

Evaluating the compliance of environmental management systems: evidence from Moroccan banks

Abdelmajid Ibenrissoul and Zakaria Benjoud
ENCG, ISO, Hassan II University of Casablanca, Casablanca, Morocco, and
Souhaila Kammoun
IHEC, CODECI, University of Sfax, Sfax, Tunisia

Abstract

Purpose – The purpose of the study is to evaluate the compliance of environmental risk management systems implemented by Moroccan banks with ISO 14001 certification or environmental charters.

Design/methodology/approach – Data were collected through the distribution of an environmental risk management questionnaire to all Moroccan banks' branches, business centers and various central entities. The study uses regression analysis to model the relationship between environmental management system (EMS) compliance and environmental management explanatory variables to identify the most relevant indicators that can explain the effectiveness and reliability of an EMS.

Findings – Empirical evidence reveals that the evaluation of EMS compliance in Moroccan banks should consider two categories of variables: the first category is related to the culture of environmental risk management, and the second one is related to environmental management practices.

Originality/value – The results show that the “information” variables play a key role in the overall design of an EMS and represent essential variables in the general definition of the environmental policy and in raising awareness and providing information on the bank's commitment to a pro-environmental approach. The “application” variables confirm that environmental management practices need to be put in place to manage the different environmental risks. The study raises some managerial implications and further research directions.

Keywords Environmental management system, Compliance, ISO 14001, Moroccan banks

Paper type Research paper

Introduction

The last few decades have seen increasing scholarly attention paid to ecological concerns, brought to the forefront by civil society, major international organizations, governments, banks and companies in developed and developing countries alike. Even in Morocco, environmental concerns have increasingly become a strategic concern for many companies in all industries. The issue of their environmental and social responsibility has manifested itself through the implementation of sustainable development strategies, and particularly environmental risk management systems. The number of Moroccan companies that declare themselves to be socially responsible is growing, and those that are ISO 14001 certified number 41. Even though the interest of companies in the environmental management system (EMS) of the ISO 14001 type continues to grow, the implications of



the implementation of this management system in Moroccan companies remain little explored. In this light, the question that arises is whether this is just a fad or a real social and economic awareness of the environmental issue.

From a research point of view, it is interesting to note that only a few studies have been conducted to understand how the requirements of ISO 14001 can be applied in reality (Boiral and Sala, 1998; Boiral, Guillaumie, Saizarbitoria, & Tene, 2018). However, although environmental risk management is undergoing a real revolution thanks to the requirements of sustainable development, the instruments for evaluating its effectiveness and making it an operational concept are still lacking (Louisot, 2005) and the findings are inconclusive (Boiral et al., 2018; Erauskin-Tolosa, Zubeltzu-Jaka, Heras-Saizarbitoria, & Boiral, 2019). *From a practical point of view*, the implementation of an environmental risk management system that meets the objectives of sustainable development is part of the overall management of the company and should enable the latter to know and control the environmental impact of its activities and, consequently, to ensure the continuous improvement of the performance obtained (Barthelemy, 2004). Companies may, therefore, decide to set-up an environmental management system, called an EMS, if they aim to increase their overall environmental performance (Musacchi, 2021). An EMS is represented by a set of processes and practices that allow the company to reduce its environmental impact and increase its operational efficiency (ISO 14001, 2015; Palamariu and Tulbure, 2021). According to Riedinger and Thévenot (2008), the EMS refers to the organization of all human, technical or financial resources aimed at the knowledge and control of the company's direct and indirect environmental impact. In the context of this paper, we assume that an EMS enables the company to facilitate compliance with regulations and even generate certain savings in terms of raw materials, waste management, etc. (Riedinger & Thévenot, 2008). However, the diffusion of the ISO 14001 standard in Morocco is still slow. In their analysis of the city of Marrakech's ISO 14001 certification, Daddi, Frey, Iraldo, and Nabil (2011) emphasized the factors that influence EMS adoption as well as its benefits and drawbacks. The authors conclude that ISO 14001 certification can increase the population's relevant sensitivity to a variety of environmental challenges. That being said, the first certification to the ISO 14001 environmental standard was only in 1999 in Morocco. Nowadays, there are 79 ISO 14001 certifications, mainly from large groups or subsidiaries of large international polluting groups or local processing companies (Mdehheb, Elkihel, Bouamama, Hammouti, & Delaunois, 2020). In brief, Morocco is still far behind developed countries and even similar countries in terms of the number of certified sites (ISO survey), so public support remains very modest. We found that some Moroccan banks are ISO 14001 certified, while others claim to be environmentally friendly without being certified. They consider that they have formalized internal procedures to apply environmentally friendly standards. This is commonly known as the "environmental charter."

Correspondingly, the study addresses the following question: do banks that implement an EMS actually comply with the applicable standards? In other words, do these banks actually consider all potential impacts of their activities? Whatever the reasons that led Moroccan banks to integrate the environment into their strategies, and whatever the strategy adopted, it would be interesting to know whether the EMSs of Moroccan banks are effective.

The overarching purpose of this study is to assess the compliance of environmental risk management systems implemented by Moroccan banks with ISO 14001 certification or environmental charters by modeling the relationship between EMS compliance and environmental management explanatory variables. The purpose is to not only conduct a compliance audit but also specify the most relevant indicators that can explain the reliability and effectiveness of an EMS. To the best of our knowledge, no previous empirical studies have addressed this question in the Moroccan context.

The study sample covers the Moroccan banking sector. The data were collected through the administration of a questionnaire addressed to all branches, business centers and various central entities of some Moroccan banks (BMCE BANK, BMCI, Société Générale, Attijariwafa BANK, Banque Centrale Populaire and Crédit Agricole). The choice of the banking sector is mainly justified for the following reasons. First, the banking sector's increasing recognition of its environmental and social responsibility is largely due to external pressures. Second, by combining internal management actions with the adoption of best practices such as the Equator Principles, banks have turned their sustainability strategy into a business tool and a source of performance. These banks see that they have much to gain by setting clear, understandable and reasonable standards, which are the best possible demonstration of the business case for sustainability. In the context of the banks' internal management, this translates into the implementation of an environmental and social management system.

Following the studies by [Elkington and Hailes \(1989\)](#), we consider that an EMS must include several variables of action. Thus, the questions are generally divided into two main categories: namely "application" and "information." The "information" variables reflect the culture of environmental risk management. The "application" variables highlight the combined practices of environmental management.

The main empirical findings show that EMS compliance in Moroccan banks depends on these two categories of variables. The "information" variables play an essential role in the overall design of an EMS, but the "application" variables should be put in place to manage the different environmental risks.

The remainder of the study is laid out as follows. The second section gives an overview of the relevant literature related to the adoption of EMSs and derives our hypotheses. The third section describes the methodology of research used in the field work and sample of Moroccan banks with EMSs. Our results overview leads into the discussion section, where we summarize and discuss the main findings. Finally, the study concludes with a summary of the main discussion, which shows the limitations of our research and sets up some further research paths.

Theoretical background

In recent decades, companies have become increasingly aware of the negative impacts that industrial business activities can have on human communities and the environment ([Potocan, Nedelko, Peleckienė, & Peleckis, 2016](#); [Mrhari and Dinar, 2019](#); [Zhou, Zhang, & Zhang, 2019](#); [Kammoun, Loukil, Ben Romdhane Loukil, & Ibenrissoul, 2020](#); [Ibenrissoul, Kammoun, & Tazi, 2021](#)) and the importance of integrating the environmental dimension into their development strategies. Thus, management solutions have been proposed to companies in order to integrate environmental concerns into their daily practices and improve their behavior regarding their relationship with the environment ([Alibeli and Johnson, 2009](#); [Mrhari and Dinar, 2019](#); [Zhou et al., 2019](#); [Mdehheb et al., 2020](#); [Ibenrissoul, Bouraqqadi, & Kammoun, 2021](#); [Ibenrissoul, Kammoun, & Tazi, 2021](#); [García Alcaraz et al., 2022](#)).

The integration of environmental concerns has led to the emergence of a new management approach: environmental management. In this area, environmental management appears as a management tool that helps companies controlling and reducing the environmental impacts of their organizations ([Gendron, 2004](#); [García Alcaraz et al., 2022](#)). According to [Allix-Desfautaux and Makany \(2015\)](#), environmental management is considered as a management system that consists of evaluating and integrating the environmental impact of the company's actions and activities.

With the development of environmental management, some research studies have been conducted on the issue in order to measure its effectiveness ([Comoglio & Bolta, 2012](#); [Heras-Saizarbitoria, Saez Vegas, & Artaraz, 2014](#); [Testa et al., 2014](#); [Comoglio and Bolta, 2012](#); [Turki, Medhioub, & Kallel, 2015](#); [Boiral et al., 2018](#); [Sartor, Orzes, Touboulic, Culot, & Nassimbeni,](#)

2019; Erauskin-Tolosa *et al.*, 2019). They differ in their scope and approach to environmental management but are mostly based on the ISO 14001 and Eco-Management and Audit Scheme (EMAS) standards. Both standards are voluntary and aim primarily at improving environmental performance of organizations (Daddi, Todaro, Marrucci, & Iraldo, 2022; Marrucci & Daddi, 2022; Testa *et al.*, 2014; Kolln and Prakash, 2002). In fact, since the adoption of the ISO 14001 standard by the International Organization for Standardization (ISO) in 1996, there has been a growing interest in environmental management. Since the 2000s, the significant improvement in the environmental performance of companies has been a major challenge (Gendron, 2004; Iraldo, Testa, & Frey, 2009; Testa *et al.*, 2014).

Environmental management system standards

At the managerial level, the integration of the environmental dimension is mainly reflected by the implementation of an EMS (Desmazes & Lafontaine, 2007; Phan & Baird, 2015; Feng & Wang, 2016; Salim *et al.*, 2018; Cosmina, Hoogenberg, Fratostiteanu, & Azam Hashmi, 2020). Admittedly, the main objective of EMSs is to help companies manage their environmental impacts, improve their environmental performance (Daddi, Iraldo, Testa, & De Giacomo, 2019; Marrucci, Daddi, & Iraldo, 2019; Testa, Heras-Saizarbitoria, Daddi, Boiral, & Iraldo, 2016) and contribute, in their own way, to the protection of the environment and natural resources. Desmazes and Lafontaine (2007, p. 2) define the EMS as “a component of the overall management system whose objective is to implement, evaluate and improve the environmental policy.” However, the primary purpose of this instrument, based on voluntary action, is distorted by the functioning of the economic system, seeking to transform the constraint that the environment represents into a strategic opportunity for companies.

Comparison between ISO 14001 and EMAS. There are two main EMSs currently recognized: ISO 14001 and the European Eco-Audit Regulation (EMAS). These two EMSs are the most widely used strategies for dealing with environmental issues (Daddi *et al.*, 2022; Marrucci & Daddi, 2022). Indeed, organizations that adhere to environmental management can apply for certification under one of these two EMSs: EMAS or ISO 14001 (Musacchi, 2021). According to the European Commission, the EMAS regulation explicitly recognizes the ISO 14001 standard as a benchmark for the implementation of its EMS. More specifically, the Eco-Audit Regulation predates ISO 14001, and the latter is largely inspired by it, even if the two standards remain specific and distinct. The standards are similar in their requirements but differ in their application. ISO 14001 is internationally recognized, but EMAS is disseminated in the European Union (Iraldo *et al.*, 2009; Testa *et al.*, 2014; Erauskin-Tolosa *et al.*, 2019). The two standards have gradually moved apart, but the systems remain competitive. However, there are some differences between the two schemes: EMAS focuses on providing transparency to stakeholders by requiring member organizations to publish an environmental statement once a year, which is later validated by an accredited verifier. The Table 1 shows a comparison between the two standards: ISO 14001 and EMAS.

In general, ISO 14001 certification is widely preferred to the “Eco-Audit” regulation, including in European countries. The spread of the standard has been rapid, and ISO 14001 certification is now an obligatory step for large companies in various sectors, as it demonstrates their managerial skills as well as their economic stability. A survey by the ISO found that the number of EMS (ISO 14001) certificates issued worldwide increased from 307,059 in 2018 to 348,473 in 2021, a 12% rate of increase due mainly to a significant increase in the number of EMS (ISO 14001) certificates in China (ISO, 2020).

The EMS process. ISO 14001 provides a structured framework based on the traditional management principles: policy definition, planning, implementation, operation, control and corrective action, management system review and continual improvement (Sanderson, 2016). The following Figure 1 gives an overview of the main elements of ISO 14001:

Table 1.
Comparison between
ISO 14001 and EMAS

ISO14001	EMAS
International validity	European validity
No review required	Initial environmental review of all direct and indirect environmental aspects
Continual improvement of the management system	Continual improvement of environmental performance
compliance with applicable legal requirements. No compliance audit	Proof of legal compliance
No external communication required	External reporting required
Trainings	Involvement of employees and their representatives
Audit of the management system	Specified frequency and methodology of internal audits
No derogations foreseen	Derogations for Small and medium-sized enterprises (SMEs)
Certification according to ISO-standards	An accredited or licensed environmental verifier validates the environmental statement and verifies the implementation of the management system
No official register	Publicly accessible register records each organisation with an individual registration number
No logo	Uniform EMAS logo

Source(s): <https://www.emas.de>

Figure 1.
Key elements of
ISO 14001



Source(s): Sanderson, (2016)

According to ISO 14001, the main task of an EMS is to implement an organization's environmental strategy and improve its environmental performance through a specific systematic framework such as measuring targets and regular review on the attainment (Salim *et al.*, 2018). In this process of implementing an EMS, senior management plays an essential role. The text of the ISO 14001 standard insists, on several occasions, on the key role of the management. Several tasks are assigned to it such as defining the environmental policy, ensuring the availability of essential resources, providing information on the results of audits, etc. The responsibilities assigned to it are important, and its degree of involvement determines the success or otherwise of the approach. Nonetheless, it is noteworthy to underline that the implementation of an EMS does not guarantee that the company is

complying with minimum legal environmental requirements or that it is continually enhancing its environmental performance (Berry & Rondinelli, 2000; Cosmina *et al.*, 2020).

EMS compliance: a multi-dimensional concept

Research on EMS compliance is essential for improving environmental performance. In this field, Riedinger and Thévenot (2008) have identified eight empirical studies that have evaluated the effectiveness of EMSs. However, research studies that have been conducted on the matter have taken two directions. Some researchers, notably Dasgupta, Hettige, and Wheeler (2000), and Dahlström, Howes, Leinster, and Skea (2003), have verified the compliance of EMSs with environmental regulations, whether the company is certified.

Attesting to the compliance with environmental regulations of 173 Mexican establishments, Dasgupta *et al.* (2000) verified the significant effect of adopting the procedures required for the ISO 14001 standard. Based on the studies by Dasgupta *et al.* (2000) and Dahlström *et al.* (2003), the following EMS action variables can be identified:

- (1) Initial assessment of key environmental and social issues, impacts and risks
- (2) Global environmental and social policies that define the bank's approach
- (3) Annual action plans
- (4) Motivation of the organization and its staff
- (5) Environmental and social procedures and standards
- (6) Provision of documentation, including for audit purposes
- (7) External reporting, verification and consultation
- (8) EMS monitoring and corrective actions; management review and improvement, with feedback to annual action plans, etc.

Stevens, Batty, Longhurst, and Drew (2012) have carried out a categorization of organizations in order to better understand the factors that influence the implementation of EMS. This categorization will help to identify the specific motivations and barriers associated with EMS for the organizations concerned and enable more effective implementation and management of EMS resources.

Impact of EMS effectiveness on environmental performance

Empirical studies dealing with the effectiveness of EMS most often conclude that environmental management has a beneficial influence. Thus, Anton, Deltas, and Khanna (2004) considered that the adoption of an EMS leads to an improvement in environmental performance, in that it allows a reduction in polluting and toxic discharges (Anton *et al.*, 2004). Their study applied to 167 American companies in 1994 and 1995 highlights the role of environmental research and development as a determining factor. The study by Russo and Harrison (2005) on 169 American establishments in the electronics sector in 2000 leads to the same result, even for EMSs not certified ISO 14001. Another consequence of the adoption of an EMS was studied by Johnstone, Glachant, Serravalle, Riedinger, and Scapecchi (2007) in 4000 establishments in 7 OECD countries. Effective EMSs have a significant effect on waste emissions and air and water discharges (Johnstone *et al.*, 2007). This conclusion was rejected by Barla in 2007 who found no significant impact of ISO 14001 on biological oxygen demand (Johnstone *et al.*, 2007). The sample observed by Barla is composed of 37 Quebec paper mills, which is smaller than that of Johnstone *et al.* (2007). Nevertheless, the result remains interesting insofar as he found that the observed companies make an effort to obtain

certification but then relax them. [Riedinger and Thévenot \(2008\)](#) suggest that certified establishments reduce not only their environmental impacts (carbon dioxide emissions) but also their production costs (energy consumption). Relatedly, [Daddi, Magistrelli, Frey, and Iraldo \(2011\)](#) conducted a survey of 64 Italian companies belonging to 6 different industrial sectors that had obtained EMAS registration. Using data reported by the registered companies in their EMAS environmental statements, such as water consumption, waste generation and energy consumption, the authors showed that EMAS leads to a real improvement in environmental performance, even in the short term. Similarly, the study by [García Alcaraz et al. \(2022\)](#) shows that investments in EMSs ensure a reduction in energy consumption and lead to significant improvements in environmental cost savings.

Recent studies have attempted to examine the impact results of the two main standards, namely ISO 14001 ([Boiral et al., 2018](#); [Sartor et al., 2019](#)) and EMAS ([Heras-Saizarbitoria et al., 2014](#); [Tourais and Videira, 2016](#)). More precisely, some researchers have found a positive relationship between ISO 14001 adoption and environmental performance ([Boiral et al., 2018](#); [Sartor et al., 2019](#); [Fagioli, Paolotti, & Boggia, 2022](#)). In the same vein, other researchers have found the same result for the case of EMAS ([Heras-Saizarbitoria et al., 2014](#); [Tourais and Videira, 2016](#)). Nevertheless, while many empirical studies have demonstrated how the adoption of an international standard guarantees improved environmental performance for the company and increased transparency toward stakeholders ([Fagioli et al., 2022](#)), other studies have revealed an unclear relationship and have come up with contradictory results ([Testa et al., 2014](#); [Boiral et al., 2018](#); [Erauskin-Tolosa et al., 2019](#)). While some studies have examined the effect of adopting an EMS based on certifiable standards, including the European EMAS and ISO 14001 standards, on environmental performance, others have examined the impact of public incentives on the adoption of these environmental management tools. [Testa et al. \(2016\)](#) show that incentives and regulatory measures can influence the adoption of certified EMSs by reducing the administrative burden on organizations and enhancing their environmental commitment. The study by [Tessitore, Testa, Iraldo, and Daddi \(2019\)](#) attempted to assess the degree of EMS implementation in 242 EMAS-registered European companies. The authors found that companies may obtain EMAS only to meet institutional or consumer expectations, but they do not have the resources or skills to implement it.

Other researchers have focused on the factors that drive companies to adopt environmental strategies. Based on the results of a survey of 242 European EMAS-registered organizations, [Daddi, Testa, Frey, and Iraldo \(2016\)](#) highlighted that normative and mimetic pressures have a more favorable impact than coercive ones. [Marrucci et al. \(2019\)](#) highlight the role of EMS and eco-design in increasing the circularity of organizations, which has become an effective pathway to sustainable development.

Other research has sought to assess the influence of EMS commitment on the internalization of EMS within an organization and how this internalization leads to improved organizational performance and stakeholder appreciation ([Daddi et al., 2022](#)). In the same vein, some empirical studies have focused on the role of capabilities in EMS internalization ([Daddi, Heras-Saizarbitoria, Marrucci, Rizzi, & Testa, 2021](#); [Marrucci, Daddi, & Iraldo, 2022](#); [Marcucci et al., 2021](#)). [Marrucci, Daddi, and Iraldo \(2022\)](#) show that the development of absorptive capacity significantly facilitates the internalization of an EMS, the improvement of the environmental performance of organizations and the implementation of a circular economy. [Daddi et al. \(2021\)](#) conducted a survey of over 400 European EMAS-registered companies and showed the positive influence of green supply chain management capacity on performance through the mediating role of internalization of the EMS. In turn, [Marrucci, Daddi, and Iraldo \(2022\)](#) show that dynamic capabilities contribute to the internalization of the EMS, which improves overall organizational performance and the adoption of the circular economy. Furthermore, while dynamic capabilities directly influence

the circular economy and environmental performance of an organization, the internalization of EMAS is crucial for improving economic performance and environmental reputation. Other empirical studies have highlighted the role of environmental managers satisfaction in EMS internalization and environmental performance achievement. Using data from a survey of 438 EMAS-registered organizations, [Daddi et al. \(2022\)](#) showed that manager satisfaction positively influences environmental reputation and competitiveness, regardless of the mediating role of internalization.

Nonetheless, while many researchers point to the positive effects of EMS implementation on environmental performance, other researchers have found no correlation between the environmental and economic performance of organizations. In fact, [Marrucci and Daddi \(2022\)](#) found that about 60% of organizations do not fully comply with the requirements of the standards related to environmental claims, which calls into question the positive impact of the implementation of EMS on environmental performance.

EMS in Moroccan banks

In Morocco, the banking sector is one of the most active sectors in the country in terms of the diversity of its offer and its role in financing businesses and creating jobs. In recent years, several Moroccan banks have displayed their commitment to environmental protection ([Mrhari and Dinar, 2019](#); [Mdehheb et al., 2020](#)) and social responsibility ([Rouggani and Bouayad, 2014](#); [Reynaud and Walas, 2015](#); [Mrhari and Dinar, 2019](#); [Tani & Bari, 2021](#)). Despite the interest in environmental issues, there are still very few empirical studies on the banking sector or financial systems compared to the number of studies on EMS in companies. For a long time, it was thought that banking activity had no direct impact on the environment. Like the industrial sector, the banking sector has been forced to pay increasing attention to the impact of its activities on society and the environment. The lack of EMS studies on Moroccan banks provides the motivation for this research.

Like all companies concerned about environmental issues, Moroccan banks are increasingly integrating EMS into their management systems, either by applying the ISO 14001 standard or by putting in place procedures and charters of good environmental conduct largely inspired by the standard. So far, only one Moroccan bank has adhered to the Equator Principles on social and environmental risk assessment in project finance and is ISO 14001 certified for the environment. The other banks have a charter of good conduct.

However, taking environmental issues into account implies taking into account a specific approach in the way it grants loans, invests funds, finances associations such as microcredit or advises its clients ([Tani & Bari, 2021](#)). In a nutshell, the Moroccan banker's interest in environmental issues is primarily motivated by his apprehension over taking on the credit risk of funding a project that might have a negative impact on the environment. But beyond the economic damage, a loss of reputation of the client and therefore by transfer to the banker can occur following an environmental crisis. It may even happen that civil society or the public authorities turn to the banker, in the absence of other identifiable actors in the project set-up, to assume the environmental consequences. The second concern of the Moroccan banker that interests us in the context of this work is that of ensuring the growth of the bank's activities in a socially and environmentally responsible manner, while satisfying the legitimate interests of its various stakeholders. This is the societal involvement of the bank, under which Moroccan banks seek to ensure their responsibilities and design EMS as the roadmap that will guide them in their evolution toward sustainable development to be among the major financial institutions in terms of environmental compliance. In what follows, we present the methodology used, highlighting the research area and data, methods of data analysis employed and the main empirical findings.

Methodology research

Scope and aim of the study

The methodology of the study provides the background to the ISO survey and describes the research methods used in the research. Some previous studies on the effectiveness of EMS adoption have measured environmental performance using self-reported data collected by questionnaire (Comoglio & Bolta, 2012; Testa *et al.*, 2014). Others studies have used both qualitative and quantitative methods while complying with environmental regulations (Turki *et al.*, 2015). The methodology in this research consists of evaluating the compliance and effectiveness of environmental risk management systems implemented by Moroccan banks that are ISO 14001 certified or have environmental charters. The data were collected through the administration of a questionnaire addressed to all branches, business centers and various central entities of some Moroccan banks (BMCE BANK, BMCI, Société Générale, Attijariwafa BANK, Banque Centrale Populaire and Crédit Agricole) (see Table A1). To assess the compliance of the EMS with the applicable standards, we use a regression method to model the relationship between EMS compliance and the explanatory variables of environmental management. The dependent variable in our model is the conformity of the EMS noted C-SME (EMS compliance). The explanatory variables of environmental management retained in the various studies on EMS compliance are derived from the ISO 14001 standard's procedures. We have classified these variables into two categories: information variables and application variables. *The information variables* are essential in the general definition of the environmental policy and in raising awareness and providing information on the bank's commitment to a pro-environmental approach. *The "application" variables* reflect the means and procedures put in place to manage the various environmental risks within the banks. The variables are presented in Table 2:

We initially assumed that all variables were relevant to explain EMS compliance. The proposed model is as follows:

$$\begin{aligned} C - SME_i = & \beta_0 + \beta_1 P_EV_i + \beta_2 Im_Ev_i + \beta_3 OPM_i + \beta_4 OF_i + \beta_5 GAPE_i + \beta_6 Bat_Cht_i \\ & + \beta_7 At_SME_i + \beta_8 PS_i + \beta_9 NC_ACP_i + \beta_{10} GRE_Ev_i + \beta_{11} GD_i + \beta_{12} R_SME_i \\ & + \beta_{13} SU_i + \beta_{14} CEEP_i + \beta_{15} DPCh_i + \beta_{16} Achat_i + \beta_{17} CCS_i + \beta_{18} T_CO2_i + \varepsilon_i \end{aligned}$$

Abbreviation	The "information" variables	Abbreviation	The "application" variables
<i>Im_Ev</i>	<i>Environmental impacts of the bank</i>	<i>PS</i>	<i>Monitoring plan</i>
<i>P_EV</i>	Environmental policy	<i>NC_ACP</i>	Non-conformity
<i>OPM</i>	Objectives and management program	<i>GRE_Ev</i>	Management of external environmental complaints and requests
<i>OF:</i>	Functional organization	<i>GD</i>	Document management
<i>GAPE</i>	EPIG	<i>R_SME</i>	EMS Review
<i>Bat_Cht</i>	Buildings and construction sites	<i>SU</i>	Emergency Situations
<i>At_SME</i>	EMS Audits	<i>CEEP</i>	Consumption - Water, Electricity, Paper
		<i>DPCh</i>	Waste and Chemicals
		<i>Achat</i>	Purchasing
		<i>CCS:</i>	Competence, Communication and Awareness
		<i>T_CO2</i>	Transport and CO ₂
<i>Abbreviation</i>	<i>Explanatory variable</i>		
<i>C_SME</i>	EMS Compliance		
Source(s): Authors' elaboration			

Table 2.
Explanatory variables
of the model from
ISO 14001

Three measurement scales were introduced to measure the information variables: “Never heard of,” “Informed but insufficient understanding” and “Well understood at the bank branch level.” Four measurement scales were introduced to measure the application variables: “Never heard of,” “No application,” “Insufficient application” and “Systematic application.”

Data collection and sampling

Our sample covers the Moroccan banking sector. The banks involved in the study are BMCE BANK, BMCI, Société Générale, Attijariwafa BANK, Banque Centrale Populaire and Crédit Agricole. For the sake of confidentiality, the names of the banks will be represented by a coding from “A” to “F.” The data collection was done through the administration of 400 questionnaires to all branches, business centers and various central entities of the banks in question. The objective is to determine the degree of understanding, deployment and application of the EMS in the banking network. The questionnaire is composed of 18 axes, which represent the variables to be modeled later. Each axis contains a set of questions that tend toward the same endpoint. The questions are generally divided into two main categories, namely “application” and “information.” Information reflects the culture of environmental risk management. Application highlights the combined practices for environmental management.

The number of responses received is 230, which represents a response rate of 57.5%. The responses by bank are distributed as follows. [Figure A1](#) presents the distribution of the responses received. Thirty percent of the responses came from Bank A’s network, which reflects the degree of its willingness to share its environmental culture with the public, being the only ISO 14001 certified bank. The other banks with an environmental charter responded as follows: Bank B (18%), Bank C (15%), Bank D and E (13%), and Bank F (10%).

The measurement of compliance levels (see [Figure A1](#)) shows that only 7.4% of the observed population achieved 100% compliance and about 44% achieved 76% compliance.

These initial results suggest two hypotheses:

- H1.* Lack of information and awareness among bank staff about the importance of environmental policy impacts negatively the degree of compliance of an EMS.
- H2.* Lack of application of environmental risk management practices impacts negatively the degree of compliance of an EMS.

Results

In order to evaluate the effectiveness of the environmental risk management systems set-up by Moroccan banks that are ISO 14001 certified or have environmental charters, we test the correlation between EMS compliance and the explanatory variables ([Table 3](#)).

The variation of the correlation coefficient between C_SME and the explanatory variables ([Figure A2](#)) shows a variation between 0.6 and 0.8. These coefficients are positive and most of them tend toward 1 with a probability of significance of 0.000. This explains the existence of a positive linear relationship between the variable to be explained (C_SME) and the explanatory variables (Im_Ev, P_Ev, OPM, OF, GAPE, Bat_Cht, At_SME, PS, NC_ACP, GRE_Ev, GD, R_SME, SU, CEEP, DPCh, Achat, CCS, T_CO₂). Thus, the EMS is well explained by the variables considered. It remains to determine the explanatory power of each variable as well as its weight in the model that we will estimate later.

The result is that the variables are almost uncorrelated with a probability of significance >5%, in most cases >0.05. The variables with a probability of <0.05 are correlated, resulting in the appearance of a relationship between them, but this is weakly significant ([Table 3](#)).

Table 3.
Correlation between
explanatory variables

	Im_Ev	P_EV	OPM	OF	GAPE	Bat_Cht	At_SME	PS	NC_ACP	GRE_Ev	GD	R_SME	SU	CEEP	DPCh	Achat	CCS	T_CO2
Im_Ev	Bilateral Sig. N																	
P_EV	Bilateral Sig. N	0.138 230																
OPM	Bilateral Sig. N	0.109 230	0.52 230															
OF	Bilateral Sig. N	0.164 230	0.126 230	0.198 230														
GAPE	Bilateral Sig. N	0.034 230	0.072 230	0.111 230	0.097 230													
Bat_Cht	Bilateral Sig. N	0.054 230	0.170 230	0.049 230	0.128 230	0.075 230												
At_SME	Bilateral Sig. N	0.066 230	0.162 230	0.057 230	0.112 230	0.108 230	0.189 230											
PS	Bilateral Sig. N	0.174 230	0.150 230	0.069 230	0.165 230	0.123 230	0.057 230	0.056 230										
NC_ACP	Bilateral Sig. N	0.051 230	0.075 230	0.117 230	0.048 230	0.147 230	0.076 230	0.182 230	0.131 230									
GRE_Ev	Bilateral Sig. N	0.123 230	0.078 230	0.087 230	0.059 230	0.040 230	0.036 230	0.472 230	0.041 230	0.106 230								
GD	Bilateral Sig. N	0.187 230	0.030 230	0.055 230	0.142 230	0.180 230	0.197 230	0.064 230	0.096 230	0.083 230	0.109 230							
R_SME	Bilateral Sig. N	0.074 230	0.181 230	0.079 230	0.096 230	0.044 230	0.054 230	0.069 230	0.072 230	0.101 230	0.120 230	0.143 230						
SU	Bilateral Sig. N	0.050 230	0.049 230	0.113 230	0.051 230	0.716 230	0.521 230	0.090 230	0.084 230	0.129 230	0.191 230	0.119 230	0.064 230					
CEEP	Bilateral Sig. N	0.050 230	0.054 230	0.062 230	0.084 230	0.074 230	0.124 230	0.041 230	0.051 230	0.053 230	0.153 230	0.050 230	0.070 230	0.057 230				
DPCh	Bilateral Sig. N	0.035 230	0.135 230	0.087 230	0.072 230	0.050 230	0.121 230	0.067 230	0.542 230	0.144 230	0.106 230	0.072 230	0.082 230	0.050 230				
Achat	Bilateral Sig. N	0.134 230	0.162 230	0.147 230	0.193 230	0.093 230	0.660 230	0.692 230	0.071 230	0.096 230	0.080 230	0.172 230	0.090 230	0.149 230	0.057 230			
CCS	Bilateral Sig. N	0.033 230	0.125 230	0.057 230	0.130 230	0.027 230	0.078 230	0.101 230	0.098 230	0.078 230	0.087 230	0.113 230	0.822 230	0.131 230	0.358 230	0.048 230	0.172 230	
T_CO2	Bilateral Sig. N	0.061 230	0.063 230	0.052 230	0.051 230	0.049 230	0.231 230	0.110 230	0.052 230	0.123 230	0.055 230	0.013 230	0.040 230	0.082 230	0.221 230	0.050 230	0.056 230	0.07 230
Source(s): Authors' calculations																		

Variables with a probability of <0.05 are correlated, resulting in the appearance of a relationship between them, but the latter is weakly significant (Table 3).

The Kolmogorov–Smirnov test (Table 4) shows that the significance level is $0.035 (<0.05)$, which does not allow us to keep the null hypothesis. The normal Q–Q diagram of C_SME (Figure 2) is not far from this hypothesis, where we notice a distribution close to a normal distribution because the points are rather well aligned.

The interest of the illustrated test remains important in the choice of the model. The distribution of the variable to be explained follows a normal distribution, which allows us to consider that the most adequate model in our case is that of multiple linear regression.

The R^2 or coefficient of determination, which measures the goodness of fit of the estimates of the regression equation, gives us an overall idea of the fit of the model. It is interpreted as the proportion of the variance of the variable Y explained by the regression. It varies between 0 and 1 and is often expressed as a percentage. The R^2 obtained, according to Table 5, shows the contribution of all the estimated variables to the explanation of the variable to be explained. The coefficient obtained is close to 1, which means that the variation of the independent variable is well explained by the explanatory variables. The higher the value of R^2 , the smaller the value of the unexplained variation. Eighty-one percent of C_SME is explained by the explanatory variables constituting the estimated model, while the remaining 19% is unexplained random noise.

In our modeling case, we are based on the top-down method. It is worth noting that all methods proposed (input, bottom-up and top-down) have the same performance. We have eliminated the following two variables: P_Ev and Im_Ev.

The results of the estimation of the coefficients obtained (Table 6) show that all the variables introduced are not significant at the 5% level. The final model will only keep the variables that have an explanatory force (significance $>5\%$) of the variable to be explained. This regression method, used for the estimation of the parameters, allowed us to eliminate in each step the least significant variable without affecting the reliability and relevance of the model. The assumptions of the significance test retained are as follows:

$H_0: \beta_i = 0$. We can remove variable X from the model without deteriorating its explanatory power.

$H_1: \beta_i \neq 0$. We must keep variable X since it is significant and therefore explanatory.

In our case, the validation is done based on the calculated “t” statistic and the “t” theoretical. Thus, the decision rule is the following: We reject H_0 if “t” calculated $>$ “t” theoretical and we accept H_0 or the case where “t” calculated $<$ “t” theoretical. The test performed gives the following results (Table 6):

Table 7 shows a Fisher’s test value of 58.76 with a significance level <0.05 , which leads us to consider that all the coefficients are generally significant and that each variable has its weight in terms of explaining the variability of C_SME. In summary, the model is globally significant with an error term of 5%.

	C_SME
N	230
Normal parameters Mean	77.03370787
Standard deviation	1.718293033E
Kolmogorov–Smirnov Z	1.423
Asymptotic significance (two-sided)	0.035
Source(s): Authors’ calculations	

Table 4.
Distribution of the
variable C_SME

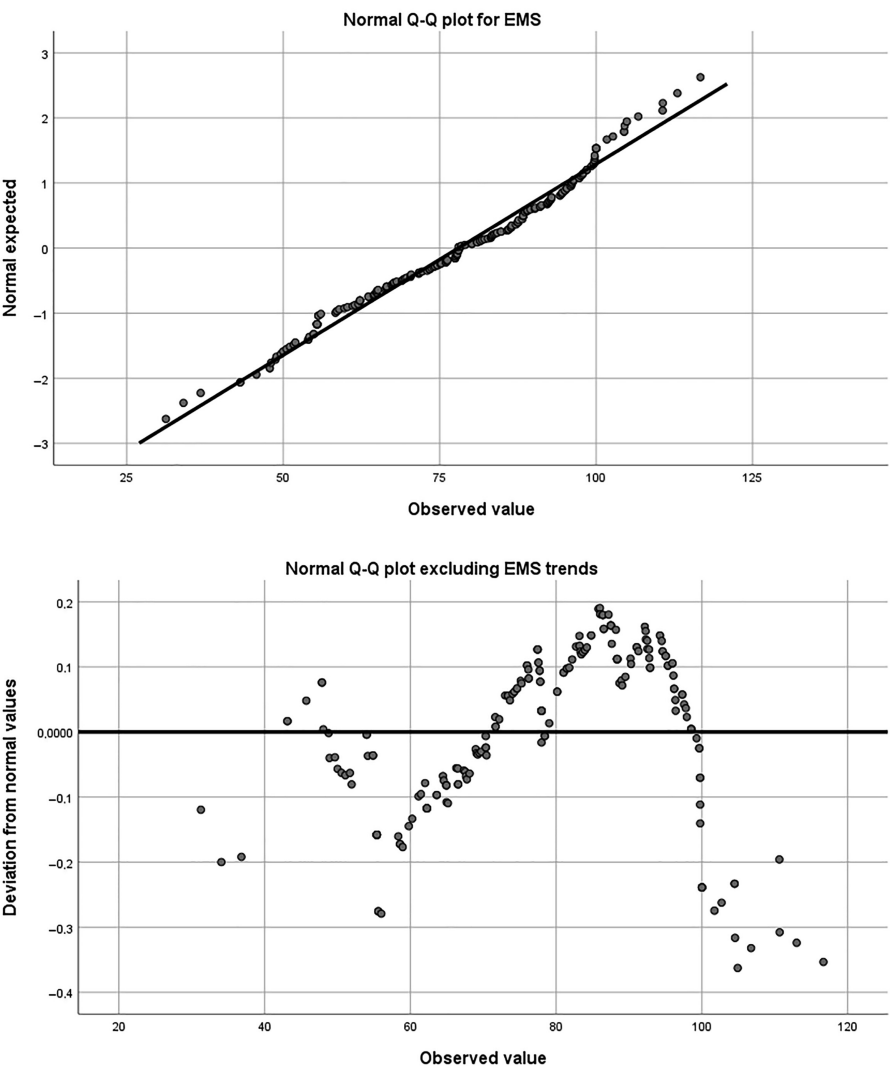


Figure 2.
Kolmogorov -
Smirnov test

Source(s): Authors' calculations

Table 5.
Result of the model
fit test

Summary of models			Adjusted <i>R</i> -square	Standard error of the estimate
Model	<i>R</i>			
7	0.9	0.81	0.797	7.74988345
Source(s): Authors' calculations				

Coefficients				Evidence from Moroccan banks
Model	Standardized coefficients Beta	t	Sig.	
(Constante)	14.238	5.944	0	683 Table 6. Results of the estimation of the coefficients
OPM	0.192	3.531	0.001	
OF	0.106	2.24	0.026	
GAPE	0.186	3.293	0.001	
At_SME	0.132	2.183	0.03	
PS	0.095	2.056	0.041	
NC_ACP	0.131	2.139	0.034	
SU	0.112	3.115	0.003	
CEEP	0.131	3.117	0.002	
DPCh	0.165	3.496	0.001	
Achat	0.116	3.105	0.003	
CCS	0.196	3.811	0.001	
T_CO2	0.146	3.656	0.002	
Source(s): Authors' calculations				

Table 6.
Results of the estimation of the coefficients

ANOVA						
Model	R	Sum of squares	ddl	Mean of squares	F	Significance
7	Regression	42349.783	12	3529.149	58.76	0.000
	Error	9910.015	218	60.061		
	Total	52259.798	230			
Source(s): Authors' calculations						

Table 7.
Significance test of the estimates

Table 8 reflects the estimation of the collinearities of the residuals. The aim of this test is to find an upper tolerance of 0.3 and a Variance Inflation Factor (VIF) value <3.3 or tending toward 1. We notice that all the observed values of VIF are <3.3 except for a few; nevertheless, the tolerances are >0.3. Based on this reading of the data, we see that there is probably no collinearity between the residuals. The correlation between the predictor variables is too low. This result reinforces the reliability of the model and its explanatory variables.

By examining the histogram of the distribution of residual values (Figure 3), we see that the premise of normality of the distribution of errors is respected at a certain level, with the presence of a pronounced peak as well as values far from the curve. It would, therefore, be wise to remove these extreme values from the analysis or to eliminate their effects.

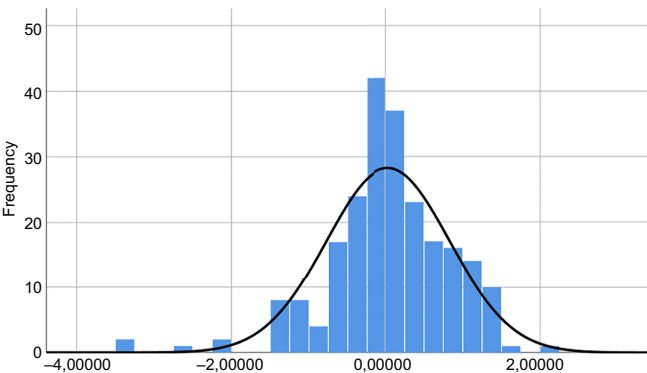
Based on the foregoing findings, the model is globally significant at the minimum five percent level. Then, we can legally use it to build our indicator. We also eliminated non-significant variables from our estimates for our entire sample in order to obtain a reduced model that is relatively robust for our estimates. The results are in line with our expectations and remain consistent with previous research on the topic (Dasgupta *et al.*, 2000; Dahlström *et al.*, 2003).

Discussion

According to all the tests we have performed, we conclude that our model is significant, and that the seventh model is the one that explains in a relevant way the variability of the explanatory variable (C_SME). The equation of the model is as follows:

Table 8.
Residual
correlation test

Coefficients							
	Unstandardized coefficients		Standardized coefficients			Collinearity statistics	
Model	A	Standard error	Beta	t	Sig.	Tolerance	VIF
(Constante)	14.238	2.85		5.944	0		
OPM	4.517	1.279	0.192	3.531	0.001	0.358	2.792
OF	2.047	0.914	0.106	2.24	0.026	0.467	2.141
GAPE	0.119	1.271	0.186	3.293	0.001	0.278	3.599
At_SME	2.16	1.134	0.132	2.183	0.03	0.261	3.828
PS	2.115	0.98	0.095	2.056	0.041	0.517	1.934
NC_ACP	2.118	1.182	0.131	2.139	0.034	0.278	3.593
SU	0.626	0.97	0.112	3.115	0.003	0.482	2.075
CEEP	0.02	1.165	0.131	3.117	0.002	0.489	2.044
DPCh	2.035	0.839	0.165	3.496	0.001	0.47	2.127
Achat	0.656	1.075	0.116	3.105	0.003	0.358	2.792
CCS	3.137	1.086	0.196	3.811	0.001	0.331	3.017
T_CO2	4.102	1.341	0.146	3.656	0.002	0.507	1.971
Source(s): Authors' calculations							



Source(s): Authors' calculations

Figure 3.
Error normality test

$$\begin{aligned} C - SME_i = & 14,238_i + 4,517OPM_i + 2,047OF_i + 0,119GAPE_i + 2,16At_SME_i \\ & + 2,115PS_i + 2,118NC_ACP_i + 0,626SU_i + 0,02CEEP_i + 2,035DPCh_i \\ & + 0,656Achat_i + 3,137CCS_i + 4,102T_CO2_i \end{aligned}$$

The results of the model show the contribution of each variable in explaining the compliance of the EMS. The weight of each variable reflects its importance in the definition of an EMS, and therefore, management should take this weight into consideration as a guiding factor in strengthening the EMS. Based on the results of the model, the variables Objectives and Management Program (OPM), Functional Organization (OF), Audits (AT_SME), Monitoring Plan (PS), Non-Compliance-Corrective and Preventive Action (NC_SME), Waste and Chemicals (DPCh), Skills, Communication and Awareness (CCS) and Transport and CO₂ (T_CO₂) represent an explanatory force. For the banking sector, an EMS model

that defines the set of relevant variables, either “information” or “application,” that the bank needs to strengthen by improving its environmental policy. Moreover, it seems that the variables in the “application” category are present since there are 8 of them compared to 4 in the “information” category. The “information” variables, which represent the essential variables in the general definition of the environmental policy and in raising awareness and providing information on the bank’s commitment to a pro-environmental approach, are the following: OPM, Functional Organization (FO), (AT_SME), Monitoring Plan (SP) and (NC_SME). We can also point out that in the category of information variables, the OPM variable related to the objectives and management program presents a weight of 4.517, which means that the higher the score of the variable, the more the EMS simultaneously achieves an increase in advanced compliance. These findings are quite consistent with the study by [Iraldo et al. \(2009\)](#), which points out that EMS adoption is most effective when all the elements of an EMS are integrated into the management dynamics of the company. The empirical findings are also consistent with the study by [Testa et al. \(2014\)](#), which points out that the top management must take into account that the internal commitment at all levels of the organizational hierarchy is crucial for an effective EMS.

Henceforth, Moroccan banks need to define clear objectives and management programs in order to reduce the risk of environmental impacts occurring. Corrective and preventive actions can also have an impact on the environment. Based on the above developments, we can deduce some managerial implications. Financial institutions should take corrective and adequate measures and measure the effectiveness of the action plans conducted by the responsible entity and the audit team hired to accomplish this mission.

The “application” variables that reflect the means and procedures put in place to manage the various environmental risks in the Moroccan banks are mainly: Waste and Chemicals (HPCD), CCS and T_CO₂. It should be mentioned that in the category of enforcement variables, CCS and T_CO₂, represent the variables with strong explanatory power. The application variable CCS presents a weight of 3.1374, which means that when the score of the variable increases, the EMS obtains at the same time an increase in advanced compliance. In other words, the increase/decrease of the CCS variable by one point generates an increase/decrease of 3.1374 units, with an effect that will be positive or negative on the compliance of the EMS. This result can be interpreted by the fact that the Moroccan banks must establish processes for communication to improve their compliance. Communication concerns individuals having a responsibility under the action plan and may extend to groups or organizations that have been identified as having a key role in the bank’s ongoing EMS program. As well, skills or training processes help banks ensuring that all responsible parties are familiar with the ongoing EMS and have the skills required to execute their roles. The overarching aim of EMS communication and training is to raise EMS awareness among the bank staff. For the variable “T_CO₂”, the increase/decrease of one point in the variable T_CO₂ generates an increase/decrease of 4,102 units with an effect that will be positive or negative on the conformity of the EMS. T_CO₂ is a second most significant variable in the model. It concerns the preservation of the environment through procedures that reduce CO₂ emissions. For these reasons, compliance is extremely sensitive to changes in any of these variables. Concerning the T_CO₂ variable, it is recognized by international standards that banks should be allocated a portion of the CO₂ emissions of the investment projects or financing they support. Moroccan banks, therefore, have a social and environmental responsibility and a crucial role to play in reducing environmental impacts, as their financing and investments contribute to greenhouse gas emissions. Moroccan banks must become aware of the environmental impact of their logistics activities and implement concrete solutions to reduce their transport CO₂ emissions and limit the consequences. These empirical findings are quite consistent with statements in the literature ([Johnstone et al., 2007](#); [Riedinger & Thévenot, 2008](#)) that the introduction of

ISO 14001 reduces the environmental impacts (CO₂ emissions) and their production costs (energy consumption). These results are also in line with the previous study by [García Alcaraz et al. \(2022\)](#), which found that EMS investments ensure a reduction in energy consumption and waste management costs.

In sum, it should be noted that only Bank A is ISO 14001 certified, the other Moroccan banks only use environmental charters. The study attempted to determine the main factors that explain the compliance of existing practices with regulations to prevent and control negative environmental impacts. The empirical findings provide some answers to the questions raised above as to whether Moroccan banks implementing an EMS really comply with the applicable standards and what are the explanatory factors of the compliance of Moroccan banks' EMS with the regulations. Overall, the empirical findings confirm our two hypotheses that the degree of compliance of an EMS depends on the dissemination of information and awareness-raising efforts of the bank's staff, as well as on the application of environmental risk management practices. On these grounds, it can be deduced that the compliance of an EMS in Moroccan banks depends on two categories of variables. First, EMS compliance is linked to a set of "information" variables that play a particularly important role in the overall design of an EMS. Second, EMS compliance is linked to another set of applications put in place to manage the various probable environmental risks. On the basis of the foregoing results, the most relevant information variables that explain the EMS compliance in Moroccan banks are awareness of the environmental objectives and management program (action plans), awareness of the functional organization (the management representative responsible for the EMS), the bank's activities covered by the EMS, environmental performance improvement groups (EPIG) and the environmental audit system (internal audits and certification audits performed).

Among the most relevant application variables that explain the EMS compliance in Moroccan banks, we first mention the Monitoring Plan (consumption of electricity, water and paper, evaluation of waste management services, waste disposal control measures, environmental incident reporting, and preventive maintenance and repairs take into account environmental and energy aspects in the acceptance process). Second, the non-conformity and corrective and preventive action (by reporting incidents to the relevant central entities, taking corrective and preventive actions following the reporting of incidents), the provision of an emergency facility at the agency and the training of staff in emergency situations. Other equally important variables relating to consumption include water, electricity, paper, compliance with the waste management procedure, the environmental approach of the entity in charge of purchasing, as well as competence, communication and awareness, and implementation of solutions in order to reduce their transport CO₂ emissions.

Conclusion, limitations and further research directions

Nowadays, environmental risk management is as necessary as risk management in both banks and companies. However, environmental issues in banking and transactions have been given little attention so far in the literature. Admittedly, it is clear that environmental risk management is a key element of strategic management in the field of financial institutions, a perspective that must become a complete reality and not a make-up to embellish the brand image. The main purpose of this study was to evaluate the EMS effectiveness of Moroccan banks that are ISO 14001-certified or have environmental charters. To specify the most relevant indicators that can explain the effectiveness of the EMS, the empirical study used a regression method to model the relationship between EMS compliance and a set of explanatory variables related to environmental management. The study defined two categories of variables: "information" variables related to the overall design of an EMS and

“application” variables related to environmental risk management. Overall, the study intends to contribute to the design of a framework for the sustainability of banking activities through the implementation of an EMS in terms of environmental management. Empirical findings in this study reveal interesting insights. The study shows that the compliance of an EMS is based on the establishment and implementation of an EMS whose variables are well defined in accordance with the standards in force dictated by the dedicated authorities. The first category of variables shows that Moroccan banks need to define clear objectives and management programs and, above all, take corrective and preventive actions to reduce the risk of environmental impacts. The second category shows that Moroccan banks not only need to establish communication and training processes to raise awareness and improve compliance among bank staff but also, and above all, to implement concrete solutions to reduce their transport CO₂ emissions and limit the consequences. In short, Moroccan banks must promote the environment and foster responsibility toward society to be involved in sustainable activities. Herein, ISO-certified banks could set an example for other banks not yet certified.

This study has some limitations that can be considered in further empirical studies. The main limitation is the lack of information on the environmental improvements achieved by Moroccan banks. In the present study, we focused on assessing the compliance of EMSs in Moroccan banks. Although this study considered variables related to environmental management, future studies should investigate the degree of change due to EMS adoption. The magnitude of the stakes requires the entire financial sector to mobilize in order to significantly contribute to the improvement of environmental management. This approach must not only preserve natural resources but also evolve toward the limitation and prevention of nuisances and pollution. Furthermore, with the emergence of new environmental and social regulations and standards, further empirical research could investigate the effect of EMS internalization on the environmental performance of Moroccan banks based on managerial and operational indicators. It would be of great interest to conduct an empirical study on how the implementation of an EMS affects financial performance in Moroccan banks.

References

- Alibeli, M. A., & Johnson, C. (2009). Environmental concern: A cross national analysis. *Journal of International and Cross-Cultural Studies*, 3(1), 1–10.
- Allix-Desfautaux, E., & Makany, L. G. D. (2015). Développement durable et gestion d'une entreprise : Croisements fertiles. *Management and Avenir*, 7(81), 15–36. doi: [10.3917/mav.081.0015](https://doi.org/10.3917/mav.081.0015).
- Anton, W. R. Q., Deltas, G., & Khanna, M. (2004). Incentives for environmental self-regulation and implications for environmental performance. *Journal of Environmental Economics and Management*, 48(1), 632–654.
- Barla, P. (2007). ISO 14001 certification and environmental performance in Quebec's Pulp and paper industry. *Journal of Environmental Economics and Management*, 53(3), 291–306.
- Barthelemy, B., & Courrèges, P. (2004). *Gestion des risques: Méthode d'optimisation globale*. Edition d'Organisation.
- Berry, M.A., & Rondinelli, D. (2000). Environmental management in the pharmaceutical industry: integrating corporate responsibility and business strategy. *Environmental Quality Management*, 9(3), 21–33. doi: [10.1002/1520-6483\(200021\)9:3<0.CO;2-4](https://doi.org/10.1002/1520-6483(200021)9:3<0.CO;2-4).
- Boiral, O., Guillaumie, L., Saizarbitoria, I. H., & Tene, C. V. T. (2018). Adoption and outcomes of ISO 14001: A systematic review. *International Journal of Management Review*, 20(2), 411–432. doi: [10.1111/ijmr.12139](https://doi.org/10.1111/ijmr.12139).

- Boiral, O., & Sala, J. M. (1998). Environmental management: Should industry adopt ISO 14001? *Business Horizons*, 41(1), 57–64.
- Comoglio, C., & Bolta, S. (2012). The use of indicators and the role of environmental management system for environmental performances improvement: A survey on ISO 14001 certified companies in the automotive sector. *Journal of Cleaner Production*, 20, 92–102. doi: [10.1016/j.jclepro.2011.08.022](https://doi.org/10.1016/j.jclepro.2011.08.022).
- Cosmina, L. V., Hoogenberg, B.-J., Fratostiteanu, C., & Azam Hashmi, H. B. (2020). The relation between environmental management systems and environmental and financial performance in emerging economies. *Sustainability*, MDPI, 12(13), 1–21, July, 5309. doi: [10.3390/su12135309](https://doi.org/10.3390/su12135309).
- Daddi, T., Frey, M., Iraldo, F., & Nabil, B. (2011). The implementation of an environmental management system in a North-African local public administration: The case of the city Council of Marrakech (Morocco). *Journal of Environmental Planning and Management*, 54(6), 813–832. doi: [10.1080/09640568.2010.537543](https://doi.org/10.1080/09640568.2010.537543).
- Daddi, T., Heras-Saizarbitoria, I., Marrucci, L., Rizzi, F., & Testa, F. (2021). The effects of green supply chain management capability on the internalisation of environmental management systems and organisation performance. *Corporate Social Responsibility and Environmental Management*, 28(4), 1241–1253. doi: [10.1002/csr.2144](https://doi.org/10.1002/csr.2144).
- Daddi, T., Iraldo, F., Testa, F., & De Giacomo, M. R. (2019). The influence of managerial satisfaction on corporate environmental performance and reputation. *Business Strategy and the Environment*, 28(1), 15–24. doi: [10.1002/bse.2177](https://doi.org/10.1002/bse.2177).
- Daddi, T., Magistrelli, M., Frey, M., & Iraldo, F. (2011). Do environmental management systems improve environmental performance? Empirical evidence from Italian companies. *Environment, Development and Sustainability*, 13, 845–862. doi: [10.1007/s10668-011-9294-8](https://doi.org/10.1007/s10668-011-9294-8).
- Daddi, T., Testa, F., Frey, M., & Iraldo, F. (2016). Exploring the link between institutional pressures and environmental management systems effectiveness: An empirical study. *Journal of Environmental Management*, 183, 647–656. doi: [10.1016/j.jenvman.2016.09.025](https://doi.org/10.1016/j.jenvman.2016.09.025).
- Daddi, T., Todaro, N. M., Marrucci, L., & Iraldo, F. (2022). Determinants and relevance of internalisation of environmental management systems. *Journal of Cleaner Production*, 374, 134064, ISSN 0959-6526. doi: [10.1016/j.jclepro.2022.134064](https://doi.org/10.1016/j.jclepro.2022.134064).
- Dahlström, K., Howes, C., Leinster, P., & Skea, J. (2003). Environmental management systems and company performance: Assessing the case for extending risk-based regulation. *European Environment*, 13(4), 187–203.
- Dasgupta, S., Hettige, H., & Wheeler, D. (2000). What improves environmental compliance? Evidence from Mexican Industry. *Journal of Environmental Economics and Management*, 39(1), 39–66. doi: [10.1006/jeeem.1999.1090](https://doi.org/10.1006/jeeem.1999.1090).
- Desmazes, J., & Lafontaine, J. P. (2007). *L'assimilation des budgets environnementaux et du tableau de bord vert par les entreprises. Actes du 28ème congrès de l'Association Francophone de Comptabilité*. Poitiers, France: CD-Rom. halshs-00543246.
- Elkington, J., & Hailes, J. (1989). *The green consumer's guide: From shampoo to champagne: High-street shopping for a better environment*. Hardcover.
- Erauskin-Tolosa, A., Zubeltzu-Jaka, E., Heras-Saizarbitoria, I., & Boiral, O. (2019). ISO 14001, EMAS and environmental performance: A meta-analysis. *Business Strategy and the Environment*, 29(6), 1–15. doi: [10.1002/bse.2422](https://doi.org/10.1002/bse.2422).
- Fagioli, F. F., Paolotti, L., & Boggia, A. (2022). Trends in environmental management systems research. *A Content Analysis - Environmental and Climate Technologies*, 26(1), 46–63. doi: [10.2478/rtuct-2022-0005](https://doi.org/10.2478/rtuct-2022-0005).
- Feng, T., & Wang, D. (2016). The influence of environmental management systems on financial performance: A moderated-mediation analysis. *Journal of Business Ethics*, 135, 265–278. doi: [10.1007/s10551-014-2486-z](https://doi.org/10.1007/s10551-014-2486-z).

- García Alcaraz, J. L., Díaz Reza, J. R., Arredondo Soto, K. C., Hernández Escobedo, G., Happonen, A., Puig I Vidal, R., & Jiménez Macías, E. (2022). Effect of green supply chain management practices on environmental performance: Case of Mexican manufacturing companies. *Mathematics*, 10(11), 1877. doi: [10.3390/math10111877](https://doi.org/10.3390/math10111877).
- Gendron, C. (2004). *La gestion environnementale et la norme ISO 14001*. Montreal: Les Presses Universitaires de Montréal.
- Heras-Saizarbitoria, I., Saez Vegas, L., & Artaraz, M. (2014). Motivations and benefits of the eco-management and audit scheme (EMAS) registration: A literature review. Available at SSRN 2686701.
- Ibenrissoul, A., Bouraqqadi, K., & Kammoun, S. (2021). The impact of adopting CSR on the firm's overall performance: Empirical evidence from large Moroccan firms, Chapter. 12. In Ziolo, M. (Ed.), *Adapting and Mitigating Environmental, Social, and Governance Risk in Business*. IGI GLOBAL, Hershey, Pennsylvania, doi: [10.4018/978-1-7998-6788-3](https://doi.org/10.4018/978-1-7998-6788-3).
- Ibenrissoul, A., Kammoun, S., & Tazi, A. (2021). The integration of CSR practices in the investment decision: Evidence from Moroccan companies in the mining industry, Chapter. 13. In Ziolo, M. (Ed.), *Adapting and Mitigating Environmental, Social, and Governance Risk in Business*. IGI GLOBAL, Hershey, Pennsylvania. doi: [10.4018/978-1-7998-6788-3](https://doi.org/10.4018/978-1-7998-6788-3).
- Iraldo, F., Testa, F., & Frey, M. (2009). Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European Union. *Journal of Cleaner Production*, 17(16), 1444–1452. doi: [10.1016/j.jclepro.2009.05.013](https://doi.org/10.1016/j.jclepro.2009.05.013).
- ISO 14001. (2015). Systèmes de management environnemental — Exigences et lignes directrices pour son utilisation. Available from: <https://www.iso.org/fr/standard/60857>
- ISO survey (2020). Available from: <http://www.iso.org>
- Johnstone, N., Glachant, M., Serravalle, C., Riedinger, N., & Scapecchi, P. (2007). Many a slip 'twixt the Cup and the lip: Direct and indirect policy incentives to improve environmental performance. In Johnstone, N. (Ed.), *Corporate Behaviour and Environmental Policy*. Cheltenham, UK: Edward Elgar; and Paris: OECD.
- Kammoun, S., Loukil, S., Ben Romdhane Loukil, Y., & Ibenrissoul, A. (2020). The relationship between CSR, corporate governance and firm performance: Evidence from Moroccan listed firms. Chapter 15. In Paiva, I. S., & Carvalho, L. C. (Eds), *Conceptual and Theoretical Approaches to Corporate Social Responsibility, Entrepreneurial Orientation, and Financial Performance* (pp. 289-304). IGI GLOBAL, Hershey, Pennsylvania. doi: [10.4018/978-1-7998-2128-1.ch015](https://doi.org/10.4018/978-1-7998-2128-1.ch015).
- Kolln, K., & Prakash, A. (2002). EMS-based environmental regimes as club goods: Examining variations in firm-level adoption of ISO 14001 and EMAS in UK, US and Germany. *Policy Sciences*, 35(1), 43–67. doi: [10.1023/A:1016071810725](https://doi.org/10.1023/A:1016071810725).
- Louisot, J. P. (2005). *Risk Management, Stratégie–Éthique*, Edition AFNOR.
- Marrucci, L., & Daddi, T. (2022). The contribution of the Eco-Management and Audit Scheme to the environmental performance of manufacturing organisations. *Business Strategy and the Environment*, 31(4), 1347–1357. doi: [10.1002/bse.2958](https://doi.org/10.1002/bse.2958).
- Marrucci, L., Daddi, T., & Iraldo, F. (2019). The integration of circular economy with sustainable consumption and production tools: Systematic review and future research agenda. *Journal of Cleaner Production*, 240, 118268. doi: [10.1016/j.jclepro.2019.118268](https://doi.org/10.1016/j.jclepro.2019.118268).
- Marrucci, L., Daddi, T., & Iraldo, F. (2022). Do dynamic capabilities matter? A study on environmental performance and the circular economy in European certified organisations. *Business Strategy and the Environment*, 31(6), 2641–2657. doi: [10.1002/bse.2997](https://doi.org/10.1002/bse.2997).
- Marrucci, L., Daddi, T., & Iraldo, F. (2022). The circular economy, environmental performance and environmental management systems: The role of absorptive capacity. *Journal of Knowledge Management*, 26(8), 2107–2132. doi: [10.1108/JKM-06-2021-0437](https://doi.org/10.1108/JKM-06-2021-0437).

- Mdehheb, Z., Elkihel, B., Bouamama, M., Hammouti, B., & Delaunois, F. (2020). The environmental management system and its application impacts on the business economy in the eastern region of Morocco. *Caspian Journal of Environmental Sciences*, 18(1), 13–20. doi: [10.22124/cjes.2020.3974](https://doi.org/10.22124/cjes.2020.3974).
- Mrhari, A., & Dinar, Y. (2019). La démarche RSE dans le secteur bancaire marocain. *Revue Internationale des Sciences de Gestion*, 2(1), 728–747. Available from: <https://revue-isg.com/index.php/home/article/view/39>.
- Musacchi, E. (2021). Green public procurement. In Letcher, T., Shulman, V., & Amirkhanian, S. (Eds.), *Tire Waste and Recycling*. First Edition- Elsevier, London, San Diego, Cambridge, Kidlington, doi: [10.1016/B978-0-12-820685-0.00020-X](https://doi.org/10.1016/B978-0-12-820685-0.00020-X).
- Palamariu, M., & Tulbure, I. (2021). Land use and management strategies for shaping sustainable cities, Chapter 3. In *Climate and Land Use Impacts on Natural and Artificial Systems: Mitigation and Adaptation* (pp. 29–48). Amsterdam, Olanda: Topic Collection: Environmental Science, ISBN: 978-0-12-822184-6. doi: [10.1016/B978-0-12-822184-6.00004-1](https://doi.org/10.1016/B978-0-12-822184-6.00004-1).
- Phan, T. N., & Baird, K. (2015). The comprehensiveness of environmental management systems: The influence of institutional pressures and the impact on environmental performance. *Journal of Environmental Management*, 160, 45–56.
- Potocan, V., Nedelko, Z., Peleckienė, V., & Peleckis, K. (2016). Values, environmental concern and economic concern as predictors of enterprise environmental responsiveness. *Journal of Business Economics and Management*, 17(5), 685–700. doi: [10.3846/16111699.2016.1202315](https://doi.org/10.3846/16111699.2016.1202315).
- Reynaud, E., & Walas, A. (2015). Discours sur la RSE dans le processus de légitimation de la banque. *Revue française de gestion*, 41(248), 187–209.
- Riedinger, N., & Thévenot, C. (2008). La norme ISO 14001 est-elle efficace? Une étude économétrique sur l'industrie française. *Economie Statistique*, (411), 3–19.
- Rouggani, K. D., & Bouayad, A. (2014). *L'implémentation d'une démarche Responsabilité Sociale des Organisations dans le système financier : le cas de la BMCE Bank, Colloque international : éthique en sciences de gestion, mythe ou réalité?*, 4-5 décembre. Maroc: El jadida.
- Russo, M. V., & Harrison, N. S. (2005). Organizational design and environmental performance: Clues from the electronics industry. *Academy of Management Journal*, 48(4), 582–593.
- Salim, H. K., Padfield, R., Hansen, S. B., Mohamad, S. E., Yuzir, A., Syayuti, K., . . . Papargyropoulou, E. (2018). Global trends in environmental management system and ISO14001 research. *Journal of Cleaner Production*, 170, 645–653. doi: [10.1016/j.jclepro.2017.09.017](https://doi.org/10.1016/j.jclepro.2017.09.017).
- Sartor, M., Orzes, G., Touboulic, A., Culot, G., & Nassimbeni, G. (2019). ISO 14001 standard: Literature review and theory-based research agenda. *Quality Management Journal*, 26(1), 32–64.
- Sanderson, R. (2016). ISO 14001. Safety and Health Practitioner Newsletter. Available from: <https://www.shponline.co.uk/legislation-and-guidance/iso-14001-explained/>
- Stevens, P. A., Batty, W. J., Longhurst, P. J., & Drew, G. H. A. (2012). Critical review of classification of organizations in relation to the voluntary implementation of environmental management systems. *Journal of Environmental Management*, 113, 206–212. doi: [10.1016/j.jenvman.2012.08.037](https://doi.org/10.1016/j.jenvman.2012.08.037).
- Tani, W., & Bari, I. (2021). Les pratiques RSE des établissements bancaires marocains : cas des banques finançant les associations de microcrédit. *Revue Internationale de Management, d'Entrepreneuriat et de Communication*, 06. Available from: <http://revue-rimec.org/les-pratiques-rse-des-etablissements-bancaires-marocains-cas-des-banques-financant-les-associations-de-microcredit/>
- Tessitore, S., Testa, F., Iraldo, F., & Daddi, T. (2019). Isomorphic or dissimilar implementation among environmental management scheme adopters? Empirical evidence from the European context. *Business Strategy and Development*, 2(4), 290–302. doi: [10.1002/bsd2.61](https://doi.org/10.1002/bsd2.61).
- Testa, F., Heras-Saizarbitoria, I., Daddi, T., Boiral, O., & Iraldo, F. (2016). Public regulatory relief and the adoption of environmental management systems: A European survey. *Journal of Environmental Planning and Management*, 59(12), 2231–2250. doi: [10.1080/09640568.2016.1139491](https://doi.org/10.1080/09640568.2016.1139491).

- Testa, F., Rizzi, F., Daddi, T., Gusmerotti, N. M., Frey, M., & Iraldo, F. (2014). EMAS and ISO 14001: The differences in effectively improving environmental performance. *Journal of Cleaner Production*, 68, 165–173. doi: [10.1016/j.jclepro.2013.12.061](https://doi.org/10.1016/j.jclepro.2013.12.061).
- Tourais, P., & Videira, N. (2016). Why, how and what do organizations achieve with the implementation of environmental management Systems?—Lessons from a comprehensive review on the eco-management and audit scheme. *Sustainability*, 8(3), 283.
- Turki, M., Medhioub, E., & Kallel, M. (2015). Effectiveness of EMS in Tunisian companies: Framework and implementation process based on ISO 14001 standard. *Environment, Development and Sustainability*, 19(2), 479–495. doi: [10.1007/s10668-015-9741-z](https://doi.org/10.1007/s10668-015-9741-z).
- Zhou, G., Zhang, L., & Zhang, L. (2019). Corporate social responsibility, the atmospheric environment, and technological innovation investment. *Sustainability*, 11, 481–493.

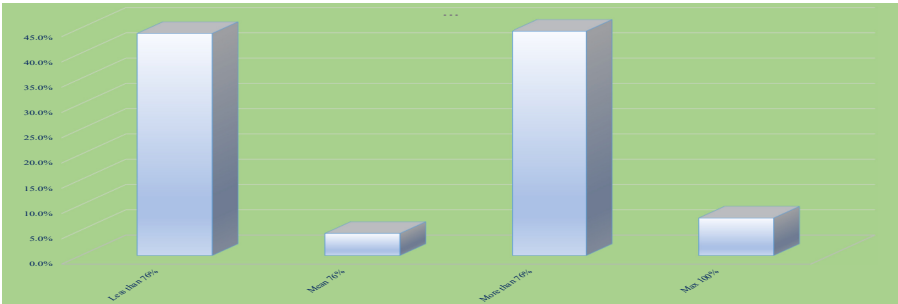
Further reading

- Brundtlan, R. (1987). *Notre avenir à tous*. Publications de l'Association Adéquations. Site de l'Association Adéquations.
- Daddi, T., Frey, M., De Giacomo, M. R., Testa, F., & Iraldo, F. (2015). Macro-economic and development indexes and ISO14001 certificates: A cross national analysis. *Journal of Cleaner Production*, 108, 1239–1248. doi: [10.1016/j.jclepro.2015.06.091](https://doi.org/10.1016/j.jclepro.2015.06.091).
- Kammoun, S., Le Bas, C., & Mercuri Chapuis, S. (2020a). Types de RSE, types d'innovation : un bilan de travaux empiriques, Chapitre 8. In Le Bas, & Mercuri Chapuis, S. C. (Eds.), *La responsabilité sociale des entreprises. Des relations sociales à la dimension stratégique*. Editions EMS, Management et Société, Questions de société.
- Kammoun, S., Loukil, S., & Ben Romdhane Loukil, Y. (2020b). The impact of firm performance and corporate governance on corporate social responsibility: Evidence from France. Chapter 14. In Paiva, I. S., & Carvalho, L. C. (Eds.), *Conceptual and Theoretical Approaches to Corporate Social Responsibility, Entrepreneurial Orientation, and Financial Performance* (pp. 266–288). IGI GLOBAL. doi: [10.4018/978-1-7998-2128-1.ch014](https://doi.org/10.4018/978-1-7998-2128-1.ch014).
- Kammoun, S., Ben Romdhane, Y., Loukil, S., & Ibenrissoul, A. (2021). An examination of linkages between corporate social responsibility and firm performance: Evidence from Moroccan listed firms. *Estudios Gerenciales, Journal of Management and Economics for Ibero-America*, 37(161), 636–646, Epub Sep 08, 2021. ISSN 0123-5923. doi: [10.18046/j.estger.2021.161.4010](https://doi.org/10.18046/j.estger.2021.161.4010).
- Mzoughi, N., Grolleau, G., Thévenot, C., & Riedinger, N. (2008). La norme ISO 14001 est-elle efficace? Une étude économétrique sur l'industrie française. *Economie et statistique*, 411(1), 3–19.
- Nakamura, M., Takahashi, T., & Vertinsky, I. (2001). Why Japanese firms choose to certify: A study of managerial responses to environmental issues, 2001. *Journal of Environmental Economics and Management*, 42(1), 23–52. doi: [10.1006/jeem.2000.1148](https://doi.org/10.1006/jeem.2000.1148).

(The Appendix follows overleaf)

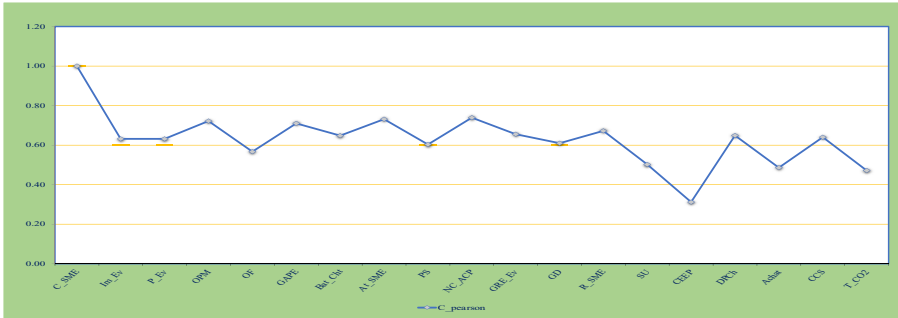
Figure A1.
Measurement of
compliance levels

Annexes



Source(s): Authors' elaboration

Figure A2.
Correlation between
EMS compliance and
explanatory variables



Source(s): Authors' elaboration

Theme	Requirements	Evidence from Moroccan banks
Environmental impacts of the bank	<i>Environmental impacts of the Bank</i> Do you know the direct impacts of banking? Do you know the indirect impacts of the bank? Do you know how these impacts are determined and assessed? Do you know that the bank has a system for evaluating and monitoring environmental regulations?	693
BMCE environmental policy	<i>BMCE Environmental Policy</i> Do you know the 8 axes of the environmental policy? Do you know how to access the environmental policy? Do you know how the public (anyone outside the bank) can access the environmental policy?	
BMCE management objectives and program	<i>BMCE management objectives and program</i> Do you know the environmental objectives of each policy area? Do you know the numerical targets for these objectives? Do you know whether or not they are being met? Are you aware of the action plans for achieving the objectives? Are you aware of the actions that have been implemented on your site in this context?	
Functional organization	<i>Functional organization</i> Do you know the name of the management representative responsible for the EMS? Do you know the geographical scope of the EMS? Do you know which of the bank's activities are covered by the EMS?	
EPIG	<i>EPIG</i> Are you aware of the topics covered by EPIG? Do you know the role and functioning of the EPIG in the EMS?	
Monitoring plan	<i>Monitoring plan</i> Do you analyze electricity consumption? Do you analyze water consumption? Do you analyze paper consumption? Do you conduct the evaluation of waste management services on the work orders? Do you monitor the disposal of waste in the register kept by the safety team? Do you report all environmental incidents via the DMG HelpDesk? Do you ensure that preventive maintenance and repairs take proper account of environmental and energy aspects during acceptance?	Table A1. Survey
EMS audits	<i>EMS Audits</i> Do you know about the internal environmental audit system? Do you know why internal and certification audits are conducted?	
Non-conformity - Corrective and preventive action	<i>Non-conformity - Corrective and preventive action</i> Do you know what the different environmental non-conformities (= environmental incidents) are? Do you report these incidents to the central entities concerned? Do you know who determines the corrective and preventive actions following the reporting of incidents? <i>Management of external environmental complaints and requests</i>	
(continued)		Table A1. Survey

Theme	Requirements
Management of external environmental complaints and requests	Are you aware of the main potential external environmental complaints and requests? Do you record and forward all external environmental complaints and requests? Is a response systematically communicated to the applicant? Do you systematically declare incidents that may disturb external persons before an external complaint is made? <i>Document management</i>
Document management	Do you know the EMS documentation: procedures, lists, forms, action plan, environmental analysis, regulatory assessment and scorecard? Do you know how to access the EMS documentation? <i>EMS review</i>
EMS review	Have you analyzed your environmental performance (consumption, NC & corrective actions)? Are you aware of the conclusions of the quarterly GAPE review? Have the results of the annual management review of the EMS been communicated within the agency? <i>Emergency situations</i>
Emergency situations	Have you been trained in emergency situations? Have you tested your emergency response at the agency: staff behavior, telephone numbers, equipment? <i>ECOGESTES</i> Are the technical and IT rooms cleared of all flammable materials (paper, cardboard, plastic, etc.)? Are defects in technical equipment that present a fire hazard immediately reported to the DMG Help Desk? Is the fire equipment perfectly maintained? <i>Consumption – Water, Electricity and Paper</i>
Consumption: Water, Electricity and Paper	Are you aware of the conclusions of the bank's energy audit? Are you aware of the action plans for saving electricity, water and paper? Are computers put on standby at night? Are lights in unoccupied rooms switched off? Are the temperature settings for heating at 20 °C and air conditioning at 25 °C, systematically? Do you use the tools deployed to save paper: internal administration on the intranet, multifunctional devices, GED, efax, double-sided printing? <i>Waste and chemicals</i>
Waste and chemicals	Are you following the waste management procedure? Is the waste disposal register correctly completed by the security guard? Are service providers assessed on their waste and chemical management? Is the branch covered by the paper recycling network? Is the branch covered by the computer recycling network? Is the agency covered by the household waste collection service? Is the chemical deposit posted in the maintenance room? <i>ECOGESTES</i> If you are covered by the recycling network, do you sort waste: paper, computer consumables and discarded computer equipment? <i>Purchase</i>

Table A1.

(continued)

		Evidence from Moroccan banks
Theme	Requirements	
Purchase	Do you include environmental criteria in your procurement requests? Are you aware of the environmental approach of the entity in charge of purchasing?	
Skills, communication and awareness	<i>Skills, communication and awareness</i> Are you aware of the results of the environmental performance and the progress of the BMCE action plans? Has the deployment kit been presented to the branch's staff? Are your service providers informed of the environmental requirements and the policy? Is the role of the branch manager in the EMS known?	695
Transport and CO ₂	<i>Transport and CO₂</i> Do you prefer training in regional centers? Are you aware of video conferencing solutions?	
Buildings and construction sites	<i>Buildings and construction sites</i> Are you aware of the environmental provisions incorporated into the design of agencies? Has your branch been or will it be upgraded with new environmental solutions? Are you aware of the "clean site" provisions applied during the fitting out and construction of agencies?	
Source(s): Authors' elaboration		Table A1.

Corresponding author

Souhaila Kammoun can be contacted at: souhaila.kammoun@ihecs.usf.tn

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgroupublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com