



Environmental training in organisations: From a literature review to a framework for future research

Charbel José Chiappetta Jabbour*

UNESP – Univ Estadual Paulista (The Sao Paulo State University), Bauru, Sao Paulo State, Brazil

ARTICLE INFO

Keywords:

Environmental training
Green management
Literature review
Sustainability
Green human resource management

ABSTRACT

Although the research on the relationship between human factors and environmental sustainability is slowly progressing, environmental training has attracted the most attention from researchers and practitioners. However, there remains a lack of research that integrates and systematises the available knowledge on organisational environmental training. Environmental training is fundamental to any successful activity of environmental management, conservation and recycling of resources. Thus, the aim of this paper was to present the results of a systematic literature review on environmental training in organisations. The main studies in this area were classified and coded, and a research agenda with 9 recommendations that may advance the field was presented. As a result of the gaps in the current literature, a framework was proposed aiming guide and strengthens the state-of-the-art research on environmental training. Additionally, results show that more research is needed on environmental training, combining training and green human resource management and defining/measuring the objectives of the environmental training actions. Future studies should also consider mixed methodologies and comparative perspectives.

© 2013 Elsevier B.V. All rights reserved.

1. Introduction

An increasing number of studies have concluded that adopting cleaner production and environmental management practices in companies requires mobilising a wide range of organisational resources (Daily et al., 2012; Kannan et al., 2012; Coelho et al., 2011; Murillo-Luna et al., 2011; Diabat and Govindan, 2011; Zhu et al., 2011; Govindan and Cheng, 2011). Thus, not only are environmental technologies needed (Kuehr, 2007), but a number of human resource factors and management practices are also necessary, which have recently been referred to as “green human resource management” (Jackson and Seo, 2010; Jackson et al., 2011; Renwick et al., 2013). The human factors include the organisational antecedents of environmental sustainability in companies (Pujari et al., 2004) as well as the drivers of the pro-environmental activity that these companies seek.

Although the research on the relationship between these human factors and environmental sustainability is slowly progressing (Wagner, 2011), environmental training has attracted the most attention from researchers and practitioners (Jabbour et al., 2010a; Teixeira et al., 2012). Environmental training is a priority because

the companies can contribute little to sustainable development without it (Agenda 21, 1992). Environmental training is fundamental to any successful activity of environmental management, conservation and recycling of resources. Some studies on this subject were conducted since the 1990s (Hale, 1995). However, there remains a lack of research that integrates and systematises the available knowledge on organisational environmental training (Gunasekaran and Galleary, 2012), and a growing number of experts consider the advancement of environmental training literature and practice necessities (Gunasekaran and Galleary, 2012; Gunasekaran and Ngai, 2012; Renwick et al., 2013; Jackson et al., 2011).

Consequently, the objectives of this paper are to accomplish the following:

- Identify the most relevant articles describing for organisational environmental training;
- Classify and codify the various characteristics of these articles;
- Provide a brief summary of each article's contribution;
- Describe the strengths and weaknesses of the studies in the available literature;
- Provide a research agenda and a framework for addressing the major gaps in the current knowledge of environmental training.

To achieve these goals, we present below the research methodology (Section 2), the classification/coding method for the identified articles (Section 3), a brief conceptual background for

* Correspondence address: Av. Eng. Edmundo Carrijo Coube, 14-01, Vargem Limpa, CEP 17033-360, Sao Paulo, Bauru, Brazil. Tel.: +55 14 31036122.
E-mail address: prof.charbel@gmail.com

Table 1

The framework for classifying and coding the studies analysed.

Classification	Meaning	Codes for alternatives
1	Context	A – Developed country B – Undeveloped country C – Not applicable
2	Focus	A – Only ET (environmental training) B – ET and another human resource practice C – ET and various human resource practices D – ET is not predominant in the analysis
3	Method	A – Quantitative B – Qualitative C – Conceptual D – Quantitative/qualitative or qualitative/quantitative E – Survey F – Cases
4	Sector analysed	A – Manufacturing B – Services C – Not applicable
5	Position in analytical model	A – Independent variable B – Dependent variable C – Mediator variable
6	Goal of environmental training	A – Up to 1 goal B – Up to 2 goals C – 3 or more goals
7	Environmental management practices	A – Organisational and planning practices B – Operational practices C – Communicational practices
8	Beneficiaries of environmental training	A – Top Management/managers B – Other employees C – Other stakeholders
9	Phases of the training process	A – Requirements for training B – Training design/plan C – Training implementation D – Training results E – Not applicable

environmental training (Section 4), the profiles and results of the studied articles (Section 5), the results and a proposed research agenda (Section 6), and final considerations (Section 7).

2. Research methodology

An integrative literature review was performed for this study (Huisinigh, 2012). Such reviews are particularly useful for integrating the results of studies on emerging issues. Further, they provide an in-depth analysis of the principal state-of-the-art studies. Finally, integrative literature reviews characterise the research field and identify the challenges for developing future studies (Huisinigh, 2012). Although several researchers have successfully used the review method (for example, Seuring and Müller, 2008; Lages Junior and Godinho Filho, 2010; Kampen et al., 2012), it has not yet been appropriately applied to the subject of environmental training.

Lages Junior and Godinho Filho (2010) have proposed that literature reviews should involve the following steps:

- First Step – Conduct a thorough survey of the available articles published on the subject in reputable academic databases;
- Second Step – Develop a classification system with a logically structured code;
- Third Step – Apply the classification system to clarify and provide structure to the existing knowledge on the subject;
- Fourth Step – Provide a profile of the scientific production and the main results of the identified articles based on the coding system;
- Fifth Step – Analyse the gaps as well as the opportunities and challenges for future studies.

The first step of the present study was conducted between November 2011 and June 2012. This step involved a systematic

periodic search for articles related to environmental training. This search was conducted using keywords contained in the article titles and abstracts as well as in the articles text. The words used in the search included “environmental training”, “green training”, “training and environment”, “training”, and “environmental management”. Other variations of these keywords were also queried to increase the chances of a successful search. Initially, the ISI Web of Knowledge and Scopus databases were queried. Next, searches were conducted in the database of journals published by Elsevier, Taylor & Francis, Emerald, Springer, and Sage.

The identified articles that did not discuss environmental training from an organisational point of view (for example, teaching environmental management in schools) or were unavailable for download were excluded from the study. As a result, 44 remaining articles were considered for the review. Similar studies have suggested a comparable number of articles for systematisation (Lages Junior and Godinho Filho, 2010; Kampen et al., 2012). The classification and coding of these articles were performed as described in the next section.

3. Classification and coding

After collecting and screening the major environmental training studies, a classification framework was constructed to classify and code the articles. This classification scheme included 9 major themes numbered from 1 to 9. Each of the classification numbers was also coded using alphabetical letters (A, B, C, and so on).

This classification therefore involved a combination of numbers and letters. A given article could receive more than one code for each item. Table 1 depicts the classification framework and codes.

Classification 1 involved identifying the national context under analysis in the studies and was coded on a scale from A–C.

Table 2

Brief descriptions of the goals and results of each analysed study.

Study	Brief summary
Babut et al. (2003)	After discovering opportunities for gold mining in Ghana, Dumasi area, has impacted the environment. Mercury contamination, in particular, is involved. The study suggests that only environmental training can change this situation. Environmental technologies are available, but environmental training is required for the technology to be adopted.
Biehler-Baudisch (1994)	This study argues that offering environmental training in German industry is still difficult but provides opportunities for improvement.
Bohdanowicz (2006)	The authors conducted a study on the environmental awareness of approximately 400 hotels in Poland and Sweden. They conclude that environmental training should be an essential practice for greening hotels.
Brío and Junquera (2003)	The authors argue that some limitations must be overcome before environmental innovations can be generated in SMEs. One of these limitations is the lack of adequately trained personnel for addressing environmental issues. They conclude that environmental training is one of the main methods for training the human resource in SMEs that seek environmental innovations.
Brío et al. (2007)	The authors conducted a study on 110 manufacturing companies in Spain. They conclude that management involvement, strategic interaction, and employee motivation and participation positively influenced the companies' competitive environmental advantage.
Brío et al. (2008)	The authors conducted a case study of 8 companies in Spain. They conclude that environmental training was similar in these companies. All of the cases provided in-house and external training to employees. The in-house training was led by individuals who were responsible for environmental management in the company.
Cloquell-Ballester et al. (2008)	The authors propose a method for evaluating environmental training for the first time through e-learning in small and medium enterprises in Valencia, Spain. They conclude that there was demand for environmental training and that high participant satisfaction was associated with the courses offered.
Daily and Huang (2001)	The authors present arguments in favour of incorporating environmental training in an environmental management system. They assert that both environmental training and other human factors (performance evaluation, rewards, etc.) are fundamental for implementing an environmental management system.
Daily et al. (2012)	The authors analysed the influence of environmental empowerment and environmental training (independent variables) on employee-perceived environmental performance (dependent variable). They found that environmental training influenced environmental performance to a greater extent than did environmental empowerment. Environmental teams among the employees were the mediators in this relationship.
Daily et al. (2007)	The authors studied employees from an American company. They conclude that the employees did not view environmental training as having a direct impact on environmental performance. However, training was positively related to teamwork. This mediator variable had a positive influence on environmental performance. Thus, environmental training empowered the environmental teams.
Demirer et al. (2003)	The authors report upon an environmental training program experience for municipal authorities in Turkey. They conclude that the environmental training process, which was focused on preventing pollution, was successful based on participant satisfaction.
Erdogan and Tosun (2009)	The study examined hotel managers. The authors conclude that the environmental training for managers, employees, and guests was infrequently available or non-existent.
Golds (2011)	The author reports on practical cases of companies that were planning environmental actions through environmental training. The author also asserts the importance of offering environmental training for employees and the Top Management.
Govindarajulu and Daily (2004)	The author suggests that training should be led by the environmental management in in-house meetings. The authors argue that a company's environmental performance (for example, developing environmentally improved products) requires support from human resources. They conclude that environmental training is vital and that it is important for the Top Management to be skilled in environmental issues and be able to provide appropriate support for greening the organisation.
Gunasekaran and Gallea (2012)	The authors state that environmental training is crucial for implementing more advanced environmental practices, such as green supply chain management. They indicate that new studies are needed to better understand the role of environmental training.
Gunasekaran and Ngai (2012)	The authors argue that environmental training is important for the future of operations management. They indicate that training should result in a transformation towards management that maintains more environmentally sustainable operations.
Hale (1995)	The study assessed the importance of environmental training for successfully implementing environmental technology and management systems. The author concludes that long-term implementation is not successful without environmental training.
Jabbour (2011)	The author surveyed 94 Brazilian companies to examine the intensity of the adopted human resource practices. The majority of the interviewees strongly agreed that environmental training should be continuous. Furthermore, although the interviewees considered training to be an important investment, not all of the employees considered it to be a priority.
Jabbour and Santos (2008)	The authors present a conceptual model integrating human practices and dimensions with the ISO14001 environmental management system. They conclude that there is a synergistic effect between these dimensions. They also assert that environmental training is important for implementing the ISO14001 system.
Jabbour et al. (2008)	The authors studied the relationship between human resource practices and the phases of an ISO14001 environmental management system. They discovered a low level of integration. The only human resource practice that was integrated in the environmental management system of these companies was through environmental training.
Jabbour et al. (2010a)	The authors propose a framework for relating the characteristics of environmental training (the hierarchical level that receives environmental training and the key success factors) with an organisational design that can benefit from environmental training.
Jabbour et al. (2010b)	The authors present the results of a quantitative/qualitative study that investigated the methods through which Brazilian companies have aligned human resource practices with environmental management. They discovered that environmental training has been offered in companies with different intensities. Each of the 4 analysed cases had existing environmental training.
Jackson and Seo (2010)	The authors argue for including the subject of environmental sustainability in human resource management studies. Environmental training provides one opportunity to do so.
Jackson et al. (2011)	The authors argue that more environmental training studies are necessary and present topics for future analysis.
Liu et al. (2010)	The authors conducted a study on 100 Chinese companies with ISO14001. They conclude that companies employing intensive environmental training are more likely to have proactive environmental management.
López-Gramero et al. (2011)	The authors conducted a case study on companies with a high level of environmental awareness in Spain. Their objective was to assess the relationship among several factors, including environmental training and the accumulation and use of environmental knowledge. They conclude that environmental training is crucial for accumulating and correctly using the knowledge to a more sustainable environment.

Table 2 (Continued)

Study	Brief summary
Madsen and Ulhoi (2001)	The authors report the preliminary results of a research project conducted in Denmark. The goal of the research was to evaluate and create strategies for business environmental training.
Marshall and Mayer (1992)	The study was the first to highlight the costs of lacking environmental training in businesses. The authors argue for offering environmental training.
Massoud et al. (2011)	The authors surveyed 220 manufacturing companies in Mexico. Their objective was to assess whether a certified environmental management system, informal environmental management system, or non-existent environmental management system influenced the adoption of environmental training and other human factors. They conclude that there are differences among the systems. They also conclude that a more formalised environmental management system is associated with a greater probability of adopting human factors in a company.
Perron et al. (2006)	The authors compared the environmental awareness of 2 companies. One of the companies offered environmental training to all of its employees, and the other did not. The authors discovered that the level of environmental awareness in companies was similar. The results indicate a potential failure in the environmental training process, mainly involving training evaluation.
Pujari et al. (2004)	The authors discovered that the interface between environmental experts and product development managers was an important antecedent to developing better environmental products. This interface allowed product development managers to be trained on environmental topics.
Ramus (2002)	The study argues that supervisor support is crucial for proactive environmental management in companies. In addition to encouraging employees, the managers ensured the availability of time and resources.
Rekker (2007)	The article details the efforts of Estonian military organisations to become environmentally appropriate. The authors conclude that environmental awareness in the military sector was increasing as a result of successful environmental training programs. They also note that there were opportunities for studying environmental training in the Estonian military sector.
Renwick et al. (2013)	The authors present a conceptual integration example between human resource practices and the environmental management perspective using the Ability-Motivation-Opportunity (AMO) theory. They emphasise that environmental training is essential for effectively implementing GHRM.
Sammalisto and Brorson (2008)	The authors state the importance of environmental training and communication for a team that implemented ISO14001 at Gävle University (Sweden). They surveyed the participants of the process. They conclude that environmental training improved the participant's environmental knowledge.
Sarkis et al. (2010)	The authors surveyed 157 companies in the automobile industry in Spain. They discovered that environmental training was a moderating variable in adopting environmental management practices. The technicality of the environmental management practices adopted by a company was positively associated with the relevance of environmental training.
Sarmiento et al. (2007)	The authors analysed the relationship between implementing environmental strategies and the company's organisational characteristics (such as size). They discovered that small companies implemented fewer environmental innovations and training programs.
Shaw et al. (1999)	The authors propose an environmental training process model based on 4 stages. The stages range from identifying training requirements to evaluating the results. The authors examined whether 49 Australian companies employed an environmental training process that used these phases. They conclude that few companies followed all of the steps even though most of the companies stated the importance of growth in this area.
Soltero (2004)	The article proposes "Training Within Industry", an integrated training program that implements organisational concepts with environmental subjects. The author concludes that the program could improve the environmental performance of companies.
Soubihia et al. (2010)	The authors surveyed environmental management training requirements in small Brazilian companies. They discovered that companies were particularly interested in developing environmental products and adopting environmental technologies.
Unnikrishnan and Hedge (2007)	The authors analysed the characteristics of environmental training in several companies that were adopting cleaner production strategies in India. They conclude that most of the companies offered environmental training and implementing cleaner production. Further, the authors conclude that the suppliers of environmental technologies played an important role in this process.
Ureña et al. (2004)	The authors studied 170 small- and medium-sized companies in Madrid (Spain) to measure the interest of companies in environmental subjects. They conclude that most of the companies did not consider environmental training to be essential.
Venselaar (1995)	The study was the first to argue that the industrial sector needed environmental training. The author argues that different types of environmental training must be offered for the environmental coordinators and other employees.
Wagner (2011)	The author conducted a comparative analysis between 2 surveys (2001 and 2006) of manufacturing companies in Germany. The author concludes that the percentage of companies that had adopted environmental training had increased. However, the importance of training compared to other environmental practices had decreased. The results indicate that environmental training deserved more attention from human resource professionals. Additionally, the study confirms the positive relationship between company size and the presence of environmental training.

Classification 2 referred to the focus of the environmental training, whether it was predominant or marginal, and was coded on a scale from A–D. Classification 3 was associated with the research method and was coded on a scale from A–F. Classification 4 was related to the analysed industrial sector, such as manufacturing, and was coded on a scale from A–C. Classification 5 was related to the study's framework or rationale/position position of the environmental training as a variable in the study model. This classification was also coded on a scale from A–C. Classification 6 was related to the goals/advantages that environmental training could bring to the organisations from the researcher's standpoint (scale A–C). Classification 7 was related to the training's contribution to the environmental management practices described by González-Benito and González-Benito (2006). This classification was coded on a scale from A–C. Classification 8 explored the target audience of the environmental training (scale A–C). Finally, Classification 9 categorised the studies according to their references and

contributions to improving the environmental training process under the training standard ISO10015 (scale A–E).

4. A brief conceptual foundation of environmental training

Training can be defined as a systematic organisational process that gives employees the knowledge, attitudes, and skills to help organisations implement their missions and visions (Jabbour and Santos, 2008). The goal of environmental training is to train employees to take environmental action (Daily and Huang, 2001; Govindarajulu and Daily, 2004). The literature has labelled environmental training "green organisational antecedents" (Pujari et al., 2004), "green human/organisational factors" (Daily and Huang, 2001), and, most recently, "green human resource management" (Jackson et al., 2011; Renwick et al., 2013).

Green human resource management (GHRM) is concerned with the systematic, planned alignment of typical human resource

management practices with the organisation's environmental goals. GHRM practices involve the following (Renwick et al., 2013; Jabbour and Santos, 2008):

- The recruitment and selection of employees based on environmental criteria;
- Designing jobs and tasks that consider environmental issues;
- Environmental training;
- Performance evaluation based on environmental issues;
- Financial and non-financial rewards related to environmental performance.

The field of GHRM research is only just beginning (Jabbour et al., 2012; Jackson et al., 2011; Jackson and Seo, 2010) and is predominantly theoretical (Renwick et al., 2013; Govindarajulu and Daily, 2004; Daily and Huang, 2001). However, some studies indicate that the companies that invest in sustainability are also generally listed among the “best places to work” (Golds, 2011). There is also a potentially positive correlation between the GHRM practices and the environmental performance of the companies (Daily et al., 2012).

As stated above, the GHRM process is prominent in the discussion on the necessity of environmental training (Jabbour, 2011). Environmental training is pervasive because it tends to be the human resource practice that most effectively supports environmental management (Brío et al., 2008). Companies with advanced environmental management also tend to be more intensive in their environmental training (Jabbour et al., 2010b). Environmental training appears to co-evolve with the development of environmental issues within organisations (Teixeira et al., 2012). This relationship may exist because organisations with different environmental requirements need different types of environmental training (Hale, 1995).

Because purely technological innovations are not sufficient to improve the environmental performance of organisations (Venselaar, 1995), environmental training is important for “greening” organisations in various sectors. These sectors include the military (Rekker, 2007), industry (Daily et al., 2007; Jabbour, 2011; Wagner, 2011), service (Sammalisto and Brorson, 2008), and mining (Babut et al., 2003) sectors.

Table 2 systematically describes the main studies on environmental training that were considered in this article. Among these studies, the study by Daily et al. (2012) is noteworthy. This study surveyed 220 companies in Mexico to investigate whether environmental empowerment and training influenced the environmental performance of these companies. According to both the managers and employees, environmental training influenced environmental performance to a greater extent than did environmental empowerment. The study also found that environmental teams were a mediating variable between the independent and dependent variables for the employees.

In a comparative study (2001–2006) examining German companies, Wagner (2011) concluded that the percentage of companies that had adopted environmental training had increased (from 48% in 2001 to 67% in 2006). However, the training had become a less important priority. These results may indicate that human resource management needs to become more involved with and prioritise sustainability issues. The study also found that a company's size was positively correlated with the presence of environmental training.

In another study, Daily et al. (2007) surveyed 437 employees of a company in the U.S. airline industry to assess the relationships among various organisational and human resource factors (empowerment, management support, training, rewards, and teamwork) and employee-perceived environmental performance. The authors concluded that the environmental training was not viewed by the employees as directly impacting environmental performance. However, the training was positively

correlated with teamwork. Teamwork was a mediating variable that positively influenced environmental performance. Thus, environmental training empowered teams to improve environmental performance.

In addition, Unnikrishnan and Hedge (2007) conducted a study examining the environmental training characteristics of Indian companies. These companies were adept at maintaining cleaner production activities. The results showed the following:

- More than half of the analysed companies offered various types of environmental training as part of streamlined production;
- Of the training types, in-house staff training and on-the-job training were most useful;
- Suppliers of cleaner technologies were very important in the environmental training for some of the companies.

Furthermore, Jabbour (2011) conducted a survey to measure the “greening” level of the human resource practices in 94 Brazilian companies with ISO14001 certification. The environmental managers interviewed rated the environmental training on a 7-point scale. “Strongly disagree” and “strongly agree” were used as the endpoints of the scale. The majority of the respondents “strongly agreed” when asked about continuous environmental training. However, they only “partially agreed” with the assertion that environmental training was a priority. Finally, most “strongly agreed” with the statement that environmental training was an important investment. Additionally, Sarmiento et al. (2007) argued that environmental innovation was correlated with environmental training in potentially polluting companies in Portugal; and Sarkis et al. (2010) concluded that environmental training influenced the adoption of environmental management practices in Spanish companies.

Some environmental training studies have focused on smaller companies. Soubihia et al. (2010) conducted a survey of small businesses in Brazil with the goal of identifying the main environmental training needs of entrepreneurs. These authors found that environmental management issues could be grouped into blocks. This survey was useful for designing environmental management courses for entrepreneurs and small businesses in Brazil. The most highly rated measures included “Product development with less environmental impact”, “Environmental technology for reducing emissions”, and “Influence of climate change in the market where I work”. Cloquell-Ballester et al. (2008) evaluated the e-learning environmental training experience in small and medium companies in Valencia, Spain. These authors concluded that there was demand for environmental training and that high participant satisfaction was associated with the courses. Lastly, Ureña et al. (2004) conducted a study examining the interest of 170 entrepreneurs from small and medium businesses on environmental management in Madrid, Spain. They concluded that the respondents did not consider environmental training to be essential. However, most of the respondents were interested in implementing an environmental management system and in learning more about environmental law.

Brío et al. (2008) concluded that environmental training among the analysed business cases tended to have some similarities as a result of the ISO14001 certification requirements; all of the analysed companies had this certification. Almost all of the companies provided in-house and external training to employees. The in-house training was led by the individuals who were responsible for environmental management in the company.

However, offering environmental training alone is not sufficient, as shown by Perron et al. (2006). These authors compared 2 companies (Company 1 and Company 2). Company 1 developed an environmental training program for its workers. Company 2 was considered a control group and did not offer

Table 3
Classification and coding of the analysed studies.

Study	Country	National context	Focus	Method	Sector analysed	Position of variable	Number of goals	Environmental management practices	Beneficiaries	ISO10015
Babut et al. (2003)	Ghana	1B	2A	3B, 3F	4C	5A	6C	7B	8B	9E
Biehler-Baudisch (1994)	Germany	1C	2A	3A, 3E	4C	5A	6C	7A, 7B	8A, 8B	9E
Bohdanowicz (2006)	Sweden	1B, 1A	2C	3A, 3E	4B	5A	6B	7A, 7B	8A, 8B	9E
Brío and Junquera (2003)	Spain	1C	2C	3C	4C	5A	6C	7A, 7B	8A, 8B	9E
Brío et al. (2007)	Spain	1A	2C	3A, 3E	4A	5A	6C	7A	8A, 8B	9E
Brío et al. (2008)	Spain	1A	2C	3B, 3F	4A	5A	6C	7A	8A, 8B	9E
Cloquell-Ballester et al. (2008)	Spain	1A	2A	3B, 3F	4A	5A	6B	7A	8A	9E
Daily and Huang (2001)	USA	1C	2C	3C	4C	5A	6C	7A	8A, 8B	9E
Daily et al. (2012)	USA	1B	2B	3A, 3E	4A	5A	6B	7A	8A, 8B	9E
Daily et al. (2007)	USA	1B	2C	3A, 3E	4A	5A	6A	7A, 7B	8B	9E
Demirer et al. (2003)	Turkey	1B	2A	3B, 3F	4A	5A	6B	7B	8C	9E
Erdogan and Tosun (2009)	Turkey	1B	2D	3A, 3E	4B	5A	6C	7A, 7B	8A, 8B, 8C	9E
Golds (2011)	UK	1C	2C	3C	4C	5A	6A	7A, 7B	8A, 8B	9E
Govindarajulu and Daily (2004)	USA	1C	2C	3C	4C	5A	6C	7A	8A	9E
Gunasekaran and Gallea (2012)	USA	1C	2D	3C	4C	5A	6A	7A, 7B	8A, 8B	9E
Gunasekaran and Ngai (2012)	USA	1C	2D	3C	4C	5B	6A	7A, 7B	8A, 8B	9E
Hale (1995)	UK	1C	2A	3C	4C	5A	6C	7A, 7B	8A, 8B	9E
Jabbour (2011)	Brazil	1B	2C	3A, 3E	4A	5A	6C	7A	8A, 8B	9E
Jabbour and Santos (2008)	Brazil	1C	2C	3C	4C	5A	6C	7A	8A, 8B	9E
Jabbour et al. (2008)	Brazil	1B	2C	3B, 3F	4A	5A	6C	7A	8A, 8B	9E
Jabbour et al. (2010a)	Brazil	1C	2C	3C	4C	5A	6C	7A	8A, 8B	9E
Jabbour et al. (2010b)	Brazil	1B	2C	3D, 3E, 3F	4A	5A	6C	7A, 7B	8A, 8B	9E
Jackson and Seo (2010)	USA	1C	2C	3C	4C	5A	6C	7A, 7B	8A, 8B	9E
Jackson et al. (2011)	USA	1C	2C	3C	4C	5A	6C	7A, 7B	8A, 8B	9E
Liu et al. (2010)	China	1B	2D	3A, 3E	4A	5A	6C	7A	8A, 8B	9E
López-Gramero et al. (2011)	Spain	1A	2C	3B, 3F	4A	5A	6B	7A, 7B	8A, 8B	9E
Madsen and Ulhoi (2001)	Denmark	1A	2A	3A, 3E	4A	5A	6B	7A, 7B	8A, 8B	9E
Marshall and Mayer (1992)	Georgia	1C	2A	3C	4C	5A	6C	7A, 7B	8A, 8B	9E
Massoud et al. (2011)	USA	1B	2C	3A, 3E	4A	5A	6C	7A	8A, 8B	9E
Perron et al. (2006)	Canada	1A	2A	3B, 3F	4A	5A	6A	7A	8A, 8B	9D
Pujari et al. (2004)	Canada	1A	2D	3A, 3E	4A	5A	6B	7B	8A	9E
Ramus (2002)	USA	1A	2C	3A, 3E	4A	5A	6B	7A, 7B	8B	9E
Rekker (2007)	Estonia	1B	2A	3B, 3F	4C	5A	6B	7A, 7B	8A, 8B	9E
Renwick et al. (2013)	UK	1C	2C	3C	4C	5A	6C	7A, 7B	8A, 8B	9E
Sammalisto and Brorson (2008)	Sweden	1A	2B	3B, 3F	4B	5A	6B	7A	8A, 8B, 8C	9E
Sarkis et al. (2010)	USA	1A	2B	3A, 3E	4A	5C	6B	7A, 7B	8A, 8B	9E
Sarmiento et al. (2007)	Portugal	1A	2B	3A, 3E	4A	5B	6C	7A	8A, 8B	9E
Shaw et al. (1999)	Australia	1A	2A	3B, 3F	4A	5A	6B	7A, 7B	8A, 8B	9A, 9B, 9C, 9D
Soltero (2004)	USA	1C	2D	3C	4C	5A	6C	7A, 7B	8A, 8B	9E
Soubihia et al. (2010)	Brazil	1B	2A	3A, 3E	4A	5A	6B	7A, 7B, 7C	8A	9E
Unnikrishnan and Hedge (2007)	India	1B	2A	3B, 3F	4A	5A	6C	7A, 7B	8A, 8B	9E
Ureña et al. (2004)	Spain	1A	2D	3A, 3E	A	5A	6B	7B	8A	9E
Venselaar (1995)	Netherlands	1C	2A	3C	4C	5A	6B	7A, 7B	8A, 8B	9E
Wagner (2011)	Germany	1A	2C	3A, 3E	4A	5B	6B	7A, 7B	8A, 8B	9E

environmental training to its employees. Surprisingly, despite the financial resources invested by Company 1 in its environmental training program, the authors concluded that the employees of the 2 companies showed a similar level of knowledge about environmental management after the experiment. Thus, the authors asserted that it was not enough to offer environmental training alone. Rather, environmental training should be planned using the best practices. For example, appropriate instruments for evaluating the training results should be developed.

Shaw et al. (1999) concluded that the structure and planning of the training process was not yet fully in use by the Australian companies that they analysed. These companies lacked a method for evaluating the environmental training requirements and results, and they focused on only one training method, namely, the classroom method. The training programs focused on improving environmental skills without addressing the structural, communication, and motivational aspects. Still, most companies recognised the importance of environmental training and expected it to become more prominent in the future.

Although these results revealed that environmental training has improved, the existing training practices are not yet sufficient for implementing GHRM (Wagner, 2011). In particular, the training is necessary for adopting more advanced environmental management practices such as green supply chain management (Gunasekaran and Gallea, 2012) and operations management in companies seeking to be more sustainable (Gunasekaran and Ngai, 2012). The relevant studies are dispersed and require systematic review.

5. Results of the literature analysis

Table 3 presents the codifications for each research revised in this study.

5.1. National context

An analysis of the national context is a concern in the recent literature on both human resource management (Schuler et al., 1993) and environmental management (González-Benito and González-Benito, 2006). This analysis is also relevant when studying environmental training. In the present study, the following categories were used to characterise national contexts: “A – Developed Country”, “B – Undeveloped Country”, and “C – Not Applicable”. Category “C” was only applied to articles that were not specific to a particular country (for example, if the article was conceptual). It is interesting to note that in some cases, the attention of the study was directed towards developing countries even though the primary author was associated with a developed country (Daily et al., 2012). Furthermore, some studies compared data between countries (Bohdanowicz, 2006) (Fig. 1).

The analysis showed that most of the articles (the sum of categories “A” and “B”) were dedicated to understanding a specific national context, especially in developed countries (category “A”). However, individual analysis revealed that category “C” was the largest category. There was only one article comparing environmental training between countries.

5.2. Focus on environmental training

The second classification was related to the focus of the environmental training in the analysed studies. The focus was classified as “A – Exclusively Environmental Training” when the research was focused only on understanding this GHRM practice. Other focuses of environmental training included “B – Environmental Training and Another GHRM Practice”, or “C – Environmental Training and Various GHRM Practices”. Finally, articles were classified as “D

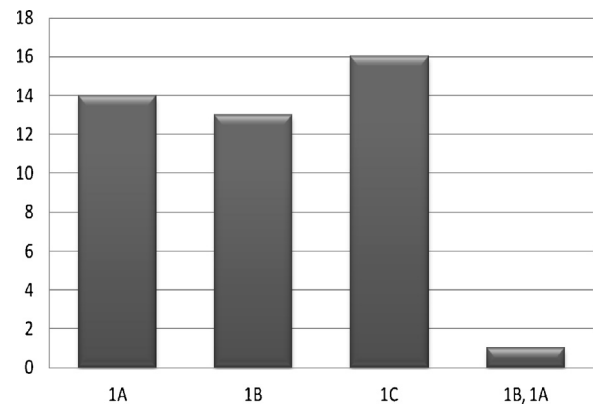


Fig. 1. Frequency distribution for the Category 1.

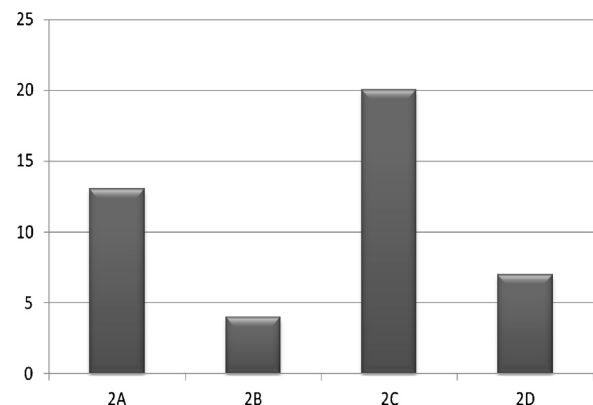


Fig. 2. Frequency distribution for the Category 2.

– Environmental Training is not prevalent in the analysis” when they contained indirect or non-detailed environmental implications (Fig. 2).

Most of the studies were classified as category “C”. These studies dealt with various GHRM practices. The articles in category “A”, which focused solely on environmental training, were also important. There were few articles that indirectly focused on environmental training because this indirect focus was not the main objective of the literature review. Furthermore, few articles focused on environmental training and one other GHRM practice (category “B”), such as environmental empowerment (e.g., Daily et al., 2012).

5.3. Research methods

The research methods of the articles were classified using the following scale (Fig. 3):

- “A – Quantitative”, usually associated with category “E – Survey”;
- “B – Qualitative”, usually associated with category “F – Case Study”;
- “C – Conceptual”, for review articles or articles with conceptual proposals;
- “D – Mixed Methodologies/Combination of Methods”, for studies usually associated with the categories “E – Survey/F – Case Study” or “F – Case Study/E – Survey”.

The analysis clearly revealed that most environmental training studies were quantitative and used surveys (categories “A” and “E”). Purely conceptual studies were the next most numerous (category “C”), followed by qualitative studies based on a case study (categories “B” and “F”). There was only one study that combined

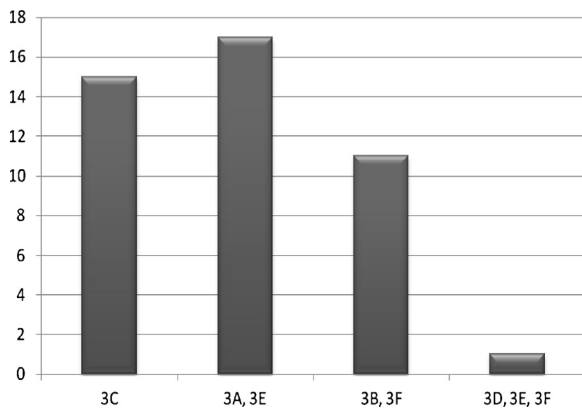


Fig. 3. Frequency distribution for the Category 3.

methods (Jabbour et al., 2010b) by employing survey and case study approaches (categories “D”, “E”, and “F”).

5.4. Economic sector analysed

Advancement in the understanding of environmental sustainability in the field of manufacturing and services is required to gain insights on the differences between these two contexts (Gunasekaran and Gallea, 2012). The categories used to encode the selected articles included “A – Focus on the Manufacturing Sector”, “B – Focus on the Service Sector”, and “C – Not Applicable”. Category C was used to label conceptual articles that did not focus on any specific manufacturing or service context (Fig. 4).

The results of the analysis revealed that the majority of the studies focused on the manufacturing sector. This sector generates greater environmental impacts than does the service sector (Sarkis, 2001).

5.5. The position of “environmental training” in the research rationale

The role assumed by the variable “environmental training” in the logical development and rationale of the studies under review was examined. The position of the environmental training was classified as “A – Independent Variable”, when it was assumed that the environmental training influenced other organisational variables; “B – Dependent Variable”, when the environmental training was influenced by other organisational variables; or “C – Mediator Variable”, when the environmental training assumed an intermediate position in the relationship between 2 variables.

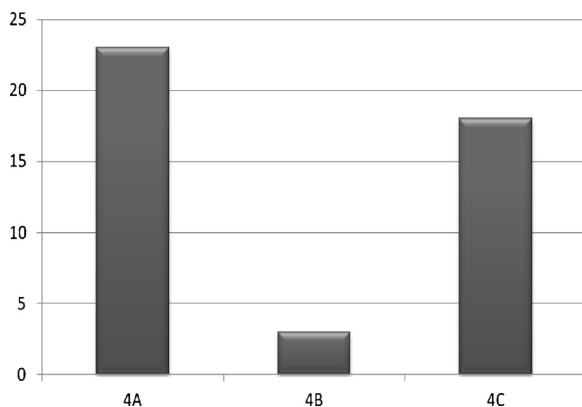


Fig. 4. Frequency distribution for the Category 4.

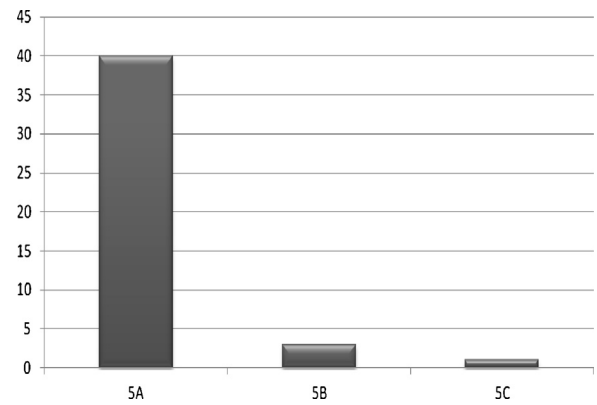


Fig. 5. Frequency distribution for the Category 5.

The results (Fig. 5) showed that the majority of the literature viewed environmental training as being independent (category “A”) from other variables, such as environmental performance.

The percentage of studies that viewed environmental training as a dependent (category “B”) or mediator (category “C”) variable was minimal.

5.6. Goals of environmental training

Environmental training was expected to be related to several organisational goals. These goals may include the following:

- Reinforcing another human resource practice. A synergistic effect between training and GHRM could be expected (Daily et al., 2012; Govindarajulu and Daily, 2004; Jabbour et al., 2010b);
- Improving the training process. The studies sought to strengthen the environmental training cycle in organisations (Shaw et al., 1999);
- Improving awareness (Jackson and Seo, 2010);
- Developing environmental skills to reduce employee environmental impact (Jackson and Seo, 2010);
- Improving environmental performance by reducing the organisation's environmental impact (Unnikrishnan and Hedge, 2007);
- Improving organisational performance. Environmental training may have positive effects on other aspects of a company's performance, such as profit, innovation, and other factors (Brío et al., 2007);

The articles were coded “A – Only One Goal Mentioned”, “B – Up to Two Goals Mentioned”, or “C – Three or More Goals Mentioned” (Fig. 6).

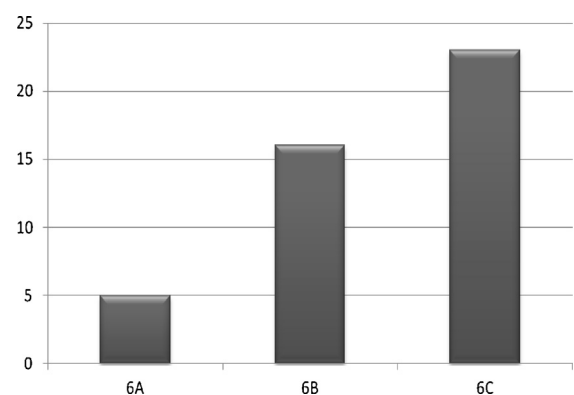


Fig. 6. Frequency distribution for the Category 6.

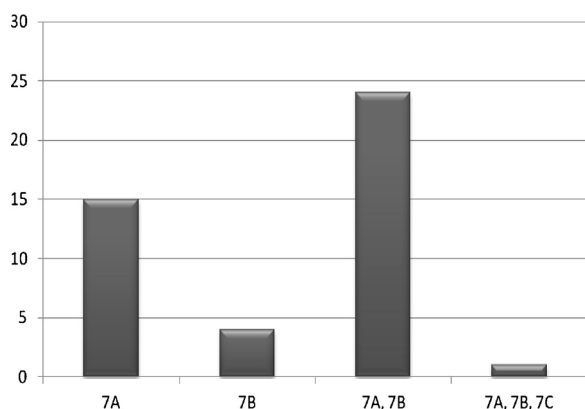


Fig. 7. Frequency distribution for the Category 7.

The analysis revealed that the majority of studies showed or suggested that environmental training contributed to 3 or more of the goals listed above (category “C”). Category “B” (up to 2 goals) was the next largest category, followed by category “A” (one goal).

5.7. The relationship with environmental management practices

González-Benito and González-Benito (2006) used the following classification scheme for environmental management practices. “A – Planning and Organisational” was used to describe organisational actions that addressed environmental issues in the organisational structure, strategy, and culture. “B – Operational Practices” involved environmental improvements in an organisation’s processes and products that reduced the organisation’s impact on the environment. “C – Communicational Practices” was used to describe practices that communicate the organisation’s environmental performance to the stakeholders. The same study suggested a relationship between environmental training and more than one of these environmental management practices (Ribeiro and Jabbour, 2012).

A majority of the studies in the literature review demonstrated a relationship between environmental training and the environmental management practices that were classified under categories “A” and “B”. The next most frequently found relationship was between categories “A” and “B”, followed by “A”, “B”, and “C” together (Fig. 7).

It is noteworthy that no study investigated category “C” alone.

5.8. Beneficiaries of environmental training

Environmental training should always be planned based on the potential beneficiaries (ISO10015):

- “A – Top Management/managers” involved in the highest levels of the organisational hierarchy;
- “B – Other Employees in the Organisation” involved in the operational levels of the organisational hierarchy;
- “C – Other Stakeholders”, defined as individuals who are not included in categories “A” and “B”, such as suppliers and customers.

Categories “A”, “B”, and “C” were combined when the studies focused on multiple beneficiaries (Fig. 8).

The majority of the reviewed studies reported or suggested environmental training for individuals in both category “A” and category “B”. In practical terms, these studies included all of the organisation’s employees. Some companies only offered environmental training to the individuals on the highest level of the organisational hierarchy (category “A”) and others only to

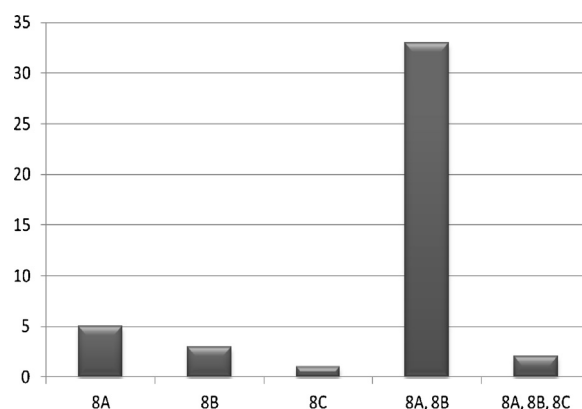


Fig. 8. Frequency distribution for the Category 8.

individuals in category “B”. Several studies described environmental training that was offered to all 3 target audience categories (“A”, “B”, and “C”). Finally, the studies that only focused on category “C” were the least numerous.

5.9. Contributions of ISO10015 to phases in the environmental training process

ISO10015 is an important framework used to improve training processes worldwide. Although it is useful for any type of training, this standard is especially relevant for improving environmental training, which has been a recent issue for organisations (Teixeira et al., 2012). Therefore, environmental training was evaluated using 4 main cyclical stages (ISO10015):

- Definition of training needs. This stage is concerned with surveying the training needs and establishing a framework for the required and already developed skills. The goal is to identify the skills that training should develop.
- Training design and planning. This stage involves decisions about the allocation, roles, and responsibilities of the environmental training process. It also involves training the task workers, establishing a training program, and offering the program to all of the organisation’s employees.
- Training implementation. This stage is concerned with decisions about training infrastructure. In particular, a decision must be made about whether environmental training will be conducted in-house or externally.
- Evaluation of training results. This stage involves recording the environmental training and assessing trainee satisfaction.

For the purposes of analysing the reviewed literature, the first 4 phases of ISO10015 were classified as category “A – Requirements for Environmental Training”, “B – Training Design and Planning”, “C – Training Implementation”, and “D – Evaluation of Training Results”. Category “E – Not Applicable” was added for the studies that did not mention or directly relate to these phases of the environmental training process. A significant portion of the reviewed literature did not mention or contribute to the phases of this process. These studies were classified under category “E” (Fig. 9).

Only one study mentioned all of the phases of the environmental training process (Shaw et al., 1999). In addition, only one study significantly contributed to category “D – Evaluation of Training Results” (Perron et al., 2006).

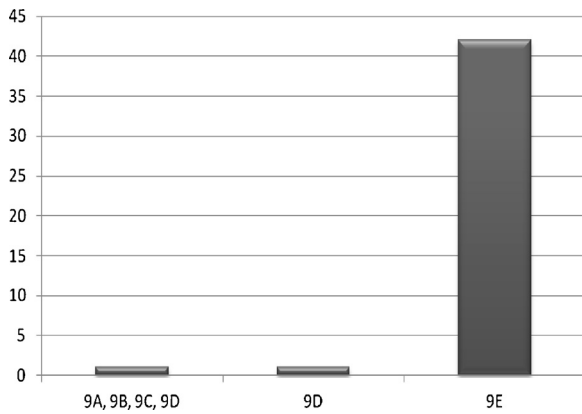


Fig. 9. Frequency distribution for the Category 9.

6. Results and proposal for a research agenda

It is possible to weigh the strengths and weaknesses in the literature based on the results. It is also possible to consider the opportunities for planning future environmental training studies, as shown in Fig. 10. In this figure, the most well-studied issues and the subjects that still need to be explored are highlighted.

Categories “A, B” in the national context (Classification 1) were the least frequently addressed categories in the literature. These categories were composed of studies that compared different countries regardless of their development status. Thus, *Recommendation 1 is to develop studies that compare different*

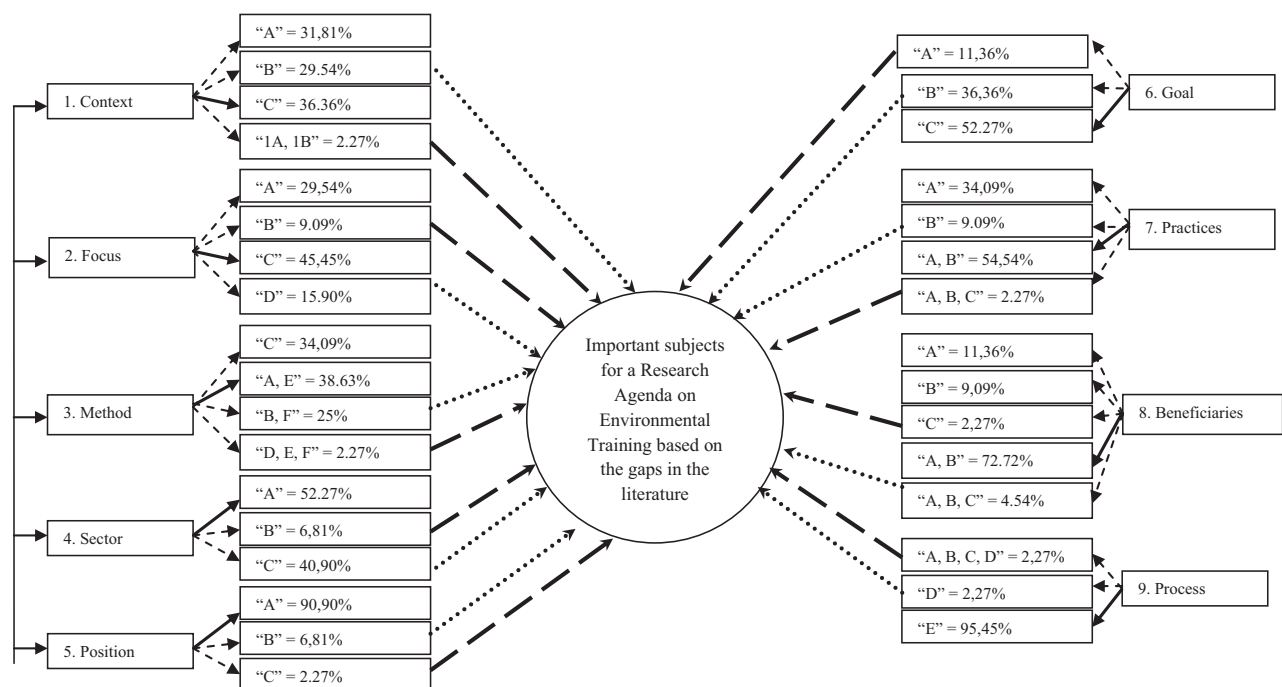
national contexts to understand the characteristics of environmental training.

The majority of studies on environmental training (Classification 2) focused on both environmental training and other GHRM practices (category “C”). More studies are needed to examine whether a synergistic relationship between environmental training and other human resource practices (category “B”) exists. Moreover, more diverse environmental sustainability studies are needed to address the subject of environmental training, even if they address the subject indirectly (category “D”). *Recommendation 2 is to develop studies to examine the relationship between environmental training and other human resource practices.*

Furthermore, quantitative studies using surveys (categories “A” and “E”) predominated the research methodology classification (Classification 3). However, few studies have integrated research methods (categories “D”, “E”, and “F”) by employing quantitative-qualitative or qualitative-quantitative study approaches. Thus, *Recommendation 3 is to apply mixed/combined methods to study environmental training.*

The manufacturing sector (category “A”) was the most frequently discussed category in the reviewed environmental training studies (Classification 4). Therefore, more studies are required to examine the service sector (category “B”) and to compare these sectors. These comparative studies should examine companies in both categories “A” and “B”. Thus, *Recommendation 4 is to conduct environmental training research in service sector organisations.*

Furthermore, with regard to how environmental training was considered as a variable for analysis (Classification 5), most studies considered environmental training to be an independent variable (category “A”). Therefore, significant research opportunities for



The most frequently addressed category of each classification item = —————>

The secondary categories of each classification item = - - - - ->

Category to be prioritised in the research agenda = — — — — —>

Categories to be additionally considered in the research agenda = ...>

Fig. 10. Distribution of the analysis classifications and categories. The percentages of articles observed in each category are listed.

studies that use environmental training as dependent and mediating variables exist. Thus, we suggest *Recommendation 5, to conduct studies that examine environmental training as a dependent and, in particular, mediating variable for other organisational variables.*

Moreover, there is a lack of studies in category “A” of Classification 6, the objectives of environmental training. This category includes studies in which only one goal was reached through environmental training. This type of study allows us to more precisely and thoroughly understand the contributions of environmental training. Thus, we suggest *Recommendation 6, to develop in-depth and detailed studies on the contribution of environmental training to reaching a specific organisational goal.*

In addition, the analysis involving the environmental management practices (González-Benito and González-Benito, 2006) in Classification 7 revealed a lack of research that considered the contributions of environmental training to green communicational management practices (category “C”). There was also a lack of studies that considered categories “A”, “B”, and “C”. Thus, we suggest *Recommendation 7, to conduct studies that verify the relationship between environmental training and particular communicational environmental practices.*

With regard to the beneficiaries of environmental training (Classification 8), more studies are needed to examine environmental training for individuals in category “C – Other Stakeholders”. In particular, studies can be conducted to examine environmental training offered to the organisations’ customers, suppliers, and other partners. As such, we suggest *Recommendation 8, to examine the characteristics of environmental training for organisational stakeholders (individuals who are not classified in categories “A” or “B”).*

Finally, there were 2 major shortcomings in Classification 9, the phases of the environmental training process. The first was related to studies that considered all phases of the ISO10015-based environmental training process (categories “A”, “B”, “C”, and “D”). The second shortcoming was the lack of focus on evaluating the environmental training results (category D). The present study identified these critical gaps. These shortcomings, however, have already been noted in the literature (Perron et al., 2006). Thus, we list *Recommendation 9, to conduct studies that improve the environmental training process, especially the evaluation of results.*

Recommendations 1–9 are expected to lead to an environmental training research agenda. These recommendations can be used individually or combined for research. The combined approach would generate more original results and have greater potential to contribute to the most current research in the field.

7. Conclusions

The aim of this paper was to present the results of a systematic literature review on environmental training in organisations. This type of literature review has proven useful for the scientific community (Seuring and Müller, 2008; Kampen et al., 2012; Lages Junior and Godinho Filho, 2010). The main studies in this area were classified and coded. Next, a research agenda with 9 recommendations that may advance the field was presented. Based on these recommendations, future studies may partially or fully apply the conceptual and methodological framework presented in Fig. 11. As a result of the gaps in the current literature, this framework may guide and strengthen the state-of-the-art research and, consequently, improve environmental management and GHRM. This framework may also complement the research on environmental training.

Applying this framework may also reveal the characteristics and constraints of a successful environmental training process in the organisational sector. These empirical results may contribute to

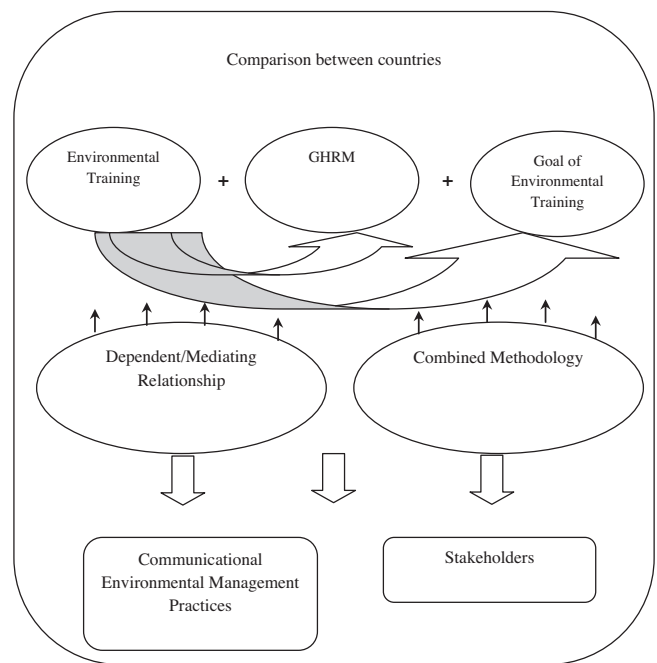


Fig. 11. A framework for future studies based on the gaps in the literature.

more effective environmental management and gradually lead to changes in an organisation's positions towards the environment.

In addition to strengthening the current environmental training research, the proposed framework can also be useful in producing original research. This type of research can support both teaching and academic investigations on environmental management, environmental training, and GHRM, which are subjects of growing interest in various higher education academic institutions.

Briefly, results show that more research is needed on environmental training:

- Combining others green human resource management practices.
- Defining/measuring the objectives of the environmental training actions.
- Considering mixed methodologies (e.g. survey and case studies).
- Applying comparative and cross-countries perspective.

Acknowledgements

This research was supported by the Sao Paulo Research Foundation (FAPESP, 2011/23454-1) and by The Brazilian National Council for Scientific and Technological Development (CNPq, 300308/2010-8).

References

- Agenda 21. Chapter 36: Promoting education, public awareness and training. Rio de Janeiro, Brazil: The United Nations; 1992.
- Babut M, Sekyi R, Rambaud A, Potin-Gautier M, Tellier S, Bannerman W, et al. Improving the environmental management of small-scale gold mining in Ghana: a case study of Dumasi. *Journal of Cleaner Production* 2003;11:215–21.
- Biehler-Baudisch H. Environmental training in Germany. *Journal of European Industrial Training* 1994;18(3):10–6.
- Bohdanowicz P. Environmental awareness and initiatives in the Swedish and Polish hotel industries – survey results. *International Journal of Hospitality Management* 2006;25:662–82.
- Brío JA, Junquera B. A review of the literature on environmental innovation management in SMEs: implications for public policies. *Technovation* 2003;23:939–48.
- Brío JA, Fernández E, Junquera B. Management and employee involvement in achieving an environmental action-based competitive advantage: an empirical study. *International Journal of Human Resource Management* 2007;18(4):491–522.

- Brío JA, Junquera B, Ordiz M. Human resources in advanced environmental approaches – a case analysis. *International Journal of Production Research* 2008;46(21):6029–53.
- Cloquell-Ballester VA, Monterde-Díaz R, Cloquell-Ballester VA, Torres-Sibbille AC. Environmental education for small- and medium-sized enterprises: methodology and e-learning in the Valencian region. *Journal of Environmental Management* 2008;87:507–20.
- Coelho TM, Castro R, Gobbo JA. PET containers in Brazil: opportunities and challenges of a logistics model for post-consumer waste recycling. *Resources, Conservation and Recycling* 2011;55(3):291–9.
- Daily B, Bishop JW, Steiner R. The mediating role of EMS teamwork as it pertains to HR factors and perceived environmental performance. *Journal of Applied Business Research* 2007;23(1):95–110.
- Daily BF, Bishop JW, Massoud JA. The role of training and empowerment in environmental performance: a study of the Mexican maquiladora industry. *International Journal of Operations & Production Management* 2012;32(5):631–47.
- Daily BF, Huang S. Achieving sustainability through attention to human resource factors in environmental management. *International Journal of Operations & Production Management* 2001;21(12):1539–52.
- Demirer GN, Uludag-Demirer S, Arikan Y. Integrated preventive environmental management training for municipalities: a case study from Turkey. *Environmental Quality Management* 2003;3:67–76.
- Diabat A, Govindan K. An analysis of the drivers affecting the implementation of green supply chain management. *Resources, Conservation and Recycling* 2011;55:659–67.
- Erdogan N, Tosun C. Environmental performance of tourism accommodations in the protected areas: case of Goreme Historical National Park. *International Journal of Hospitality Management* 2009;28:406–14.
- Golds C. Reaping the benefits of environmental awareness: how organizations are engaging their employees. *Development and Learning in Organizations* 2011;25(2):18–20.
- Govindan K, Cheng TC. Environmental supply chain management. *Resources, Conservation and Recycling* 2011;55(6):557–8.
- González-Benito J, González-Benito O. A review of determinant factors of environmental proactivity. *Business Strategy and The Environment* 2006;15:87–102.
- Govindarajulu N, Daily BF. Motivating employees for environmental improvement. *Industrial Management & Data Systems* 2004;104(4):364–72.
- Gunasekaran A, Gallea D. Special issue on sustainable development of manufacturing and services. *International Journal of Production Economics* 2012;140(1):1–6.
- Gunasekaran A, Ngai EWT. The future of operations management: an outlook and analysis. *International Journal of Production Economics* 2012;135:687–701.
- Hale M. Training for environmental technologies and environmental management. *Journal of Cleaner Production* 1995;3(1–2):19–23.
- Huisingh D. Call for comprehensive/integrative review articles. *Journal of Cleaner Production* 2012;22:1–2.
- Jabbour CJC. How green are HRM practices: organizational culture, learning and teamwork? A Brazilian study. *Industrial and Commercial Training* 2011;43(2):98–105.
- Jabbour CJC, Santos FCA, Nagano MS. Environmental management system and human resources practices: is there a link between them in four Brazilian companies? *Journal of Cleaner Production* 2008;16:1922–5.
- Jabbour CJC, Teixeira AA, Oliveira JHC, Soubihia DF. Managing environmental training in organizations: theoretical review and proposal of a model. *Management of Environmental Quality: An International Journal* 2010a;21(6):830–44.
- Jabbour CJC, Santos FCA, Nagano MS. Contributions of HRM throughout the stages of environmental management: methodological triangulation applied to companies in Brazil. *International Journal of Human Resource Management* 2010b;21:1049–89.
- Jabbour CJC, Santos FCA. Relationships between human resource dimensions and environmental management in companies: proposal of a model. *Journal of Cleaner Production* 2008;16:51–8.
- Jabbour CJC, Jabbour ABL, Teixeira AA, Freitas WRS. Environmental development in Brazilian companies: the role of human resource management. *Environmental Development* 2012;3:137–47.
- Jackson SE, Seo J. The greening of strategic HRM scholarship. *Organization Management Journal* 2010;7:278–90.
- Jackson S, Renwick D, Jabbour CJC, Muller-Camen M. State-of-the-art and future directions for green human resource management. *Zeitschrift für Personal-forschung (German Journal of Research in Human Resource Management)* 2011;25:99–116.
- Kampen TV, Akkerman R, Donk DP. SKU classification: a literature review and conceptual framework. *International Journal of Operations & Production Management* 2012;32(7):850–76.
- Kannan D, Diabat A, Alrefaei M, Govindan K, Geng Y. A carbon footprint based reverse logistics network design model. *Resources, Conservation and Recycling* 2012;67:75–9.
- Kuehr R. Environmental technologies: from a misleading interpretations to an operational categorization and definition. *Journal of Cleaner Production* 2007;15(13–14):1316–20.
- Lages Junior M, Godinho Filho M. Variations of the kanban system: literature review and classification. *International Journal of Production Economics* 2010;125:13–21.
- Liu X, Liu B, Shishime T, Yu Q, Bi J, Fujitsuka T. An empirical study on the driving mechanism of proactive corporate environmental management in China. *Journal of Environmental Management* 2010;91:1707–17.
- López-Gramero MD, Zaragoza-Sáez P, Claver-Cortés E, Molina-Azorín JF. Sustainable development and intangibles: building sustainable intellectual capital. *Business Strategy and The Environment* 2011;20:18–37.
- Madsen H, Ulhoi JP. Greening of human resources: environmental awareness and training interests within the workforce. *Industrial Management & Data Systems* 2001;101(2):57–63.
- Marshall ME, Mayer DW. Environmental training: it's good business. *Business Horizons* 1992;2:54–7.
- Massoud JA, Daily BF, Bishop JW. Perceptions of environmental management systems: an examination of the Mexican manufacturing sector. *Industrial Management & Data Systems* 2011;11:5–19.
- Murillo-Luna JL, Garcés-Ayerbe C, Rivera-Torres P. Barriers to the adoption of proactive environmental strategies. *Journal of Cleaner Production* 2011;19:1417–25.
- Perron GM, Côte RP, Duffy JF. Improving environmental awareness training in business. *Journal of Cleaner Production* 2006;14(6–7):551–62.
- Pujari D, Peattie K, Wright G. Organizational antecedents of environmental responsiveness in industrial new product development. *Industrial Marketing Management* 2004;33:381–91.
- Ramus CA. Encouraging innovative environmental actions: what companies and managers must do. *Journal of World Business* 2002;37:151–64.
- Rekker A. Military sector and environmental protection in Estonia: challenges from 1991 to today. *NATO Security Through Science Series* 2007;4:9–26.
- Renwick DWS, Redman T, Maguire S. Green human resource management: a review and a research agenda. *International Journal of Management Reviews* 2013;15(1):1–14.
- Ribeiro S, Jabbour CJC. Environmental management in ethanol and sugarcane plants in Brazil. *International Journal of Sustainable Development & World Ecology* 2012;19:54–66.
- Sammalisto K, Brorson T. Training and communication in the implementation of environmental management systems (ISO 14001): a case study at the University of Gävle, Sweden. *Journal of Cleaner Production* 2008;16(3):299–309.
- Sarkis J. Manufacturing's role in corporate environmental sustainability – concerns for the new millennium. *International Journal of Operations & Production Management* 2001;21(5/6):666–86.
- Sarkis J, Gonzalez-Torre P, Adenso-Diaz B. Stakeholder pressure and the adoption of environmental practices: the mediating effect of training. *Journal of Operations Management* 2010;28:163–76.
- Sarmiento M, Durão D, Duarte M. Evaluation of company effectiveness in implementing environmental strategies for a sustainable development. *Energy* 2007;32:920–6.
- Schuler RS, Dowling PJ, De Cieri H. An integrative framework of strategic international human resource management. *International Journal of Human Resource Management* 1993;4(4):717–64.
- Seuring S, Müller M. From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production* 2008;16:1699–710.
- Shaw L, Dingle P, Annandale D. Improving the design and implementation of environmental training programmes. *Eco-management and Auditing* 1999;6:140–7.
- Soltero C. Training within industry: overcoming the barriers to improved environmental performance. *Environmental Quality Management* 2004;2:19–39.
- Soubihia DF, Jabbour CJC, Leal Filho W. Green management, climate change and small business in Brazil: implications for training and education for sustainable development. *Journal of Baltic Science Education* 2010;9:324–33.
- Teixeira AA, Jabbour CJC, Jabbour ABL. Relationship between green management and environmental training in companies located in Brazil: a theoretical framework and case studies. *International Journal of Production Economics* 2012;140(1):318–29.
- Unnikrishnan S, Hedge DS. Environmental training and cleaner production in Indian industry – a micro-level study. *Resources, Conservation & Recycling* 2007;50:427–41.
- Ureña A, Rams J, Méndez FJ, Rodríguez J. Las pequeñas y medianas empresas del sector metalúrgico en la zona sur de la Comunidad de Madrid: Gestión medioambiental y necesidades de formación. *Revista de Metalurgia de Madrid* 2004;40:209–13.
- Venselaar J. Environmental training: industrial needs. *Journal of Cleaner Production* 1995;3(1–2).
- Wagner M. Environmental management activities and sustainable HRM in German manufacturing firms – incidence, determinants and outcomes. *Zeitschrift für Personalforschung* 2011;25(2):157–77.
- Zhu Q, Sarkis J, Lai KH. An institutional theoretic investigation on the links between internationalization of Chinese manufacturers and their environmental supply chain management. *Resources, Conservation and Recycling* 2011;55(6):623–30.