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Environmental management control: Steering and assessment tools

BENDAHHANE Anouar
FSJES/UIZ Agadir Maroc

Résumé: This work explores the environmental management control tools that an ISO 14001-certified company can mobilize to monitor and achieve its environmental objectives. The research begins with a theoretical analysis of the link between environmental management control and the ISO 14001 Environmental Management System (EMS). It explores corporate environmental strategy, EMS standards and definitions, and the main components of environmental management control. The article then highlights specific tools compliant with the ISO 14001 standard, such as environmental analysis tools, forecasting and management tools, as well as those dedicated to communication. This conceptual framework provides companies with practical levers for optimizing the management and monitoring of their environmental performance.

Mots-clés : Environmental management control; Environmental reporting; Environmental management system.

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1 Introduction

For several decades, environmental issues have been at the forefront of concerns in both the public and private sectors. This awareness has been marked by significant events. In the 1970s, the ecological environment was seen as an inexhaustible resource, and its preservation was viewed as an obstacle to economic development. However, the Club of Rome report published at the time demonstrated that economic and demographic growth generated negative externalities, particularly in terms of resource depletion, excessive exploitation of natural systems, and pollution. The conclusions of the 1972 United Nations Conference on the Human Environment in Stockholm also highlighted the harmful impacts of the production factors used by businesses on the ecosystem. In 1987, the Brundtland Commission report affirmed that the environment is now a public good and that human well-being can only be achieved through the sustainable and responsible management of natural resources. It was in this report that the concept of sustainable development emerged.

Sustainable development thus became a macroeconomic concept adopted by states through public policies aimed at preserving natural and human resources. To meet these challenges, states and businesses have had to revise their political, productive, and managerial systems in order to ensure the participation of all economic actors and their integration into society.

At the national level, Morocco has implemented various measures to address climate disruptions. Politically, this includes integrating the principles of sustainable development into sectoral strategies and implementing the Environmental Upgrading Strategy (MANE). Legally, the country has developed a framework law on the Charter

of the Environment and Sustainable Development. In light of these developments, Moroccan businesses must now integrate environmental issues and adopt a proactive approach.

Protecting the natural environment is now essential to ensure the sustainability of businesses. Considering the environmental dimension represents both a threat and an opportunity. Companies that manage this aspect effectively can capitalize on the global demand for sustainable technologies, investments, and services (Renaud, 2015). Environmental changes and pressures from various stakeholders have pushed companies to integrate environmental concerns into their management systems.

The shift from traditional management to environmental or sustainable management has been reflected in the adoption of charters and codes of conduct that demonstrate companies' commitment to environmental issues, and the integration of an Environmental Management System (EMS) within classical management to implement an environmental strategy.

Despite the attention given to the environment by public authorities and businesses, the adoption of management control practices that take environmental aspects into account, particularly through the ISO 14001 EMS, remains essential. These practices allow for a better understanding and management of the environmental dimension within the company (Marquet-Pondeville, 2003).

In this context, the research question addressed in this study can be formulated as follows :

What environmental management control tools can an ISO 14001-certified company deploy to manage and monitor its environmental objectives ?

To answer this research question, we carry out a literature review that examines key concepts and management control tools that take into account the environmental aspect of the company.

2 Theoretical foundations of environmental management control in the light of the ISO 14001 EMS

Through the involvement of all economic players, protection of the ecological environment has thus become a matter for society as a whole, including companies. The integration of the environmental issue within companies has gone through several phases, the most important of which are the voluntary option for corporate social responsibility and the implementation of an environmental strategy to operationalize the environmental component of CSR.

With the advent of ISO 14001 EMS certification, companies have become increasingly interested in environmental management as a means of implementing their environmental strategy and improving their environmental performance. The ISO 14001 EMS groups together a series of systems for implementing and monitoring environmental strategy. These include environmental management control. Indeed, during all phases of the ISO 14001 EMS, several EMC practices are mobilized through the use of EMC tools.

The aim of this section is therefore to present the theoretical framework of our paper, clarifying the transition from sustainable development as a public policy to the integration of the environmental issue into daily operations through the option of CSR and the adoption of an environmental strategy.

2.1 Corporate environmental strategy

Like environmental management, green strategy has many definitions. According to Johnson et al (2005), green strategy is a new way of capitalizing on the competitive advantages offered by the ecological environment. This involves integrating the environmental variable into the organization's competitive, political and industrial strategies, taking into account the expectations of stakeholders identified by management.

For Essid (2007), environmental and ecological concerns represent both sources of opportunities and constraints. They are sources of opportunity insofar as the adoption of green practices improves the competitiveness and reputation of organizations. However, they also pose constraints, as a company's commitment to the environment requires a radical overhaul of organizational procedures and practices, entailing investments that are perceived as costly in the short term, whereas the benefits only become apparent in the long term.

Hartmann and Perego (2005) define environmental strategy as the degree of acceptance and integration of environmental values and principles within organizations, forming a continuum from proactive to reactive. This definition is based on the typologies of green strategies developed by Roome (1992) and Hart (1995). These authors proposed typologies based on companies' degree of involvement and response to environmental issues (Essid, 2007).

The acceptance, integration and operationalization of environmental issues by companies depend on the analysis of three dimensions of strategy: competitive, political and industrial (Renaud, 2015). Analyzing these dimensions from an ecological angle aims to encourage top management to integrate environmental concerns into their strategic vision (Boiral, 2007).

Indeed, Renaud (2015) has attempted to summarize all the strategies proposed by Room (1992) and Harte (1995), adapted by Essid (2007), in three forms: reactive strategies, intermediate strategies and proactive strategies.

2.2 Environmental management system definition and standards

The Environmental Management System (EMS) is defined by the European Commission (2001) as a component of the organizational system that includes the structure, planning activities, responsibilities, practices, procedures and resources necessary to develop, implement, evaluate and maintain an organization's environmental policy.

According to Nash and Coglianese (2001), the EMS is "a set of formal structures, rules and resources that management adopts to establish organizational routines for achieving the organization's environmental objectives. This system is a subset of the overall management system". Desmaz and Lafontaine (2007) define the EMS as "a component of the overall management system, whose objective is to implement, evaluate and improve the organization's environmental policy".

ISO 14001 describes the EMS as "a component of an organization's management system, used to develop and implement its environmental policy and manage its environmental aspects. A management system is a set of interdependent elements used to establish a policy and objectives to achieve them. It includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources".

ISO 14001 stands out for its comprehensiveness, providing a clear framework for implementing an EMS that can be applied to all organizations, whatever their size or sector of activity, and adapted to a variety of geographical, cultural and social contexts (Gendron, 2004).

In response to growing interest in respect for the environment, and increasing demand for guidelines to guide corporate environmental management, the International Organization for Standardization (ISO) created the EMS, guided by the ISO 14001 standard. This system aims to integrate environmental concerns into the day-to-day activities of companies (Boiral, 2000). However, the emergence of this system has given rise to ambiguity among those involved in environmental issues, particularly as regards the distinction between environmental management and the EMS. The major difference lies in the fact that EMS is based on reference systems established by professional bodies, public institutions or national and international standardization bodies, whereas environmental management corresponds to a set of informal practices specific to each company, aimed at protecting the environment (Renaud, 2015).

There are also several types of EMS, such as the Responsible Care program, specifically dedicated to the chemical industry. However, the main EMSs are the Eco Management and Audit Scheme (EMAS) and ISO 14001.

Eco Management and Audit Scheme : To harmonize national standards into a single international standard, the European Union approved the EMAS program. Its aim is to guide industrial companies operating in Europe by encouraging them to "publish an environmental statement and provide the public and other interested parties with information on the organization's environmental impacts and performance, and on the continual improvement of environmental protection within the organization".

Standard ISO 14001 : The limitations of the EMAS program, particularly in terms of territoriality, led to the emergence of international standards such as those in the ISO 14000 family, which enable an organization to formulate a policy and objectives that take into account legal requirements and information on significant environmental impacts (Essid, 2007). The first ISO standard to address environmental issues, ISO 14001, was published in 1996 and subsequently revised in 2004 and 2015. This standard defines a set of requirements for certifying the conformity of organizations' management practices to environmental requirements (Renaud, 2015). Adopting ISO 14001 helps companies integrate ecological considerations into their operations and continuously improve their environmental performance.

The environmental management system is thus made up of various control mechanisms that enable the environmental strategy to be implemented and monitored, while ensuring accountability to internal and external stakeholders (Renaud, 2015). According to this author, these devices include environmental management control, control through environmental rules and procedures, as well as control systems through environmental values (Renaud, 2009).

2.3 Components of environmental management control

Environmental management control is often marred by conceptual ambiguities, mainly due to confusion between its key components: environmental accounting, environmental management accounting and eco-control.

According to Christophe (1992), the first attempts to integrate environmental concerns into corporate management date back to the emergence of the concept of environmental accounting. This had two essential aims: firstly, to communicate physical and monetary information on the company's environmental management to internal and external stakeholders; and secondly, to monitor this information in the form of reports, so that it can be integrated into the decision-making process (Harscoët, 2007).

To achieve these objectives, environmental accounting relies on three indispensable tools: environmental cost calculation and accounting, which aims to assess the costs of preventing or repairing environmental damage; life cycle assessment (LCA), which examines the environmental impacts of the organization's processes; and environmental reporting, which informs stakeholders of the depletion of resources caused by the company's activity, expressed in monetary and physical units (Renaud, 2015).

Environmental management accounting, also known as environmental management accounting, is defined by Burritt et al. (2002) as a system for generating, analyzing and using financial and non-financial information to optimize a company's ecological and economic performance, thereby ensuring its sustainability (Antheaume, 2012). The tools of environmental management accounting are similar to those of environmental accounting, with the exception of environmental reporting and sustainable development reporting.

Eco-control, introduced by Henri and Journeault (2010), aims to improve environmental and economic performance by integrating environmental issues into management control systems (Schaltegger & Burritt, 2000). Although eco-control adapts traditional management control components to include natural resources, as well as the human, financial and material resources to be controlled (Caron et al., 2007), it is only one part of environmental management control, as it does not use certain environmental analysis tools such as LCA or environmental costing (Renaud, 2015). Environmental management control thus encompasses a variety of tools and systems. According to Renaud (2015), "EMC is a set of tools derived from environmental accounting (EA) - apart from the green accounts included in financial accounting -, environmental management accounting (EMA) and eco-control''.

3 Environmental management control tools based on the ISO 14001 EMS standard

The environmental management system (EMS) based on the ISO 14001 standard is a benchmark for guidelines, helping to legitimize the actions of organizations and standardize internal environmental behavior on an international scale. The effective implementation of environmental strategy requires the use of specific tools, to which the environmental manager must have recourse. Two categories of tools will be discussed : environmental analysis tools, and forecasting, steering and communication tools.

3.1 Environmental analysis tools

3.1.1 Life cycle assessment (LCA)

Life Cycle Assessment, also known as ecobalance, is a tool used to identify the various environmental impacts that a product, service or process can generate. According to Awewomom (2024), Life Cycle Assessment (LCA) is a structured methodology used to evaluate the environmental impacts associated with a product, process, or service throughout its entire lifecycle, from the extraction of raw materials to final disposal. LCA is considered by the United Nations to be the most advanced technique for integrating sustainable development into companies (United Nations, 2002). According to ISO 14040, the life cycle covers all consecutive and interdependent phases of a product, from the acquisition of raw materials to its final disposal.

For Christophe (2009), LCA is akin to cost accounting, in that it examines, upstream, the physical resources consumed by the organization and, downstream, the natural resources affected by the use of the final product.

According to ISO 14040 (2006), LCA comprises four essential and complementary phases, to be addressed in an iterative approach. These phases are:

- Objectives and scope of the study (ISO14041)
- Inventory and inventory analysis (ISO14041)
- Impact assessment (ISO14041)

- Interpretation of results (ISO14041)

The LCA method offers significant benefits for business, providing relevant information that helps managers make eco-efficiency and eco-effectiveness decisions, and set environmental objectives. LCA also makes it possible to assess the costs associated with a life cycle, taking into account both environmental criteria and socio-economic parameters (Renaud, 2015). However, this method also has its drawbacks, notably its cost and complexity.

3.1.2 Life cycle cost analysis (LCCA)

Life Cycle Cost Analysis is largely based on the LCA steps. It consists in analyzing the environmental costs incurred by the various players, both inside and outside the organization, throughout the life cycle of a product or service.

Identifying environmental costs is complex, as they fall into two categories: those incurred to achieve environmental objectives, and those which, without being directly aimed at doing so, implicitly improve certain environmental aspects. Harscoët (2007) distinguishes these costs into two types: integrated costs or "pollution prevention costs", and "end-of-pipe" or "purely environmental costs". Antheaume (1998) describes them as direct and indirect costs.

Other cost categories include internal and external costs, conventional and hidden costs, as well as contingent and intangible costs (Harscoët, 2007). The complexity and diversity of these costs make them difficult to estimate. With reference to traditional cost accounting, the allocation and identification of costs is problematic, as is the assessment of environmental costs, which are often heterogeneous and difficult to estimate. Conventional (end-of-pipe) costs are easier to assess, as they are generally recorded in traditional accounting, while other costs are often hidden and difficult to calculate. In this sense, Bendahhane et al (2022) note that hidden costs remain invisible to many company managers.

Indeed, the degree of estimation also varies according to the nature of the costs, and the following table highlights the different levels of difficulty involved in estimating environmental costs.

Table 1. Levels of difficulty inherent in estimating environmental costs.

Environmental Costs	Description
Conventional Costs	Easily identifiable and quantifiable costs.
Hidden Costs	Costs that are not directly visible or apparent.
Contingent Costs	Costs that may arise depending on future events.
Intangible Costs	Costs related to non-physical elements, such as reputation.
External Costs	Costs borne by society or the environment rather than the company.

Source : author based on Hatscoet, (2007).

According to Swarr et al. (2011), the LCCA comprises four main phases: definition of goals and scope of study, life-cycle economic inventory, interpretation and communication.

3.1.3 Carbon footprint

The carbon footprint is a tool for accounting for greenhouse gas (GHG) emissions generated by corporate activities (Renaud, 2015). It identifies the various sources of emissions, called "emitting stations", in order to prioritize them and set up action plans for their reduction (Bilan Carbone Report, 2011)

Among the GHGs identified by the UN, the carbon footprint focuses solely on those with a direct impact on climate phenomena, such as carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), as well as certain fluorinated gases such as hydrofluorocarbons (HFCs), sulfur hexafluoride (SF6), and per fluorocarbons (PFCs).

The carbon audit follows a methodical approach proposed by ADEME. This starts with defining the scope of the study, continues with an inventory of emission sources, and includes setting an action plan, appointing a steering committee, and raising stakeholder awareness.

The advantage of this tool is that it is easy to use and affordable for companies, especially small ones. Unlike Life Cycle Assessment (LCA), which is a sophisticated tool requiring solid expertise in energy science and significant investment to implement, carbon footprinting is more accessible and less costly. LCA is optional for companies

wishing to assess the potential environmental impact of their products, services or processes. In France, however, carbon footprints are mandatory for companies and local authorities meeting certain criteria, such as a workforce of over 500 employees for companies, or a population of over 50 000 for local authorities located in France. This report must be produced and published every three years.
Although this obligation is currently limited to France, the ISO 14064 standard has sought to harmonize this tool worldwide by proposing, as early as 2006, guidelines for GHG emissions reporting, followed in 2013 by the publication of the first carbon chart of accounts (Renaud, 2015).
Among the limitations of this practice, it should be noted that the estimation of GHG emissions is still approximate, with CO2 equivalents determined on an order-of-magnitude basis due to the large number of parameters taken into account in the calculation (Renaud, 2015).

3.2 Forecasting, management and communication tools

3.2.1 Green dashboard

The green scorecard (GSC) is an extension of the traditional scorecard applied to the environmental field (Renaud, 2015). Its objective is similar to that of the traditional dashboard: it is a decision-support tool that brings together a set of indicators designed and selected to enable managers to monitor the state and evolution of the systems they steer, as well as to identify the trends that will influence these systems in the medium and long term (Bouquin, 2010).
TBV must reflect the diversity and complexity of environmental impacts, using mainly physical indicators. These indicators are generally intended to alert managers and trigger corrective action when necessary (Renaud, 2015). On the other hand, monetary indicators are less present in this type of dashboard, often being limited to the simple observation of results achieved, such as environmental expenditure for the past year (Renaud, 2015).
There is no such thing as a standardized VCS: the content of the VCS (number and nature of environmental indicators) varies from one organization to another, depending on a number of contingent factors, such as size, sector of activity, and the organization's green strategy (Dohou-Renaud and Berland, 2007).
Thus, the content of a VGS depends largely on the nature of the organization's activities, its size and its environmental strategy. For example, a company operating in the service sector will design a very different TBV from that of an industrial company. According to Renaud (2015), the TBV of a company in the chemicals sector will focus primarily on pollutant emissions (CO2, NOx, SO2) or energy consumption, while a bank will favor indicators linked to materials consumed, discarded or recycled, such as paper, cans, cups or ink cartridges.

3.2.2 Environmental indicators

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By definition, environmental indicators are "quantities established from observable and/or calculable quantities, reflecting in various ways the environmental impacts associated with a given activity" (Tyteca, 2002). The quantities referred to may be physical quantities, such as inputs (energy used in the process, raw materials, etc.) and outputs (discharges into the environment such as toxic solid waste or intermediate consumer products), or monetary quantities in the case of expenditure incurred to set up or improve the organization's environmental management system.
The literature on the typology of environmental indicators (Tyteca 2002, Tyteca et al. 2002, ISO 14033) agrees on two broad categories: environmental performance indicators (EPIs) and environmental condition indicators (ECIs). According to Jiang (2017), ISO 14031 distinguishes two subcategories of EPIs: management performance indicators (MPIs) and operational performance indicators (OPIs). MPIs provide information on management's efforts to operationalize environmental actions, aiming to achieve a satisfactory level of environmental performance for all company processes. SOPs, on the other hand, provide information on the company's operational environmental performance (Renaud, 2009).

Environmental condition or impact indicators, as defined by Tyteca (2002), reflect the effects of an organization's activities on the local, regional, national and international environment. They are macroeconomic indicators providing information on the state of the environment at these various scales, for example the concentration of a specific pollutant in the air, water or soil, the impact on human health, or GHG emissions (Renaud, 2015).
Both types of indicator can be evaluated in physical or monetary units (Tyteca, 2002). Physical evaluation links performance to physical quantities (resources used, quantity of waste discharged, energy consumption, level of water and air pollution linked to the organization's activities). Monetary evaluation, on the other hand, quantifies the environmental impact of the organization's activities. The systems adopted to manage environmental issues within the organization can also be key indicators, reflecting efforts to mitigate these impacts.
Environmental indicators enable us to measure the organization's environmental performance and track the progress of actions implemented. The information provided by these indicators feeds into the content of environmental reporting, which aims to provide senior management and stakeholders with an account of the organization's environmental performance.

3.2.3 Environmental reporting

Le terme reporting est historiquement associé au domaine financier (Ayadi, 2010). Gray et al. (1996) définissent le reporting financier comme la description des événements économiques survenus au cours d'une période donnée pour une organisation ou une entité comptable définie, afin de fournir des informations à divers utilisateurs. Cependant, avec l'évolution des attentes des parties prenantes, ce type de reporting s'est révélé insuffisant pour décrire la situation globale de l'entreprise et répondre à ces attentes. Ainsi, le reporting s'est étendu à d'autres domaines. Gray et al., (2001) ont mis en lumière trois catégories de reporting : le reporting financier, le reporting sur d'autres activités de l'organisation (notamment sociales et environnementales), et le reporting effectué par des organismes externes à l'organisation.

4 Conclusion

Integrating environmental considerations at all levels of the organization requires the implementation of an environmental strategy. There are several types of environmental strategy: passive, intermediate and proactive.
In this context, environmental management control is a key component of an organizational environmental control system, including the EMS. The latter corresponds to a set of control systems put in place by companies to implement and monitor their environmental strategy. Environmental management control practices are used throughout the ISO 14001 EMS process. These practices include environmental analyses, environmental programs and environmental indicators.
In order to better fulfill these missions, the environmental manager calls upon a set of tools dedicated specifically to this purpose. According to the literature, these tools are used for analysis, forecasting, management and communication of environmental information. Analysis tools correspond to the set of tools used to identify the organization's various environmental impacts.

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