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Evaluation of a national food industry based on environmental performance and condition indicators: critical success and barriers of EMS implementation in Tunisia

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Abstract This paper attempts to assess environmental performance indicators (EPIs) of Tunisian food industry as well as the effectiveness of its environmental management system (EMS) according to the ISO 14001 standard. It is related to the management effort which is measured by management performance indicators and to organization's operations representing the operational performance indicators in order to reduce the significance of environmental impacts. Otherwise, it does reflect critical success and barriers of environmental performance of a food company for its management and operation processes according to the Tunisian context. Moreover, this research focuses on environmental condition indicators (ECIs) in developing of environmental performance evaluation (EPE). EPIs and ECIs depend closely on the compliance of the food company with applicable laws and regulatory requirements that stimulate the pollution prevention. Furthermore, EPE integrates environmental and human health risks in assessment process consequently ensuring the adoption of a new policy by decision makers under the concept of continuous improvement. However, it should discuss a voluntary initiative taking by the top managers to prevent pollution and to share information in a structured and regular way.

Keywords Environmental performance · Food company · EMS · Indicators · Risks · Compliance

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1 Introduction

Industrial processes are the major source of global pollution, and it is widely recognized that regulation is required to prevent pollution for company sustainability (Testa et al. 2014). How does the certification process of environmental management system (EMS) according to ISO 14001 or Eco-Management and Audit Scheme (EMAS 2014) look like over the past few years in various companies? Trying to find a suitable reply and consider that the ISO 14001 standard provides an effective managing of environmental impacts and improving performance via conformance to environmental regulatory requirements, pollution prevention and continuous improvement (Kaur 2011; Turki et al. 2015). Otherwise, an organization's environmental performance criteria set by management are evaluated based on environmental aspects and impacts to meet objectives of the EMS in a suitable way (Turki et al. 2015). Environmental aspects play a crucial role in the formulation of effective environmental policy, thus laying the basis for the whole EMS improvement (Gordon et al. 2010). Moreover, complying with regulation should limit environmental degradation by several industries through the no rational consumption of water, energy, and materials via their activities such as production, transport, provision of support service, and management. The use of performance indicators, as management tools, demonstrates the effectiveness of the organization and ensures clear management, operational, and environmental conditions in food industry. Nevertheless, a performance indicator system should be deployed based on the organization's mission related to strategies via the identification of critical success factors of its business (Campos et al. 2015). Several studies (Kwon et al. 2002; Campos et al. 2015; Topuz et al. 2011; Daddi et al. 2015; Alshuwaikhat and Abubakar 2008) were adopted more than a

method and strategy to investigate the effect of ISO 14001. Nevertheless, it remains unclear which strategies and methods should be employed to evaluate EMS effectiveness since the results vary between them. Despite rather complicated assessment schemes which are sometimes used, the evaluation procedures have been largely focused on subjective judgments because of inadequate assessment criteria (Seiffert 2008).

This paper attempts to assess environmental performance of Tunisian food industry as well as the effectiveness of its environmental management system (EMS) based on environmental performance and condition indicators in developing of environmental performance evaluation (EPE) with clarity scheme. Otherwise, the identification of environmental performance indicators (EPIs) represent the suitable keys to manage and operate an EMS of the food company with a good manner according to the Tunisian requirements (NT 106.09. 2005) and to the ISO14001 standard (2015). Furthermore, this study reflects as well upon the Tunisian context, critical success and barriers of environmental performance of a food company for its management and operation processes. In the same context, the sustainability reporting in food and agriculture sectors elaborated by the guidelines of the global reporting initiatives (G4 sector disclosures 2014) and the sustainability assessment of food and agriculture (SAFA) systems of the food and agriculture organization (FAO) of the United Nations, are discussed with the effectiveness of Tunisian food EMS by illuminating gaps and underexposed themes in the area of regulation and governance as well as stakeholder perception (Hřebiček et al. 2015a, b). The EMS effectiveness of a Tunisian food company is measured from different forms of industrial regulation in practice, based on enterprise' inputs, physical facilities and equipment, and outputs for operational indicators measurement as well as policy and objectives, stakeholders' involvement, communication, and awareness for management indicators measurement. Furthermore, EPIs and ECIs depend closely on the company compliance with applicable laws and regulatory requirements that stimulate the pollution reduction. However, EPE integrates environmental and human health risks in assessment process that ensures the adoption of new policies by decision makers under the concept of continuous improvement. For a better management of risks, environmental performance conducts to reduce significance of impacts should be communicated to employees and stakeholders.

2 Method

The case study is a Tunisian food enterprise specialized in the production of soft drinks, mineral water, and fruit juices. This company has implemented an environmental management system that is expected to be a factor to the future business success. A qualitative and quantitative method of measuring the environmental performance of EMS Tunisian food company is carried out via this research. The methodology underlying this paper consists of the following elements: (1) a theoretical framework; (2) the identification of EPIs and ECIs for a better environmental performance; and (3) the environmental performance evaluation (EPE) which assesses conformance of food activities with regulatory requirements and evaluates efficiency of risks' management.

The literature review gives the theoretical framework to attempt environmental performance as well as the effectiveness of EMS inside Tunisian food industry according to ISO 14001 (2015). This research describes two general categories of indicators which are environmental performance indicators (EPIs) and environmental condition indicators (ECIs). EPIs provide information about management and operational performance of industrial processing, while ECIs provide information about the local, regional, national, or global condition of the environment surrounding the Tunisian food company (ISO 14031 2013; NT 106.16 2000). EPIs are divided in two types: management performance indicators (MPIs) and operational performance indicators (OPIs). MPIs concern environmental policy and objectives, conformance state, stakeholders, and employees' involvement, training, communication, and awareness. In this research, MPIs are defined to measure qualitatively and quantitatively the coherence of environmental policy with objectives, the rate of compliance with regulation framework, and the effective integration of stakeholders via communication strategy. Furthermore, the conformance is controlled by the link of food enterprise's inputs, physical facilities and equipment, and outputs with OPIs which are materials, energy, water, wastes, services, and emissions. In this paper, the OPIs measured the water and energy consumptions, noise problem, hazardous wastes and chemicals concentrations (SO_4, Mg, K, Na, Al, Ca) in effluents and other wastewater parameters such temperature, pH, DCO, and DBO_5. In fact, several firms are familiar with legal compliance which is considered as an important environmental performance indicator and such ECI measures the rate of compliance of chlorides concentrations in effluents.

EPE assesses the conformance state of a food company with national regulatory requirements and evaluates efficiency of risks' management. The assessment of management and operational aspects via EPE reveals the impacts significance and environmental risks that occur damage to the environment and have a strong effect on human health. Several data are obtained from environmental impact analysis to measure the effective improvement of EMS food company and its environmental performance. The

diagnostic appears the significance of some aspects/impacts to monitor the nonconformance with an appropriate method (Table 1). This paper has exploited environmental analysis results of Turki et al. (2015) research to identify the features of environmental performance of Tunisian food industry. The presence of regulatory framework has been used as a criterion variable to highlight the significance of a particular aspect. If the enterprise does not apply applicable laws and other regulatory requirements, it does not ensure compliance. During the first internal audit, the rate of compliance was measured and compared with other food firm in Tunisia delivering soft drinks and mineral water, too. Environmental risks are identified through environmental impacts which appear both weakly, mildly and strongly significances. Eventually, the communication of internal and external information such as environmental performance indicators, regulatory compliance, environmental policy, objectives, and targets of the food company was measured qualitatively.

3 Theoretical framework

3.1 Environmental management system (EMS) according to the ISO 14001

Food-processing companies have the potential to influence the sustainability of their suppliers through their sourcing management approach (G4 sector disclosures 2014). SAFA brought a holistic global framework for the assessment of sustainability along food and agriculture value chains (SAFA 2014). Additionally, SAFA draws upon the family ISO 14040 standards for Life Cycle Assessment (ISO 14040 2006), and the G4 sector disclosures (2014). ISO 14001 represents a voluntary international environmental requirement, which likely be adopted by a vast majority of corporations. Its major focus is on structure, implementation, and maintenance of a formal environmental management system (Curkovic and Sroufe 2010). Neither the ISO 14001 standard nor the government-initiated voluntary environmental programs are required by law, but they play a vital role in promoting companies to adopt this standard (Bansal and Roth 2000; Darnall and Edwards 2006; Sharma and Henriques 2005; Arimura et al. 2008). Furthermore, ISO 14001 requires that organization formulates an environmental policy for planning, implementing, monitoring, and measurement for effectiveness and ensures legal compliance, overt consumer demand, and market pressure to potential cost savings and a healthier environment (Mohammed 2000). As a result, EMS implementation in such enterprise based on ISO 14001 standard offers policy prompts for targeted environmental management improvements (Singh et al. 2014). In the same case, the EMS dependence with ISO 14001 requirement increases not only the firm's ability to have a long-term effect on environmental performance but also build a meaningful environmental management program (Testa et al. 2014). Moreover, the EMS establishment provides a wide range of benefits. In the world, several companies have confirmed the implementation of EMS according to ISO 14001 reduces environmental risks, enhances a better management of regulatory compliance, improves utilization of resources and improves public reputation (Phan and Baird 2015). Eventually, SMEs that are ISO 14001 indicate the benefit market and the cost reduction are the key drivers for the eco-products (Granly and Welo 2014).

Table 1 Measure of coherence between environmental policy and objectives via EPIs

Policy	Significant aspects	Significant impacts	Objectives	Indicators	Type of indicator	Actions
Pollution prevention	Oil leak Production of non-hazardous/hazardous wastes	Soil pollution	Avoid oil leak wastes selective sorting	100% of sorting 0% of hazardous nonconformance	OPI ECI	Collaboration with ANGED office for wastes management
Conformance with regulation	Effluents spill CO_2 emission noise	Water and air contamination Acoustic pollution	Conformance with NT.106.02/04 and NT 48.289-8	Max 1000 mg O_2/l DCO and DBO5; $6.5 < PH < 9$; Max 700 mg/l of chlorides; 80 decibels for noise	MPI OPI ECI	Installing biological treatment station; using CO_2 absorbing filters and safety equipment
Continuous improvement	Water and energy consumptions	Resources depletion	Reducing consumptions	−6.67% as water reduction per year and −7.14 for energy	OPI	Employee awareness Reuse of wastes water and divisional counters

3.2 Environmental indicators

Indicators should be related with environmental policy, goals, and targets as well as the business objectives. Environmental indicators support the process of defining such effective environmental objectives and pursuing their coherence with policy (ISO14031 2013). In addition, environmental indicators can be established for the three core evaluation areas of such enterprise which are: management, operations, and environmental conditions. Management performance indicators (MPIs) demonstrate the performance of the management of an organization which are divided into two categories: system indicators and functional area indicators. As a system indicator, it should focus on system implementation or on regulatory framework, whereas, as a functional area indicator, it consists in training, safety of employees, stakeholder involvement, and external communication. Moreover, operational performance indicators (OPIs) should provide information on the environmental performance of the organization's operations. The OPIs may be based on inputs materials, energy and services, design, installation, operation (including emergency events and non-routine operation), maintenance of the physical facilities and equipment, the outputs products (e.g., main products, by-products, recycled and reused materials), services, wastes, and emissions, while environmental condition indicators (ECIs) provide information about the quality of the environment surrounding the organization like the water quality of a nearby lake or the regional air quality. Furthermore, the levels of water pollutants are influenced by many factors such as local emissions sources, weather conditions, etc. (SAFA 2014). Since the condition of environmental media (air, water, land) and the environmental problems arising (e.g., ozone depletion, land contamination, greenhouse effect) depend on a variety of influences (e.g., emissions from other companies, private households, or traffic), (Nilsson et al. 2007). The measurement of such variables for environmental performance improvements was focused on specific environmental aspects such as waste production (Testa et al. 2014). For instance, CO_2 emissions and other chemicals leaks could be considered as the typical key performance indicators to check the industrial contribution to one of the major global environmental challenges like climate change (Davis et al. 2010). Therefore, energy intensive industries can reduce their CO_2 emissions by decreasing activity levels, by switching to new technologies (e.g., based on cleaner or renewable fuels) or by improving energy efficiency (Johansson et al. 1996). Eventually, the percentage threshold for a "substantial" reduction in energy use should be set and justified by internal and external experts, based on the level of energy efficiency already achieved by the company at the beginning of the analyzed period. The indicator serves to assess whether the analyzed enterprise has a formal and written plan with binding targets for replacing non-renewable sources of energy in its operations (SAFA 2014).

3.3 Conformance with applicable laws and regulatory requirements

Several businesses have traditionally resisted changes brought by government legislation and pressure from the public. It reveals trough reluctant adoption or willing change, many firms have found that a pro-environment stance can enhance a number of goals (Inman 2002). The increasing reliance of environmental policy on market-based incentives has led firms to shift from regulation-driven management approaches to proactive strategies involving the voluntary adoption of environmental management system (Anton et al. 2004). On the other hand, pollution caused by operation activities is viewed as an undesirable consequence that is no longer endorsed by many organizations (Campos et al. 2015). The definition of production efficiency should be include the cost as an input to reveal that regulation improves production efficiency (Telle and Larsson 2007). To fully assess the efficiency of a particular regulatory instrument, it is also necessary to consider the performance of alternative instruments (Testa et al. 2012). Tollefsen et al. (2009) highlighted the potential of efficiencies through coordinated regulation of multiple pollutants. Pollutants and environmental risks are controlled by applicable laws and regulatory requirements of all activities' enterprise. Otherwise, regulation provides the pollution monitoring and reporting framework that is why ISO14001 brings a positive incentive for regulatory compliance, making compliant enterprise more competitive in the marketplace (McGuire 2014). Furthermore, environmental indicators enable the early detection of nonconformance trends and can also be used as an early warning system. Non-compliance indicates either inadequate internal management systems and procedures or ineffective implementation G4 sector disclosures (2014). Companies most frequently use performance indicators directly associated with legal requirements because these companies are forced to meet the environmental regulations (Campos et al. 2015). The well-designed environmental regulation can improve operation efficiency and firm competitiveness by incentivizing the development of intangible assets, including know-how (Teece 1980), corporate culture (Barney 1986), and reputation (Hall 1992). They reported that regulation framework leads to efficiency and ensures continuous improvement. Improving efficiency means enhancing employees' awareness on pertinent environmental regulations, followed by enhancing organizational image and assisting management to deal with environmental issues (To and Tang 2014).

3.4 Environmental communication and involvement

The global reporting initiatives provide the background against which an organization communicates the impacts of its economic, environmental, social, and governance performance. It should include the number of non-compliance with laws and regulations (G4 sector disclosures 2014). Furthermore, Clarity about commitment to sustainability is central to sustainable practice in all enterprises (SAFA 2014). The ISO 14001 standard requires the adoption of cooperative approach inside enterprise to communicate voluntary its significant environmental aspects or impacts to the stakeholders like NGOs, local communities, government, neighbors, customers, and employees. Otherwise, stakeholders exert institutional pressure to influence some environmental initiatives. Specifically, the pressure exerted by stakeholders and government has led to creating appropriate regulatory pressures for the EMS effectiveness (Phan and Baird 2015). As a result, it allows attracting more investments and has the possibility of obtaining priority public funds (Daddi et al. 2015). However, enterprises shall share its environmental goals and targets to their various departments to strength internal communication in issuing the certification scheme. Organizations may choose different tools of communication providing information about their environmental performance to external stakeholders. Information describing the performance of the organization should be reliable, substantive, and presented in good manner that recognizes the level of technical knowledge of the intended audience (Nilsson et al. 2007). In the same context, company should import source data from the main company information system to provide a selected information in the form of reports accessible online to the general public or only to selected persons. Otherwise, this system must be easy to use and accessible to the general public; as many indicator values as possible should be computed or imported from external sources (Hřebiček et al. 2015a, b). For instance, the development and the use of some software for communication like SAFA software WESRIS (web sustainability reporting information system) give several advantages to the company. The administration and editing of reports are much easier and much more effective for corporate performance evaluation. The implemented methodology in WESRIS makes it possible to assess the given company's sustainability (caused by its activity) by means of objective considerations and to conduct the comparison of different companies and evaluate whether their activities correspond to the principles of sustainable development (SAFA tool 2014). The software could support an efficient knowledge-based decision making for the sustainable development, too. Other softwares could be used like neural network in order to identify current and future directions for research of advanced quantitative methods modeling of sustainable corporate performance and reporting, which include environmental indicators (measuring the environmental impact on resources), social indicators (health and safety, human rights, ethical behavior, etc.), corporate governance indicators (related to efficiency, structure and responsibilities of the governance), etc. It builds a descriptive model of a decision support system, aimed at simplifying the decision process (Hřebiček et al. 2015a, b). It is obvious that the information required for decision-making vary with the type of decision to be made, the context of the decision-making and the stakeholders involved (Viegas 2005). Furthermore, the information generated by EPE helps company to determine whether its environmental objectives and targets are being met that identifying opportunities for better management of environmental aspects (e.g., cleaner production and pollution prevention), operational and environmental performance, increasing the company efficiency and effectiveness, demonstrating compliance with regulations, increasing the awareness of employees, and identifying strategic opportunities (Nilsson et al. 2007).

3.5 Environmental and human health risks

The generation of wastes, in particular hazardous wastes, creates disposal problems that can cause social problems (health risks, noxious odors), environmental pollution (leaching from inappropriate disposal, gaseous emissions), and economic damage (cost of disposal and rehabilitation). Therefore, waste generation should be reduced to the minimum in value chains (SAFA 2014). In fact, several hazardous chemicals are used in different industrial production processes, and there is need for studies about environmental and human health risks assessment which are developed specifically for these industrial activities (Topuz et al. 2011). For example, the European countries were developed some measures to implement more integrated solid waste management especially about REACH directives with which to rationalize their technological choices and management strategies. Nevertheless, considering systems analysis models and tools in a synergistic way would certainly provide opportunities to develop better solid waste management strategies leading to the conformity with requirements and foster future perspectives for both the waste management industry and government agencies in European Union (Pires et al. 2011). Consequently, different risk-based approaches may be applied. A probabilistic risk-based approach identifies specific activities which are the most likely to cause a

major accident or release pollutants on the environment. A human health risk-based approach identifies aspects having a major risk of posing a significant health threat. It is needed to assess worker health risk because there are some specific factors affecting worker health (Topuz et al. 2011). In reality, having quantitative results in risk assessment process is the key point to determine environmental hazards and simplify the decision making, develop strategies and environmental actions, and eliminate the apparition of effective environmental impacts. A sustainability risk approach refers to environmental aspects that may threaten the environment or the competitiveness of the company.

3.6 Environmental performance evaluation (EPE)

EPE is the ongoing evaluation of the environmental performance of an organization. An enterprise assessment measures performance against sub-themes' objectives. To do so, indicators are needed for measurements in order to provide evidence as to whether or not a certain condition exists (SAFA 2014). The organization can share with the public its performance (sustainability assessment) or check a sustainability development progress (Hřebiček et al. 2015a, b). It is a method to measure the results of the environmental aspects from activities, products, or services. EPE is based on the saying "what gets measured gets managed". Otherwise, environmental performance and condition indicators are collected in certified and non-certified plants in order to be evaluated (Nguyen and Hens 2015). Neverless, the difficulty in assessing the environmental performance and the number of methodological challenges facing enterprises has been emphasized. For instance, the possibility of implementing life cycle environmental impact indicators in such evaluation (Zhang et al. 2014). The objective of the environmental evaluation is to determine the positive and negative environmental impacts of the proposed cleaner production option. The evaluation of environmental impacts associated with activities, processes and services is one of the most important steps of EMS implementation. The inventory of environmental aspects is related to the impact evaluation process and an approach is elaborated to offer a series of advantages, such as the awareness and commitment of those participating since the beginning of the implementation process; the identification of the aspects at all levels and functions and the reduced risk that some aspect/impact goes unnoticed (Seiffert 2008). In many cases, the environmental advantages are obvious: a net reduction in toxicity and/or quantity of wastes or emissions. In other cases, it may be necessary to evaluate whether an increase in electricity or in water consumptions.

4 Results

4.1 Environmental performance and condition indicators (EPIs and ECIs)

Environmental indicators allow to the Tunisian food company a measurement of environmental performance and its efforts to improve this performance. Indicators can be used within an environmental management system (EMS) to check that a firm has met the targets that is required to set for itself, but can equally well be used in companies which have not developed yet an EMS (UNEP/DEPA 2000). In order to fill their function, the chosen indicators must be appropriate for comparing the actual environmental performance with the criteria that have been set. In addition, indicators bring significant improvement in their management system related to environmental issues. Several data are obtained from environmental impact analysis indicating that EMS causes an effective improvement in environmental performance, even in short periods (Daddi et al. 2011) or both in short and long terms (Testa et al. 2014). Critical factors (significance of environmental impacts), which assess the EMS environmental implementation, should diagnose environmental impacts that are generated from all enterprise's activities or processes (Fig. 1). This research describes two general categories of indicators for environmental performance evaluation: environmental performance indicators (EPIs) and environmental condition indicators (ECIs). EPIs provide information about the environmental performance of a Tunisian food company, while ECIs provide information about the condition of the environment. This information could help this company to better understand the actual impact or the potential impact of its environmental aspects and thus assist in the planning and the implementation of environmental performance evaluation (Nilsson et al. 2007).

4.1.1 Management performance indicators (MPIs)

Management performance indicators (MPIs) provide information about management efforts to influence environmental performance of the Tunisian food company's operations. Several MPIs are defined such as: policy coherence with environmental objectives, compliance to the regulation framework, rate of stakeholders' involvement, communication, and awareness methods. MPIs should specifically depend to the food environmental impact. The results of management performance based on MPIs are described below.

Policy coherence with environmental objectives An environmental policy declaration of the food company is

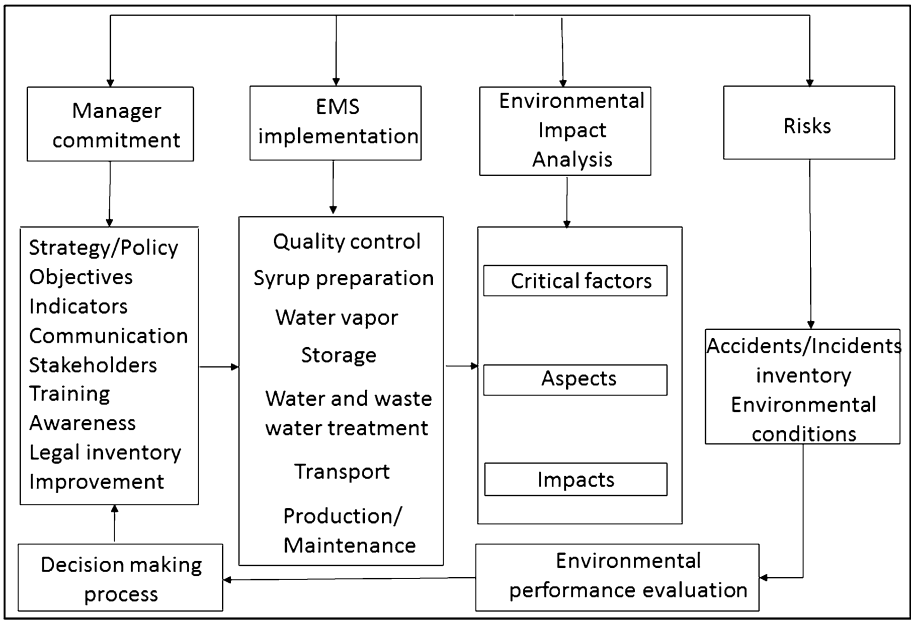

Fig. 1 Inter-relation of Tunisian food company EMS components and legal requirements

defined and reviewed by the top managers during the certification phase, and it is considered necessary for an EMS. Policy should be elaborated in good coherence with environmental objectives. It consists of pollution prevention, conformance with regulation and continuous improvement. Food company policy is illustrated in adequacy with environmental aspects for reducing impacts' severity and risks. Food firm has defined several objectives especially the reducing of energy and water consumptions, avoiding oil leak, the wastes selection and sorting, the conformance of effluent pollutants with NT.106. 02/04, the gas emission, and acoustic pollution with NT. 48.298.8. In addition, OPIs could measure the policy coherence with environmental objectives via the environmental evaluation process, EPE. Moreover, the performance of EMS objectives and indicators ensures more conformance with national regulation and stimulates pollution prevention and continuous improvement mainly for water and energy management, noise and effluents' parameters and their effects on the environment (Table 1). Eventually, environmental indicators support an effective environmental objectives, pursuing them over a long period of time inside food enterprise.

Regulatory inventory of Tunisian food industry Environmental objectives provide information about the conformance rate of food enterprise's activities face to the regulation inventory (Table 2). Conformance is ranked on two type scales (compliance and non-compliance). During the first internal audit, it appears eight non-compliances with applicable laws and regulatory requirements. As main MPIs, complying with regulation is considered as the main priority for the EMS effectiveness of a food company. In the case of food industry, ISO14001 and other national requirements obliged decision makers to strength communication and awareness process for employees at different levels (management and operational) to ensure conformance, to involve stakeholders and to take into consideration the regulation framework and its application with inputs, processing, physical facilities and equipment, and outputs with operational indicators OPIs, which are materials, energy, water, wastes, services and emissions (Nguyen and Hens 2015).

Stakeholders' involvement, training, communication and awareness Environmental performance evaluation provides useful information describing the environmental performance of a Tunisian food company. This information is used for reporting and communicating the environmental performance to stakeholders within as well as outside the company. All enterprises should be able to identify their stakeholders and report on how these are engaged with (SAFA 2014). Decision makers ensured that appropriate and necessary information describing the environmental performance is communicated throughout the food company in a structured and regular way. It assisted employees, contractors and others related to the company to fulfill their responsibilities, and the firm to meet its environmental performance targets. Such internal information has included the trends in the environmental performance, the regulatory compliance with the environmental policy of a food company, objectives and targets. It is communicated for more transparency above the opportunities or the recommendations to improve environmental performance. Transparency and sharing information with employees and stakeholders have led to more senior manager's involvement in sustainable activities. Real transparency involves understanding the information needs of stakeholders and

Table 2 Conformance of environmental aspects with applicable laws and regulatory requirements

Variable	Aspects/activity	Compliance	Non-compliance
Solid wastes	Wastes management and control		×
	Non-Hazardous wastes	×	
	Hazardous wastes		×
	Tote and used bags	×	
	Used accumulators and batteries		×
	Oil, lubricants, and used filters	×	
Water	Sanitation fees	×	
	Wastes water		×
	Effluents	×	
	Residual water	×	
	Distribution water	×	
Energy	Energy management	×	
	Energy audit	×	
	Expert auditors	×	
Air	Ambient air		×
	Polluted air		×
Environment	Transport of dangerous products		×
	Vehicles park	×	
	Environmental impact study	×	
Noise	Machines		×
	Logistics	×	

making accurate, timely and relevant information available in an accessible way (SAFA 2014). However, stakeholders were not involved properly during the certification process of a food company to contribute to the EMS improvement and its performance. Environmental performance indicators are used also as a significant tool for external communication of environmental data through environmental reports or environmental statements. Furthermore, the shifting of responsibility from the senior managers to environmental staff emphasized environmental performance to all employees. Decision makers focused their efforts to strength communication and involvement process that employees felt better about themselves producing in environmentally responsible manner. This initiative is considered as a positive outcome for food enterprise to increase employee motivation, too. In addition, communication encouraged employees to improve environmental practices. Several actions are undertaking mainly the regular meeting by trimester, visits by supervisors and stakeholders, biannual internal audits and monthly reports. Staff and stakeholders could contribute by suggestions and innovative ideas to the environmental management initiatives. In the other case, top managers launched an environmental training program for capacity building of their employees about environmental impacts and their risks' severity on the environment and on the human health. Training of employees covered in general the regulatory constraints facing all enterprise's activities.

4.1.2 Operational performance indicators (OPIs)

Operational performance indicators (OPIs) have provided information about environmental performance of Tunisian food company's operations. OPIs have linked food enterprise's inputs, physical facilities and equipment, with outputs which are raw and reused materials, energy and water consumed, wastes generated, services provided and gas emissions. In this research, the operational indicators mentioned above are evaluated mainly water and energy consumptions, noise problem, hazardous wastes, and chemicals concentrations. About effluents' parameters such temperature, pH, DCO, DBO_5, and chemicals (SO_4, Mg, K, Na, Al, Ca, Cl), company maintained the compliance of these parameters to the regulatory requirements. In addition, an analysis is made focusing firstly, on water and energy consumption reduction. For instance, enterprise reach -6.67% as a water consumption reduction per year. The undertaken actions were the wastewater reusing after treatment under certain conditions and the collection of rainwater to spray green areas. Concerning electricity, the food company has reduced consumption about -7.14 per year by installing divisionary counters, using economical lumps and sensitizing employees to rationalize consumption. Secondly, the noise reduction is controlled by 5% decrease in medical consultations per year for hearing problems. As a result, this assessment conducts to obtain quantitative results

from OPIs in improved water and energy consumptions, the good management of solid wastes (100% of sorting of wastes, % of hazardous wastes) the efficient control of chemical concentrations and other effluents' parameters, and the rational protection against noise of food company operations.

4.1.3 Environmental condition indicators (ECIs)

ECIs provide information about local, regional, national or global condition of the environment surrounding the Tunisian food company (ISO 14031 2013). It helps food firm to better understand the actual or the potential impact of its environmental aspects and assist managers in the planning and staff in the implementation of EPE as appropriate to capabilities, interests and needs of Tunisian company. However, the major problem of a food company is considered in the appearance of high chlorides pollutant concentrations. As a result, the biological treatment station is implemented to control with a rational way some chemicals parameters mainly chlorides concentrations according to the Tunisian regulation (NT 106.02 1989). The progressive decrease of chlorides pollutants is appeared in effluents from 3500, 2000 to 1025 mg/l. This indicator account is partially a barrier for EMS performance of food enterprise seeing that it exceeds the national regulation NT.09.77 (Chlorides concentrations must be in the range of 600–700 mg/l). This parameter is not in conformance with the national regulation. It does reduce progressively, and it does expect waiting an efficient treatment process to solve the chlorides problem in effluent.

4.2 Environmental performance evaluation (EPE)

The identification of EPI success and barriers based on EMAS, SAFA, and G4 reports can be evaluated. In line with the environmental policy of the Tunisian food company, some issues may have a higher priority than others. Given the wide range of environmental issues, it will probably be necessary to prioritize those issues of greatest concern. For instance, the environmental performance index report (EPI 2016) provides an overview of global environmental performance, identifying key trends and the status for high-priority issues of Tunisia among several countries. It based on two broad policy areas: protection of human health and protection of ecosystems. These indicators reflect the environmental status of industrial sector especially Tunisian food processing. The EPI report of 2016 was evaluated Tunisia that ranks in the 53rd and value 77.28, i.e., positive 18.29% in comparison with 2014 score which was 58.99. It is due to the integrated new indicators adopted by the ministry of environment and implemented through the industrial processing to reach environmental performance. In the case of food company, typical indicators for improved performance are: the conformance assessment with legislation, risks assessment to the environment and human health. There should be periodic monitoring to determine whether positive changes are occurring and whether the food company is progressing toward its targets. Examples of the types of aspects that could be checked to evaluate their impacts are shown in Table 3. The most important steps in establishing or upgrading an environmental monitoring system are to agree on the objectives of the system and design the system to address these objectives. Monitoring methodologies for the different aspects like, CO_2 emissions, fuel leak, chemicals spill, and monitoring planning are reached in coherence with the food company policy. For instance, the EMS maturity of a Tunisian food company, is evaluated with the levels of statistical significance percentage elaborated by Turki et al. (2015) for two different Tunisian food companies. Aspects' significance ranges between 40 and 34%, respectively. The results reveal a better environmental performance of our food company based on percentage of significance aspect/impact. Moreover, this study revealed that the questioned enterprise maintains a better regulatory compliance than the other company. For the sustainability purpose, this company may be concerned about an environmental aspect, which may threaten the environment or it competitiveness.

4.2.1 Assessing conformance with regulatory requirements

The regulation inventory is elaborated by food enterprise and it is necessary to evaluate both the compliance and the non-compliance of its environmental aspects and impacts (Table 2). This study ranks the conformance in two type scales: compliance and non-compliance. The method proposed is to link the nonconformance results with risks and their significance on environment and on human health. Otherwise, the results show a quite environmental performance of our case study which is based on percentage of significance aspect/impact (Turki et al. 2015). As a result, food enterprise has taken firstly some efficient actions to treat by priority the non-compliance of some environmental aspects concerning mainly the solid wastes issues (management and control, hazardous wastes, batteries and accumulators). Secondly, it has strength the control process of CO_2 emission, the soil and water contaminations from oil and grease spill and chlorides chemicals in effluent. Consequently, the food company has ensured the monitoring of regulation inventory to monitor effectively the compliance with legislation and response to the enterprise policy against pollution prevention. The regulation framework obliges food enterprise to control in permanence the

Table 3 Severity measure of environmental and human health impacts' significance

Environmental risks	Environmental impacts	Significance effect	Human health impacts	Significance effect
Fuel leak	Water/soil polluted	Mildly	Intoxication	Mildly
CO_2 leak/emission	Air/soil contaminated	Strongly	Inhalation	Mildly
Oil and grease spill	Soil contaminated	Strongly	–	
Syrup and chemicals spill	Water and soil polluted	Strongly	Intoxication/diseases	Mildly
Fire	Air polluted	Mildly	Asphyxia/burn/death	Mildly
Strong noise	Acoustic pollution	Mildly	Stress	Strongly
Few lighting	–	–	Vision deterioration	
Command system dysfunctioning			Fracture/sprain	Weakly
Contact with mechanism in movement			Disconnection/death	Weakly

severity of negative impacts. Some number of laws are identified to assess environmental performance that is based mainly on the following laws:

- Law N° 49 (1996) for wastes management and control, to prevent and reduce wastes production and their negative impacts, to valorize wastes via recycling and reuses processes to produce mainly energy, to provide controlled discharges for wastes (hazardous and non-hazardous, liquid and solid wastes).
- Law N° 59 (1989) for effluents to oblige food enterprise to control chemical parameters according to the NT 106.02.
- Law N° 34 (1996) to control the conformance of gases emitted according to the NT 106.04.
- Law NT 48.289-8 (2010) against noise protectors—Safety requirements and testing.

Eventually, qualitative and quantitative investigation leads to measure the regulatory compliance of food activities reflecting environmental performance improvement and minimizing risks. As such, corporate departments located in several countries with more stringent environmental regulations may to be more sensitive to institutional pressures to improve their environmental performance (Toffel and Marshall 2004).

4.2.2 Assessing efficiency of risks' management

Environmental risks are determined from management, operation and environmental conditions especially through the EMS implementation. The assessment has included emissions to the air and water, the volume of solid wastes, the noise, and accident prevention which are illustrated according to their severity and human health affects (Table 3). After that, the food company has reported the EMS effectiveness of environmental risks face to their various impacts. From Table 3, Three-point scales are used to indicate whether impacts and risks are weakly, mildly, and strongly significant. Nevertheless, five mildly, one strongly and two weakly significances which have direct impact on human health are highlighted. It is needed to evaluate the safety issues facing workers because there are some specific factors affecting their health (Topuz et al. 2011). The assessment of impacts' severity reveals different damages on human health ranging from weakly (fracture, disconnection), to mildly (intoxication, diseases, and asphyxia) and strongly effective significance resulting from the stress generated by machines and vehicles. Enterprise has reduced the impact appeared from noise affecting the labor productivity, generating stress and causing hearing problems. Furthermore, several significant aspects affecting environment are illustrated in the production of hazardous wastes, fuel and CO_2 leak, water and energy consumptions, gases' emissions from vehicles, pesticides uses, chemicals—oil and wastewater spill, and chlorides problem in effluents. Having quantitative results in risk assessment process are the key points to determine hazards and simplify the decision making for developing management strategies (Topuz et al. 2011). Food enterprise identified 57 hazardous wastes to control their transport, storage and elimination with the risk minimum to the environment and human health. The indicators are taking into account for a better management of the collection, storage, and transport in collaboration with national specialized agencies of waste management in Tunisia (ANGED office). Therefore, the environmental review process has evaluated environmental actions concerning the redefinition of policy, goals, indicators and monitoring process to maintain the nonsignificance of environmental impacts (Fig. 1). In addition, several improved actions are undertaking by a food company which are:

- When acoustic noise exceed 80 decibels, enterprise provides safety equipment to minimize the hearing affect
- Using divisional counters for water and energy consumptions

- Invest on new technology to reduce air, water and soil leaks
- Encourage the renewable energies' uses
- Sensitization on the environmental risks' severity for workers by posters
- Review preventive maintenance frequency
- Collect, storage, and transport of hazardous wastes with ANGED office
- Install an advanced biological treatment station for wastewater efficiency
- Selective sorting of wastes
- Wastewater reuse
- Include safety procedures as inputs on work instructions

5 Conclusion

The environmental management system of a Tunisian food company has provided a decision-making structure and an action plan to support continuous environmental improvements, to develop new strategies for pollution prevention and to ensure conformance with national legislation. Environmental performance depends on several initiatives taking by a food company that the effective implementation of EMS provides environmental indicators, establish a regulation framework and assess environmental risks to all enterprise's activities. From the results of this study, MPIs has ensured the coherence of environmental policy with objectives and has defined a communication process with employees and stakeholders. However, operational and condition indicators are highlighted critical success and barriers about aspects' significance and impacts' severity that concern the wastes production (solid, water and gases), the energy and water consumption, the chemical parameters in wastewater like chlorides concentration in effluent. In fact, the major problem of a food company is about the chlorides pollutants in effluent that has a strong negative impact. This parameter should be considered as the priority in the strategy of the company and should be solved via an effective action plan. For the other effluent' parameters like temperature, pH, DCO, DBO_5 and chemicals (SO_4, Mg, K, Na, Al, Ca), the food company ensured the conformity. The assessment of impacts' severity on human health reveals different damages ranging from weakly, mildly to strongly resulting negative consequences on workers' productivity and cause hearing problems.

Eventually, certification with the ISO14001 standard may function as a substitute for juvenile regulatory framework in Tunisia face to the several pollutants that affect environment and human health. However, it requires sometimes an advanced technical knowledge of environmental issues especially on the determination of environmental criteria. A systematic approach should require the involvement of environmental issues into every aspect and impact of business management and the measurement must include different dimensions of environmental performance. Choosing the good indicators may not be obvious at times but choose carefully since these will guide many of measurement/data gathering efforts. Otherwise, for a food enterprise to be sustainable, it must contribute to the economic development of the country, promote environment and foster accountability toward society. This is shall be accomplished by the enterprise following appropriate procedures such as risk assessments, and others that ensure that stakeholders are informed, engaged, and respected.

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