully chosen by the authors following two criteria: to cover as many types of CDM projects as possible, and to include projects located in different regions of the country. As expected, the HRM practices involved and CDM project types in the resulting sample are quite diverse. In total, 9 out of the 11 project types registered in Brazil (as of September 2011) are represented. Table II shows the 12 companies selected for the 15 case study analysis, including CDM project information, such as title, location, and project activity description.

For all the 15 case studies, primary data were collected through semi-structured interviews and field observations. These primary data were triangulated with the secondary data from the 15 PDD and Annex III desktop analysis. The secondary data for this second research phase were extracted from the 194 PDD and Annex III desktop analysis developed to the first research phase.

More than one person was interviewed for each company, with the aim of collecting different perceptions of the implementation of HRM practices related to the projects. By the end, 31 people were interviewed, including directors, managers, and employees. The semi-structured interviews displayed precise questions focused on indicators from Table I. The 31 interviewees were asked to compare the company's HRM practices before and after implementing the CDM project. Field notes were taken during the visit to the 15 CDM projects in order to complement and validate some of the information collected during the interviews (e.g. the workplace conditions of the employees).

5. Results and discussion
The results of the two-phase studies are presented separately in this section. First, the results of the 194 PDD and Annex III desktop analysis are shown and discussed. The results of the first research phase are presented as percentages and relative frequencies of mention (see Section 5.1). Second, the results of second research phase, the 15 qualitative case studies, are presented and discussed in Section 5.2.

5.1 Desktop analysis
The desktop analysis of the 194 PDD and Annex III of the 194 Brazilian CDM projects was carried out based on 10 out of 15 indicators, as discussed earlier.

As shown in Figure 3, improvements in recruitment, HR participation, and training far exceed those regarding compensation and teamwork.

Recruitment and selection. Net employment generation is one of the expected sustainable development co-benefits of the Brazilian CDM projects (Cole and Roberts, 2011). With regard to the desktop analysis, this expectation is being achieved. Green job creation is claimed in 87 percent of the projects (i.e. 169 out of 194 CDM projects). Therefore, the PDD suggests that Brazilian CDM projects have actively mobilized green recruitment jobs. These new job opportunities are mostly described as long-term opportunities (59 percent of the projects, i.e. 115 out of 194) and they are meant for qualified professionals (35 percent of the projects).
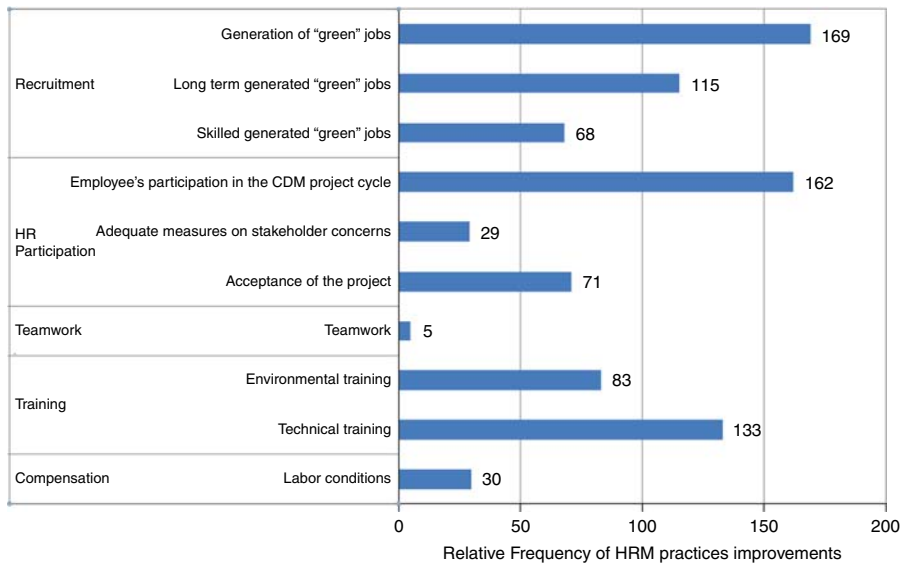
HR participation. Desktop analysis suggests that 84 percent of the proponents of the Brazilian CDM projects has communicated their climate change mitigation strategies to their employees during the design phase of the project. Thus, it is expected that employees are informed of the expectation to accomplish the GHG emission reduction goal. Furthermore, 37 percent of the analyzed PDD highlights workers' acceptance and only 15 percent of them highlights the commitment of the employees to the CDM project activities.

Teamwork. The results suggest that only 2.5 percent of the CDM projects in Brazil are employing teams as an HRM practice. This seems to be a clear weakness of the GHG mitigation project co-benefits to improve HRM practices, since motivating employees for

Table II.
Case study projects

Company name	Company ID	CDM project title	Project ID	Location	Project type	Activity description
Tractebel Energia S.A.	C1	Lages Methane Avoidance Project	P1	Santa Catarina	Biomass energy	Avoid methane emissions from anaerobic digestion in stockpiles (biomass decay) through controlled combustion
Celulose Irani S.A.	C2	Irani Biomass Electricity Generation Project	P2	Santa Catarina	Biomass energy	Construction and operation of an electricity biomass generation plant
		Irani Wastewater Methane Avoidance Project	P3	Santa Catarina	Methane avoidance	Installation of new wastewater methane avoidance treatment scheme
Econergy Brasil Ltda.	C3	Horizonte Wind Power Generation Project	P4	Santa Catarina	Wind	Generating renewable energy through wind power resource
		Água Doce Wind Power Generation Project	P5	Santa Catarina	Wind	Generating renewable energy through wind power resource
CEESAM Geradora S.A.	C4	Alto Benedito Novo Small Hydroelectric Project	P6	Santa Catarina	Hydro	Construction of small hydroelectric plant (renewable electricity generation)
SANTECH – Saneamento & Tecnologia Ambiental Ltda.	C5	SANTECH – Saneamento & Tecnologia Ambiental Ltda. – SANTEC Resíduos landfill gas emission reduction Project Activity	P7	Santa Catarina	Landfill gas	Installation of landfill gas capture and flaring
NATIXIS Environment & Infrastructures	C6	GHG capture and combustion from swine manure management systems at Paxinal dos Guedes and Toledo	P8	Santa Catarina	Methane avoidance	Installation of not-heated anaerobic digester which captures and flares greenhouse gases
Bahia Transferência e Tratamento de Resíduos S.A.	C7	Salvador da Bahia Landfill Gas Management Project	P9	Bahia	Landfill gas	Installation of an enclosed flaring
Qualix Serviços Ambientais Ltda.	C8	Feira de Santana Landfill Gas Project	P10	Bahia	Landfill gas	Installation of a flare station and equipment for electricity generation
Votorantim Cimentos Ltda.	C9	Votorantim Hydropower Plant with existing *Pedra do Cavalo* Reservoir CDM Project	P11	Bahia	Hydro	Construction of electric substations, fabrication and installation of turbines and generator
Petróleo Brasileiro S.A. – Petrobras	C10	Petrobras FAFEN-BA Nitrous Oxide Abatement Project	P12	Bahia	N_2O	Installation of a secondary catalyst to abate nitric oxide (N_2O)
Plantar S.A.	C11	Mitigation of Methane Emissions in the Charcoal Production of Plantar, Brazil	P13	Minas Gerais	Fugitive	Implementing of improvements in the carbonization process of charcoal production
		Reforestation as Renewable Source of Wood Supplies for Industrial Use in Brazil	P14	Minas Gerais	Reforestation	Establishment of plantations as a renewable source of energy for industrial needs
Nobrecel Celulose e Papel	C12	Nobrecel fuel switch in black liquor boiler project	P15	São Paulo	Biomass energy	Improvements to a black liquor recovery boiler

Sources: Author; based on data from Fenhann (2011)

Source: Authors

Figure 3.
Number of HRM
practices claims
by dimension

greater participation in environmental improvement efforts may usually require the employment of teams (Govindarajulu and Daily, 2004).

Training. The desktop analysis of 194 registered Brazilian PDDs suggests that CDM project activities are promoting both technical and environmental training (69 and 43 percent of instances, respectively). The PDD specify that technical and environmental trainings are focused on climate change mitigation technologies.

Compensation. A well-designed reward system can be helpful in encouraging employees to perform environmental practices (Daily and Huang, 2001). This can be implemented in several ways, such as financial rewards and recognition awards. GHG reduction activities are frequently implemented by companies within difficult working conditions (Fernandez, 2014). Some examples can be easily found in landfills, where biogas and leachate are not appropriately treated; or in carbonization processes, where workers are exposed to high temperatures and smoke. Thus, the improvement of such working conditions is considered a kind of reward for the employees. PDD desktop analysis shows that only 16 percent of the projects has improved the working conditions in aspects as nuisances, odor reduction, automation of the productive processes, and vector control.

Figures 4 and 5 show how HRM practice improvements are claimed by the different CDM project type registered in Brazil. The project type categories used for this study are defined by UNEP (UNFCCC, 2011).

Figures 4 and 5 show that CDM projects of every project category claim improvements in, at least, three out of ten analyzed indicators in Table I. Figure 4 shows the categories of CDM projects with major improvements, and Figure 5 shows the ones with minor improvements.

Energy distribution projects report the least contribution, with improvements in just three out of ten indicators. Biomass and hydro energy projects report the highest contribution, claiming improvements in nine out of ten indicators. The largest generation of green jobs and highest employee participation in the CDM project cycle contributions are claimed by the largest CDM project categories (i.e. biomass energy, methane avoidance, and hydroelectric power generation).

Figure 4.
Sustainable
development claims
by UNEP project
category as a
percentage of the total
claims for each
criterion (major
contribution)
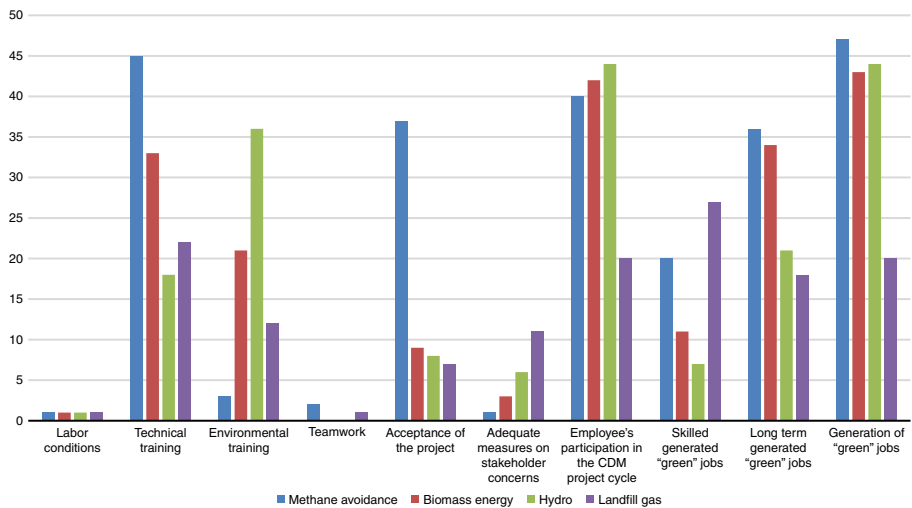
Source: Authors

Figure 5.
Sustainable
development claims
by UNEP project
category as a
percentage of the total
claims for each
criterion (minor
contribution)
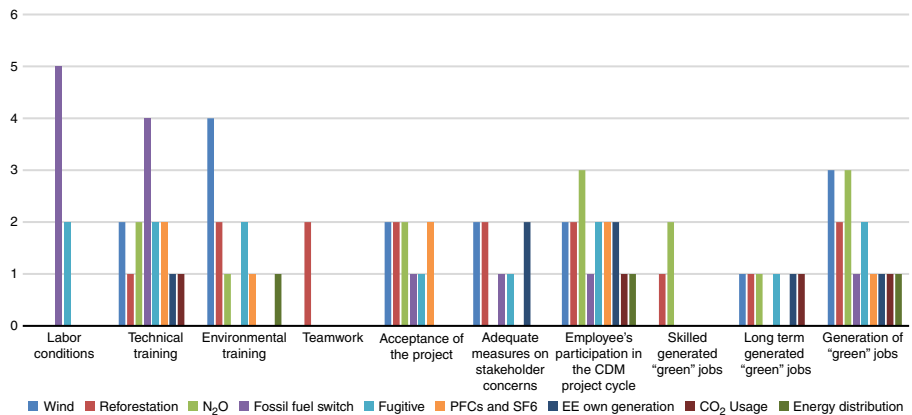
Source: Authors

5.2 Case study analysis

Across the 15 case studies, reasonable agreement was found concerning interviews, field notes, and desktop analysis on HRM practice improvements by the companies' implementation of CDM projects.

Recruitment. In total, 13 out of 15 visited CDM projects effectively generated green jobs, directly linked to climate change issues. In addition, and in concordance with the 15 PDD desktop analysis information, as found in the interviews, 8 out of 15 visited projects created long-term jobs and only four of such jobs are skilled positions, linked to the CDM activity. These findings suggest that as environmental aspects gain importance within companies, there is an increased demand for specific green job on long-term positions. But the number of highly skilled and qualified labor was low, in a contradiction to Jabbour, Almada Santos, Azevedo Fonseca, and Seido Nagano (2012) and Strietska-Ilina *et al.* (2011).

HR participation. It was revealed that, apart from a letter that was sent during the stakeholder consultation procedure, in only 2 out of 15 visited projects (P13 and P14) there was management communication to inform the employees about GHG reduction activities. In others, interviews with the employees showed that they generally feel insufficiently informed about the environmental and climate change issues going on in their companies. Nonetheless, the PDD of all 15 visited projects claimed that employees were included in the stakeholder consultation meeting. This is so, because stakeholder consultation is a compulsory requisite for CDM project approval by the UNFCCC. However, as identified earlier in other studies, this does not guarantee a truly participatory procedure (e.g. Fernández *et al.*, 2012). Surprisingly, the same employees who feel insufficiently informed have a positive perception of company environmental activities. This could be noted in the interviews and field observations. On the other hand, and following the trend identified in the 15 PDD desktop analysis, most of the visited companies neither established the mechanism to allow employees to voice their concerns nor took measures to address such concerns. Exceptions were found in P7, P13, and P14, in which, as a result of the implementation of the CDM activities, formal procedures have been established by the companies.

Teamwork. Results suggest a lack of cross-functional teams within the companies that are implementing CDM project activities. In addition, field data show that, among companies implementing the same type of project, nothing is being done to communicate the mistakes and successes of their respective activities. For instance, two companies that are operating landfill projects, located near each other, and implementing the same technology were visited in the state of Bahia (C7 and C8). Both project managers were unaware of the existence of the other CDM landfill project activity in their region (P9 and P10). An exception was found with C11. This company worked in a network that involves universities and research institutes, governmental representatives (at local and national levels, as it is a World Bank-sponsored project) and Brazilian companies from the same productive sector. The strategy resulted in important achievements, including policy advocacy at national and international levels.

Training. Regardless of the fact that 10 out of 15 analyzed PDD declared that a technical training was going to be specially developed to the CDM project activities, the interviews have showed that this training is very limited and specific. The managers have trained only new employees, but they did not continue with the training of current staff. With regard to environmental training, the findings suggest that the training process is not promoting a behavioral change of the employees to respond to climate change issues. In addition, when specific climate change training was observed, it was only being delivered to front-line employees and those who have a direct influence on CDM project, neglecting other employees of the companies. This result agrees with previous studies of CDM projects (Olsen and Fenhann, 2008; Subbarao and Lloyd, 2011; UNFCCC, 2011), which conclude that environmental awareness is one of the potential co-benefits of CDM that is not being fully achieved.

Compensation. The case studies reveal that, despite the fact that the carbon market creates an effective overall incentive, none of the 15 visited projects used part of the income obtained from carbon credit sales to reward their employees. In addition, and considering compensation as a way to guide an employee's performance to environmental achievement, there is no evidence that the 15 visited CDM projects are stimulating this HRM practice. However, it was found, in both 15 PDD desktop review and on-site interviews, that some companies invest part of the carbon credit revenue to improve working conditions. Managers from 9 out of 15 visited projects have affirmed that such practice, considered a compensation instrument, was actually being implemented.

Organizational learning. During the case studies, it was explored whether information regarding the failures or successes of the mitigation climate change activities is

systematized, and whether such systematized information was communicated within the organizations was also carefully examined. It was found that in only two out of 15 visited projects (P13 and P14) are the acquisition, interpretation, and distribution of information about their mitigation activity actually being stimulated and shared. However, for the rest of the 15 visited projects, no changes in the routine are found due to the CDM activities in any of the companies.

Organizational culture. The case studies assess the organizational culture from the stimulation of acquisition of new values and behaviors related to climate change issues by employees. The results suggest that in most of the 15 visited projects, no such change has occurred yet due to CDM implementation. However, only in P13 and P14, some interviewees presented evidence of incipient acquisition of new behaviors due to CDM project implementation.

6. Conclusions

This paper aims to answer two research questions:

RQ1. What do Brazilian CDM project proponents declare as HRM practices that would be taken into account during the implementation of the projects?

RQ2. Are these HRM practices actually being implemented by Brazilian CDM projects?

Regarding the first research question, we conclude that, even though it would be possible to develop HRM practices in ten different categories, indeed, only three of them were given a more detailed attention by the Brazilian CDM project proponents: recruitment and selection, HR participation, and training.

Some of the findings were: there was significant green job generation, with more than half of the vacancies being long-term ones and around one-third being skilled ones; meaningful employee participation in the CDM project cycle and few adequate measures for stakeholders' concerns and regular acceptance of the project by employees; and technical training practices were significant after CDM project implementation, whereas environmental training was implemented in almost half of the companies. Additionally, it is important to highlight the great contribution of three Brazilian CDM project types (methane avoidance, biomass, and hydro energy projects) to HRM improvements.

Concerning the second research question, we conclude that, differently from the PDD expectations, only two categories of HRM practices were actually being implemented, although with some limitations, by Brazilian CDM projects: recruitment and selection, and training.

Most of the visited CDM projects had really generated long-term green jobs. However, most of these green jobs did not increase a demand of highly skilled labor. It is important to highlight that, although the majority of the visited projects promote training practices, the technical training delivered after CDM project implementation is very limited and specific, and it does not promote new skills among the employees. Regarding environmental training, it was delivered only to front-line employees and it does not promote behavioral change. Although, there were some improvements in labor conditions of the employees, none of the visited projects have used part of their income to reward employees.

In disagreement with the PDD expectations, the participation of the employees was restricted to the direction team. At the visited CDM projects, there was very few employees' involvement and information about project activities and only few adequate measures to incentive stakeholders' participation. However, there was a good acceptance of the project by employees. In agreement with the PDD expectations, there is a lack of cross-functional teams. The activities on CDM projects are made at individual or very restrictive group level.

6.1 Implications for future research

Some aspects of HRM practices as sustainable development co-benefits of CDM projects have not been fully explored in this paper. Further research should focus, for example, on clarifying the cause-effect relationship between projects to reduce GHG and improvements in HRM practices. In order to do so, it would be useful, for instance, to compare companies implementing CDM projects with companies of similar characteristics, but without a CDM project activity, as a control group. The application of the adapted framework by means of the dashboard of indicators used in this paper could serve as a strategy for future research.

Another point to be investigated is why some types of CDM project (methane avoidance, biomass, and hydro energy projects) have improved more HRM practices than others. It would be interesting that future studies try to verify if such distinction is due to the kind of project or whether it is related to the company responsible for the implementation. If it is confirmed that the difference is caused by CDM project type, it would be useful to understand why such differences occur.

Finally, it is important to investigate the organizational learning and organizational culture HRM practices. They are not well explored in this paper. Further research using the organizational change literature could explore why some organizations are able to change the routines associated with organizational learning and/or culture, whereas others are not. It may reveal crucial data regarding green HRM practices as co-benefits of CDM projects.

Notes

1. The following definition of stakeholders is adopted in the CDM modalities and procedures: "Stakeholders" means the public, including individuals, groups, or communities affected, or likely to be affected, by the proposed clean development mechanism project activity.

2. Yet there is no universally accepted definition of sustainable development or an agreed basis for determining whether a specific action, such as a proposed CDM project, would contribute to sustainable development. However, it is widely agreed that sustainable development comprises three mutually reinforcing dimensions, namely, economic development, social development, and environmental protection (UNFCCC, 2011).

3. Registration is a key stage in the CDM project cycle, representing the point at which a project activity is accepted as a CDM project, making it eligible to generate certified emission reductions (CER).

4. The PDD represents the key document involved in the validation and registration of a CDM project activity. It contains the main information about the project. It is one of the three documents required for a CDM project to be registered. The others are the validation report from the Designated Operational Entity and the letter of approval from the Designated National Authority.

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