



# Environmental performance of the cement industry in Vietnam: the influence of ISO 14001 certification



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## ABSTRACT

This empirical study is the first to analyze the response of Vietnamese cement plants to ISO 14001. The influence of ISO-compliant environmental management systems in Vietnam's cement industry was studied by examining the differences between pre- and post-certification and by comparing the results between certified and non-certified cement plants using a questionnaire and environmental indicators. The results of the management performance analysis demonstrated that the environmental awareness and attention in certified plants was better than in the non-certified plants. On operational performance, the results showed significant differences between the certified and non-certified plants on selected environmental indicators like dust, SO<sub>2</sub> and NO<sub>2</sub> as well as a significant improvement after the adoption of ISO 14001. As a whole, the certified plants performed better than the non-certified ones on management and operational aspects. This study has a twofold wider impact. It shows the methodological difficulties of assessing the impact of environmental management systems in situations of early implementation and low company awareness. Moreover, our findings indicate that ISO 14001 has the potential to improve organizations' environmental performance in a fast-developing country characterized by impressive industrial growth in recent decades.

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## 1. Introduction

Since the United Nations Conference on Environment and Development (UNCED) and the associated Earth Summit in 1992, the environment has become increasingly important for governments worldwide and for environmental management stakeholders. A key focus for these parties is the adverse impact of human activities on the environment and the ways of mitigating it (Price, 2007). In this context, environmental management systems (EMSs) are highly relevant and recommended by Agenda 21 (United Nations, 1998). As a result, the ISO 14001 certified EMS (the Standard) emerged as a leading management tool to address environmental degradation by the manufacturing industry and an exponential increase in global registration to the Standard has been observed. Reasons to adopt the Standard range from legal compliance, overt consumer demand and market pressure to potential cost savings and a healthier environment (Mohammed, 2000).

However, there is limited evidence that certified ISO 14001 EMSs lead to decreased resource consumption and pollution, and uncertainty exists as to whether or not ISO 14001 certification actually improves environmental performance (Fryxell et al., 2004; Iraldo et al., 2009). Proponents of international standards to assess corporate EMSs claim that substantial benefits exist for organizations that adopt the ISO 14001 standard (Heras and Arana, 2010; Hillary, 2003; de Oliveira et al., 2010). Others argue that the standard is an inadequate instrument to improve environmental sustainability as it does not directly measure environmental performance (Rondinelli and Vastag, 2000). Studies on the performance of ISO 14001 certified companies show inconsistent results. For example, the studies by Ann et al. (2006), Babakri et al. (2004), Comoglio and Botta (2012), Melnyk et al. (2003) and Turk (2009) indicate that adoption of ISO 14001 is associated with significant improvement in environmental performance, whereas others illustrated the challenge of demonstrating a relationship between ISO 14001 certification and decreased pollutant emission (e.g. Ghisellini and Thurston, 2005; Gomez and Rodriguez, 2011). Similarly, studies that examined differences in environmental performance between certified and non-certified companies noted that companies with an ISO 14001 certification did not perform better than those without (e.g. King et al., 2005; Tyteca et al., 2002).

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In some cases, plants with a certified EMS performed worse (Barla, 2007). Furthermore, a meta-analysis by Darnall and Sides (2008) and later by Nawrocka and Parker (2009) on the effects of voluntary environmental programs, including ISO 14001, revealed inconclusive evidence regarding the effects of ISO 14001 certification (Darnall and Sides, 2008; Nawrocka and Parker, 2009) and offered little evidence that participants in ISO 14001 showed greater improvement in environmental performance than non-participants (Darnall and Sides, 2008).

The published studies apply three different strategies to analyze the effects of a certified EMS on the environmental performance of organizations: a) differences in environmental performance within an organization between pre- and post-EMS certification (Arimura et al., 2008; Babakri et al., 2004; Comoglio and Botta, 2012; Tan, 2005); b) environmental performance of EMS-certified organizations compared with that of non-certified EMS organizations (Dasgupta et al., 2000; Franchetti, 2011; Ghisellini and Thurston, 2005; Melnyk et al., 2003; Potoski and Prakash, 2005; Tyteca et al., 2002); and c) a combination of both changes in environmental performance between pre- and post-EMS certification in EMS-certified organizations and between certified and non-certified facilities (Andrews et al., 2003; Barla, 2007; King et al., 2005; Kwon et al., 2002). Methods used to collect data in these studies include: questionnaires (e.g. Babakri et al., 2004; Melnyk et al., 2003), in-depth interviews (e.g. Bridgen and Helm, 2000; Dasgupta et al., 2000), and environmental indicators (e.g. King et al., 2005; Potoski and Prakash, 2005). Some studies use a combination of more than one method and more than one strategy to investigate the effects of ISO 14001 (e.g. Andrews et al., 2003; Kwon et al., 2002). Nevertheless, it remains unclear which strategies and methods should be employed to evaluate the impact of certified EMSs since the results vary with the strategies and methods. These findings confirm the results of a meta-evaluation of empirical studies on the impacts of certified EMS plants (Schlyander and Zobel, 2003).

Since the Doi Moi economic liberalization economic reform of 1986, Vietnam has demonstrated steady economic growth, which was further boosted by the country's entry into the World Trade Organization in 2007. However, an impact of this economic development is the degradation of the environment. In order to make growth sustainable, the environmental impacts associated with economic growth should be significantly reduced. Environmental management systems (EMSs) are important instruments in achieving this sustainable growth. In particular, there is great potential for the industrial sector to apply EMSs to increase its energy efficiency. International companies active in Vietnam recognized this potential and were the first to implement ISO 14001. However, widespread implementation of ISO 14001 certified companies is hampered not only by low company awareness, but also by limited knowledge and information, lack of financing, and conflicting policies combined with weak enforcement (Punte et al., 2005). In Vietnam, a sector with a high energy saving potential is the cement industry. However, difficulties occur in the early implementation of the instrument and the old production facilities (Quyenhuy and Tan Thanh, 2012). Although the Vietnamese government has demonstrated concern about the environmental impacts of the manufacturing and service sectors, (as indicated in the Vietnam National Strategy for Environmental Protection for 2010–2020, which states that “50% of manufacturing and services are certified with an environmental certificate or ISO 14001 in 2010 and in 2020 this figure should increase to 80%” – GOV, 2003), the motivation for Vietnamese organizations to put ISO 14001 into practice is still limited. This may be due to a lack of understanding of the effects of ISO 14001. While there have been many studies in Western countries on the influence of ISO 14001, there is little documentation

and analysis to assess the effects of ISO 14001 in Vietnam and in Southeast Asia. Thus, an empirical study of the impact of ISO 14001 certification is useful in Vietnam, enabling the tool and its implementation to be further improved. This paper analyses the impact of ISO 14001 on the cement industry as a step toward further research on ISO 14001 certification and environmental performance in the Vietnamese context. Its aim is twofold:

- The primary goal is to determine whether EMSs established by mature Western industries can also be applied under the Vietnamese conditions of a fast-developing country with, at least in part, old production facilities;
- The second goal is to identify the strategies and methods most appropriate for assessing EMSs in Vietnam.

## 2. Cement production in Vietnam

This section briefly describes the development of the cement industry in Vietnam and its environmental impacts. The first cement factory in the country was established in 1910 in Hai Phong – a harbor city in East of Hanoi. Beginning in 1991, the industry experienced rapid growth. During the last two decades, the total production capacity increased 13 times. During the last five years, the development of the cement industry was even more intensive due to the approval of the Strategic Plan for the Cement Industry in Vietnam for the period of 2010–2020, on May 16th, 2005 (GOV, 2005). As a result, Vietnam became the biggest producer of cement in the Association of Southeast Asian Nations (ASEAN) (VEA, 2011). In 2010, the total production was about 53 million tons and the supply now slightly exceeds demand. In the future, the total production is expected to increase further to 84 million tons in 2015 and 121 million tons in 2020 (VEA, 2011). The rapid growth of the industry on one hand contributes to economic development, but on the other causes severe environmental pollution (VPC, 2002). In Vietnam, cement companies are private, joint ventures or are state owned by the Vietnam National Cement Corporation.

The cement industry was chosen for this study because it has a long history of environmental problems and impacts as indicated in a World Bank (2008: 21) study which stated, “Cement plants have the highest hazardous content in their pollution to air than any other industry sector”. The general environmental impacts of the cement industry have been summarized by the Vietnam Productivity Center and are:

- Large quantities of dust generated in the grinding, clinker production and packaging processes;
- A large amount of fuel (coal, diesel oil) and electricity used for the baking process;
- Noise generated during the grinding and crushing processes;
- Discharged solid waste and wastewater;
- High fuel consumption – cement production under the standard wet kiln process requires a higher amount of fuel as compared to the rotary dry kiln process;
- Air pollution – the rotary dry kiln process produces fewer emissions than that of the stand wet kiln process. Carbon dioxide (CO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>) and carbon monoxide (CO) are generated from the clinker kiln and are discharged into the environment (VPC, 2002:3).

The cement sector is currently aiming to reduce pollution and save energy. However, a primary focus has been placed on “hard” measures such as technological change or new innovations in comparison with “soft” solutions such as environmental management. This study aims to investigate how ISO 14001 – a “soft”

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