

# **DETERMINANTS OF ENVIRONMENTAL MANAGEMENT SYSTEM**

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## **ABSTRACT**

In the large system of social-economic sustainable development, the environment, one of the most important subsystems, has drawn much attention from academia and practitioners. Due to rapid industrialization, China has become one of the world's most endangered urban and rural environments. The balance between economic development and environmental protection becomes a critical concern. For improving the environment, China has been active in implementing ISO 14000 international standard series. Using a structured questionnaire survey and the method of relative importance index, this paper identifies the critical factors affecting effective implementation of the standards for enterprises. The five tops out of twenty-seven factors are: environmental consciousness of top leader; consciousness of management; definite responsibility on environmental management; legal system; and legal enforcement. Based on analysis, it proposes the ways for the government to provide active measures in following aspects including mandatory policy, encouraging policy and supporting policy.

**Keywords:** Environmental management; ISO 14000; Sustainable development; China

## **INTRODUCTION**

The “Earth Summit” in Rio de Janeiro 1992 brought a new global emphasis to the corporate role in environmental protection. The International Organization for Standardization (ISO) set up a technical committee (TC207) to develop the ISO 14000 standards series, in which environmental management system (EMS) was finished in 1995 (Ritchie and Hayes 1998). Since the issuance of the ISO 14000 standard series in 1996, the standards spread across the world rapidly and the number of organizations certified under the scheme has been constantly increasing (Stager 2000). By June 2001, there have been 30,181 organizations obtaining the ISO 14001 certificates. Some developed countries such as Japan (6,648), UK (2,500), Germany (2,400), Sweden (1,911) and USA (1,480) have apportioned the largest slice of the pie (CACEB 2001).

China has been active in implementing ISO 14000 environmental certification. Up to August 2001, there have been 836 organizations obtaining ISO 14001 certificates, which is ranked the thirteen in the world and the top of developing countries. Among the certified enterprises in China, the electronic and communication equipment sector is ranked the first and occupies 71%, while the manufacturing sector is ranked the second at 7% (CACEB 2001). There are two significant characteristics in the certification; first, most of the certified enterprises are joint ventures and their products are export-oriented; second, most of the certified enterprises locate in the more developed eastern regions with a few at the inland. This could be attributed to China's opening policy. Especially

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for the eastern regions, the geographical endowment and effective implementation of policies are main reasons fascinating volume of foreign investment.

There are various factors influencing implementation of EMS, which can be grouped into management, interested party, market competitiveness, organization structure and so on (Chin et al. 1998; Labatt and Maclaren 1998). Due to the following characteristics in China: large population growth; the economy system in transition; massive urbanization; growing local level administrative autonomy which has not been parallel by the effective implementation of government policy and control, especially in relation to environmental protection; and an absence of environmental pressure groups and general awareness of environmental issues, hence there may be obvious difference between the adoption of EMS for enterprises in China from that in a market economy system.

Using a structured questionnaire survey, this paper is aimed to identify the factors affecting implementation of EMS for enterprises in China. Based on analysis and discussion, it proposes ways of promoting the adoption of the standards in China.

### **SURVEY**

Before conducting the survey, a number of publications on the adoption of ISO 14000 standard by companies were reviewed. Then auditors of EMS and senior management representatives of eight ISO 14000 certified companies were interviewed and requested to provide information and verification in drafting the questionnaire. Finally a structured questionnaire was sent to the senior management representatives of three hundred ISO 14000-certified enterprises/organizations listed in the Directory of ISO 14001 EMS Certified Enterprises of CACEB. One hundred and eight completed questionnaires have been received with a response rate of 36%.

In the survey, the responding certified enterprises include 48 (44%) electronic and electrical equipment companies, 20 (19%) construction companies, 12 (11%) chemical equipment and chemicals companies, 12 (11%) manufacturing companies and 16 (15%) others. All the 108 enterprises fall into five categories of ownership; 64 venture joint (59%); 22 state-owned (20%); 14 sharing-holding (13%); 4 private (4%) and 4 other enterprises (4%). That is consistent with the distribution of certified enterprises in China.

With respect to the duration taken in obtaining ISO 14000 certificates, 26% of companies proclaimed to be within one year, 46% of companies between one and three years, and 28% of the companies over three years. In addition, 85% of the certified companies had involved consulting agencies in applying for EMS certification, which may be attributed to the fact that ISO 14000 series was just issued in 1996 and is still at the early development stage in China and most companies were short of experienced staff in environmental management.

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### RESULTS AND ANALYSIS

The respondents were asked to provide their opinions on the importance of factors influencing implementation of EMS by scores from 1 to 5, where ‘1’ represents the least important and ‘5’ the most important. To determine the relative ranking of the factors, the scores were then transformed to relative importance index (RII) based on the following formula.

$$\text{Relative importance index} = \frac{\sum W}{A * N} \quad [1]$$

where w is the weighting given to each factor by respondents, ranging from 1 to 5, A is the highest weight (i.e. 5 in the study) and N is the total number of samples. Based on equation (1), the relative importance index (RII) can be calculated ranging from 0 to 1. Table 1 lists the relative importance indices and ranks of the factors.

In Table 1, the respondents ranked “environmental consciousness of top leader” and “consciousness of management” the first and the second, with a relative importance index of 0.896 and 0.841. The role of top management in environment management was highlighted by many researchers (Gupta 1995; Quazi et al. 2001). According to a study by Gupta (1995), 92% of 400 CEOs and top management surveyed agreed that the environment challenge was one of the central issues of the 21st century. Hunt and Auster (1990) identified top management leadership as one of the seven critical elements that was required to create an effective proactive environmental management. Without strong top management support, the implementation of EMS would not be successful (Berry and Rondinelli 1998).

“Definite responsibility on EM” was ranked the third, with a relative importance index of 0.748. That is due to the fact that ISO 14000 stipulates the responsibility of environmental management in procedures. Because the precise cause of environmental accidents is often difficult to determine, many people have a “pass the buck” mentality in many companies. Ignoring problems or leaving them for others to tackle is an easy alternative unless definite responsibility of problems is firmly established. In traditionally planning economy system in China, there is no definite relationship among “responsibility”, “right” and “benefit” in state-owned companies. Some companies attempt to develop “ownership” by basing performance appraisals bonuses, in part, on the attention an employee pays to environmental problems. Only a few such formalized reward programs exist in the environmental area. That is confirmed by the respondents’ views that the respondents graded “encouragement mechanism for clear production” the fifteenth in the survey.

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**Table I. Ranking of The Factors Affecting Implementation of EMS**

Ranking	Factors	RII
1	Environmental consciousness of top leader	0.896
2	Consciousness of management	0.841
3	Definite responsibility on EM	0.748
4	Legal system	0.737
5	Legal enforcement	0.730
6	Emergency measures	0.726
7	Resources input	0.719
8	Minimizing environmental nuisance materials	0.715
9	Expertise professional	0.715
10	Effective implementation of the relevant regulations on EM	0.711
11	Training on EM	0.711
12	Systematic operation regulations	0.704
13	Civilianized operation	0.689
14	Safety protection	0.667
15	Encouragement mechanism for clear production	0.656
16	Innovation technologies	0.637
17	Information exchanges	0.633
18	Utilization of environment-friendly equipment	0.622
19	Measures of environmental protection on production	0.619
20	Re-utilization of resources	0.604
21	Protection measures in material handling	0.596
22	Equipment maintenance	0.596
23	Protection measures in material storage	0.589
24	Encouragement mechanism of reducing wastage	0.567
25	Inspecting equipment for EM	0.556
26	Quality first-line workers	0.552
27	Records of environment management	0.548

The respondents graded “legal system” and “legal enforcement” the fourth and the fifth, with a relative importance index of 0.737 and 0.730. The legal system and legal enforcement are prerequisites of effective environment protection. In this survey, the current status of Chinese legal system and legal enforcement on environment protection were explored (see Table 2).

In Table 2, 22% of the respondents agreed that China has a systematic legal framework regulating environmental protection. In recent years, the Chinese government has made great effort in enacting laws on environment protection such as the ratification of Environment Protection Act in 1989, Water Pollution Protection Act in 1984 and revised in 1996, Air Pollution Protection Act in 2000, Solid Wastage Pollution Protection Act in 1995, and Noise Pollution Protection Act in 1996. However, most of these regulations do not contain explicit clauses defining the action and standards of performance. Only

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applying these explicit standards to communities with the consideration of the local context and characteristics can EM be effectively promoted. Moreover the system of environmental legal regulation remains with serious flaws. It is still essentially administrative rather than legal in nature, with courts and lawyers playing only a minor role; there is a real need to establish clearer parameters of liability; and the system places too much emphasis on punishment as opposed to material incentives in order to secure compliance (Edmonds 1998). That could be reflected from the responses of the respondents e.g. that 78% of the respondents chose the average and not systematic act and regulations on environment in China.

**Table II. Evaluation of Respondents on Chinese Legal System on Environment**

Item	Evaluation of respondents	Number of companies
Act and regulations	Systematic	24 (22*)
	Average	58 (54)
	Not systematic	26 (24)
	Others	0 (0)
	Total	108 (100)
Legal enforcement	Stringent	10 (9)
	Average	26 (24)
	Not stringent	68 (63)
	Others	4 (4)
	Total	108 (100)

\* Figures in brackets are the percentages

Moreover only 9% of the respondents indicated that the legal enforcement was stringent. Most of the respondents (87%) opined that the legal enforcement was average and not stringent in China. Currently the administration still has very considerable powers, and can use its discretion to influence local environmental protection to suit itself. Violation of environmental law often go unpunished, especially in cases in which enforcement is required by a body from outside the immediate area – the local government often has a direct interest in the financial health of local enterprises, and the development of town-and-village enterprise has worsened the situation (Warren et al. 1999). Environmental law is an area in which problems of distorted decision-making stemming from corruption, selective implementation of rules, the difficulties of confronting local political leaders, the low status of those involved in administrating the system and so on appear to be particularly serious (Edmonds 1998). Hence strict legal enforcements need to await improvement of the Chinese legal framework.

“Emergency measures” was graded the sixth, with a relative importance index of 0.726. The enterprise needs to develop and maintain procedures that identify potential for and respond to accidents and emergency situations. It should also establish and maintain procedures for preventing and mitigating the environmental impact that may be

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associated with accidents and emergency situations. These procedures should be tested periodically, where practicable.

The respondents ranked “resources input” the seventh, with a relative importance index of 0.719. Implementation of EMS needs resources input including human resources and financial input. The certified enterprises have to train the internal auditor. With respect to financial input, 50% of the respondents chose “take measures for environmental protection”; 42% chose “investment in environment-friendly equipment”; 6% “R&D for innovative technology”; and 2% “utilization of environment-friendly materials”. In fact enterprises’ cost-benefit concerns influenced their attitudes to the implementation of ISO 14000. They felt it would not bring tangible short-term benefits. That could be envisaged from the main corporate management for implementing ISO 14000 that 55% of respondents hope to “save resources and reduce wastage”.

The respondents ranked “minimizing environmental nuisance materials” the eighth, with a relative importance index of 0.715. For example, current consumption of more than 1.3 billion tons of coal a year is the main cause of China’s air pollution and acid deposition. China’s energy intensity in 1995 was about four times that of the USA. Additionally, China is also much less technically efficient than industrial countries, especially in energy-intensive industries and major energy-consumption equipment. According to prediction of World Bank (1997), China’s energy intensity will reach 0.586 tons of coal equivalent per 1,000 of GDP by 2020 – three times less than in 1995 but still about 40% more than the current USA level. Thus mitigating the environmental effects of energy consumption will require improving energy efficiency, diversifying energy supplies, and controlling emissions.

“Expertise professional” was graded the ninth, with a relative importance index of 0.715. The expertise professional played a vital role in ISO 14000 implementation. Many enterprises are shortage of expertise professional who are familiar to environmental management. Moreover ISO 14000 standard is a novelty to most of enterprises in China. That could be witnessed from the fact that 85% of the certified companies had involved consulting agencies in applying for EMS certification.

The respondents graded “effective implementation of the relevant regulations on EM” the tenth, with a relative importance index of 0.711. This is associated with “legal system” and “legal enforcement”.

## **DISCUSSION AND RECOMMENDATIONS**

As aforementioned, the environmental consciousness of an enterprise is indispensable in environment protection. In addition, the government should play an important role in promoting environmental management. In some developed countries, there are encouraging policy and supporting policy besides mandatory policy for environment management and clearer production (see Table 3).

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**Table III. Policy for Environment Management in Some Developed Countries**

Policy		USA	Holland	Denmark	UK	Germany
Mandatory policy	Legal system	√	√	√	√	—
	Objective responsibility	√	√	√	—	√
Encouraging policy	Tax	√	√	√	—	√
	Subsidies	√	√	√	√	√
Supporting policy	Workmanship model	√	√	√	√	√
	Product model	—	√	√	—	√
	Open information	√	√	√	√	√
	Training	√	√	√	√	√
	R&D plan					

Source: Zhang (1997)

Note: √ represents adoption; — represents not adoption.

In Table 3, it indicates that the encouraging policy includes tax and subsidies in developed countries. In addition, the supporting policy involves workmanship model project, project model project, open information, training, and R&D plan. Currently although it is difficult for China government to fully implement the above measures in environment management, She could focus on the following aspects:

- Mandatory policy. It is necessary to establish a proper legal framework for promoting environment protection and ISO 14000 standards. Currently the major problem is the lack of local regulations consistent with the national standards. In addition, because the involvement of the general public is very important in promoting environmental protection, it is necessary to establish channels for the public to address their complaints.
- Encouraging policy. Although Chinese government might not support tax exemption for the certified enterprises (Matouq 2000), she could provide soft loan or short-term subsidies. The Chinese large-sized state-owned and township-and-village enterprises are main pollution source (Warren et al. 1999). The former has been experiencing severe difficulties in operation and the latter facing the challenge of obsolete technology and poor know-how. Moreover the cost of pollution protection for large-sized state-owned enterprises is as five times as that of non-state-owned enterprises (Teng 2001). That further exerts pressure upon these enterprises for preventing pollution and clearer production.
- Supporting policy. She should organize training courses and seminars on the subject of environment management for the management of enterprises as their environmental awareness is pivotal in adopting EMS. The leaders of firms are concerned that ISO 14000 cannot bring them instant or short-term benefits, leading

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them to adopt a wait-and-see attitude (Alberti et al. 2000). The training should include sharing of experience by those ISO-14000 certified companies. From their experience, participants could learn more about the implementation process and benefits. In fact, research has indicated that strong EM is positively correlated to the financial performance of the company (Klassen and McLaughlin 1996).

### **CONCLUSIONS**

China has been active in implementing ISO 14000 environmental certification. There are various factors influencing implementation of EMS. Using a structured questionnaire survey, the study identifies the critical factors affecting implementation of the standards. The five top out of twenty-seven factors are: environmental consciousness of the leader; consciousness of management; definite responsibility on environmental management; legal system; and legal enforcement.

The government should play an important role in promoting environmental management. It is necessary for the government to provide active support in the following three aspects:

- Mandatory policy – establishment of a proper legal structure and related regulations for promoting ISO 14000;
- Encouraging policy – provision of soft loan or short-term subsidies to the construction industry; and
- Supporting policy – training to the leaders of construction firms to arouse their environmental awareness.

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