

**MOTIVATION AND BARRIER FACTORS OF ENVIRONMENTAL  
MANAGEMENT SYSTEMS IMPLEMENTATION IN CONSTRUCTION**

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MOTIVATION AND BARRIER FACTORS OF ENVIRONMENTAL  
MANAGEMENT SYSTEMS IMPLEMENTATION IN CONSTRUCTION

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*Especially dedicated to:*

*My lovable parents & fiancée, my dearest sisters and brothers*

*Who offered me unconditional love and support...*

*My supportive supervisor, Dr. Khairulzan bin Yahya*

*Who teach and guide me throughout the study...*

*All my faithful friends*

*For their friendships and supportive that brighten my student life...*

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## ABSTRACT

The construction industry is one of the major sectors that contributes essential infrastructure to society and provides benefits to the country's economy. However, this thriving sector has become one of the major contributors to environmental pollution which are typically classified as air, waste, noise and water during the execution of construction activities. The promotion of environmental management and the mission of sustainable development have resulted in pressure demanding the adoption of proper methods to improve environmental performance in construction industry. The aim of the study was to investigate the level of contractor's awareness, motivation and barrier factors for the purpose of promoting ISO14001:2004-EMS in Malaysian construction industry. The level of contractor's awareness on practice towards implementation of ISO14001:2004-EMS in Malaysia's contractor companies was identified. In addition, the barriers and motivation factors were established, and furthermore the study was highlighted the effective ways on promoting ISO14001:2004-EMS in Malaysia's contractor companies. A pilot study was conducted by sending questionnaires survey to 20 selected respondents consists of EMS certified and non certified contractor companies. The final questionnaires survey was distributed to 38 EMS certified contractor companies from Grade G3 until G7 in Malaysia which have been registered with Construction Industry Development Board (CIDB). The samples were analysed by using Reliability Test, Average Index Method, Kendall's W Test and Chi- Square Test. Results show that the level of contractor's awareness are to perceived benefits and market orientation were agreed by the respondents. While, the barriers and motivation factors were mostly came from the client, employees and financial costs. The study recommended that the effective ways on promoting EMS should come from the top management, planning and documentation, education and training program, monitoring and supervision, new technologies and financial management. Finally, some recommendations were mentioned in this report.

## ABSTRAK

Industri pembinaan merupakan salah satu sektor utama yang menyumbang kepada infrastruktur penting kepada masyarakat dan memberi manfaat kepada ekonomi negara. Walau bagaimanapun, sektor berkembang maju ini telah menjadi salah satu penyumbang utama kepada pencemaran alam sekitar yang lazimnya diklasifikasikan sebagai pencemaran udara, bunyi, sisa dan air semasa pelaksanaan aktiviti pembinaan. Galakan dalam pengurusan alam sekitar dan misi pembangunan mampan telah menyebabkan tekanan dalam menuntut penggunaan kaedah yang sesuai untuk memperbaiki prestasi alam sekitar dalam industri pembinaan. Tujuan kajian ini adalah untuk menyiasat tahap kesedaran kontraktor, faktor motivasi dan halangan yang bertujuan untuk menggalakkan pelaksanaan ISO14001:2004-EMS di dalam industri pembinaan Malaysia. Tahap kesedaran kontraktor terhadap amalan ke arah pelaksanaan ISO14001:2004-EMS dalam syarikat kontraktor Malaysia akan dikenal pasti. Di samping itu, halangan dan faktor motivasi akan ditubuhkan, dan tambahan pula kajian ini mengetengahkan cara berkesan untuk mempromosikan ISO14001:2004-EMS di dalam syarikat kontraktor Malaysia. Kajian rintis telah dijalankan dengan menghantar soalan kaji kepada 20 responden yang telah dipilih di mana terdiri daripada syarikat kontraktor yang disahkan dan yang belum disahkan. Akhirnya, kajian soal selidik akhir telah diedarkan kepada 38 EMS syarikat kontraktor yang disahkan dari Gred G3 hingga G7 di Malaysia berdaftar dengan CIDB. Sampel dianalisis dengan menggunakan Ujian Kebolehpercayaan, Kaedah Indeks Purata, Ujian W Kendall dan Ujian Chi-Square. Keputusan menunjukkan tahap kesedaran kontraktor adalah untuk mendapat manfaat dan orientasi pasaran. Halangan dan faktor motivasi adalah daripada pelanggan, pekerja dan kos kewangan. Cara yang berkesan yang dicadangkan kepada usaha menggalakkan EMS adalah perlu hadir daripada pengurusan atasan, perancangan dan dokumentasi, pendidikan dan program latihan, pemantauan dan penyeliaan, teknologi baru dan pengurusan kewangan. Akhirnya, beberapa cadangan telah disebut dalam laporan ini.

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## **LIST OF ABBREVIATION**

EMS	-	Environmental Management System
CIDB	-	Construction Industry Development Board
SIRIM	-	Standard and Industrial Research Institute of Malaysia
ISO	-	International Organization of Standardization
EMAS	-	Eco- Management and Audit Scheme

## LIST OF SYMBOLS

% - Percent

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

The construction industry is one of the major sector that contributes essential infrastructure to society and provides benefits to the country's economy. However, this thriving sector have become one of the major contributor to environmental pollution which are typically classified as air, waste, noise and water pollution during the execution of construction activities. For instance, there was 14 million tonnes of wastes are put into landfills in Australia each year and 44% of this wastes is attributed to the construction industry (McDonald, 1996).

According to the studies by Zainol and Zailani (2009), the world is currently facing environmental degradation such as global warming, water and air pollution, depletion of stratospheric ozone layer and acid rain. For Malaysia, with a large segment of industry being export oriented, the impact from customer demand forces the individual companies to respond to the environmental issues. Thus, the Malaysian government has formally endorsed the drafts of the standard ISO 14001, partly because it feared the standards could put Malaysian companies off the European and other markers as well (Chemical Week, 1996).

In addition, the rapid growth of development in Malaysia has resulted in increased of environmental pollution problems. According to Khor, (1996) has summarized many pressing environmental problems which resulting from development activities as the depletion and degradation of resources, pollution and contamination of air, water , land etc; use and disposal of toxic materials and other environmentally related to health hazards and problems; climate change and ozone loss; the erosion of biodiversity; and environment and health problems due to the development.

Based on Mori, Y and Welch, E.W. (2008), appropriate management and control strategies to address the environmental issues have become a requirement to retain global customers and to thrive in a more critical global economy. In this aspect, Environmental Management System (EMS) that is ISO14001 compliant is designed to overcome environmental issues into every aspect of the company's operation, and offers an organized approach to manage environmental issues. Briggs (2007) mentioned that, the benefits of ISO14001 lies in the cost savings through energy consumption, raw material input, waste management, environmental impact reversal as well as an improved public image.

## **1.2 Background of Study**

Commonly society's concerns over pollution, resource depletion, hazardous waste, and other environmental matters have increased over the last decades ( Rezaee and Elam, 2000). Hence, in order to overcome this problems an awareness among the companies in construction industry should take into account on the implementation of Environmental Management System (EMS) in this sector. Atkinson (1999), suggested that environmental assessment, environmental audits and management systems may be used more strategically to prevent pollution at source.

As a result, most of government in various countries has strongly promoted the certification exercise of ISO 14001:2004 Environmental Management System (EMS). However, gaining ISO 14001:2002-EMS certification is only awarded to the companies who achieve the standard by considering and applying EMS in their company. Furthermore, EMS have been said to enable organization to improve their economical and environmental performance (Goh, Suhaiza and Nabsiah, 2006 ; Fortunski , 2008).

Organizations need to keep in mind that an EMS such as ISO 14001 is a voluntary system and tools and thus does not replace the existing regulations but provides guidance and flexibility in addressing both environmental and business issues (Zutshi and Sohal, 2004). The key elements of ISO 14001 include environmental policy, planning, implementation and operation, checking and corrective action, and management review (Liyin et.al, 2006)

Hence, it is important for construction companies to consider on applying the environmental management in order to reduce the construction impacts to the society instead of focusing only on time, cost and quality. According to Montabon et. al., (2000), managers today are not only expected to reduce lead times, improve quality, reduce costs and enhance flexibility, but they are also expected to become more environmentally responsible.

### **1.3 Problem Statement**

The construction industry tends to produces substantial amount of waste which is about four time that produced in households thereby accounting for more than 50 percent of the waste deposited in a typical landfill (Ferguson et. al., 1995 ; Coventry and Guthrie, 1998). Moreover, construction waste has become a serious environmental problem in many large cities in the world (Chen et al., 2002). Thus, a proper environmental management should be considered by the construction industry in order

to minimize the waste and control the environmental impact to the public society. Hence, the importance of EMS for organizations is becoming widely known across all industrial sectors (Burnett and Hansen, 2007).

According to the Quazi (1999); Gregor and Polona (2006); Goh, et al., (2006) the ultimate aim of implementing EMS is to help organization to establish a systematic way to introduce environmental issues into every aspect of the company's operations and offers an organized approach to manage environmental issues. Nevertheless, many companies are still doubtful as to whether or not getting certification (Petroni, 2001).

The impact of ISO 14001 on Malaysia's economic and environmental performance is still lacking and left behind (Goh et al.,2006). Construction results in series of environment polluting activities, for an example erosions, building debris, site clearance materials, mind or scheduled wastes into the water, air and land and excessive extraction of resources to meet rapid growth in production demand for energy, raw materials and natural resources (Bishop, 2000).

The intention of the ISO 14001:2004-EMS standard is to drive environmental improvements worldwide through systematic approach to environmental management. Moreover, ISO 14001:2004-EMS is the world's most recognized EMS framework that helps organizations both to manage better the impact of their activities on the environment and to demonstrate sound environmental management. (Balta and Woodside, 1999).

The idea and practices of proper environmental management has spread in North America and in Europe (Guimares and Sato,1996). However, Malaysian firms seem to have conservative attitude toward the ISO 14001:2004-EMS adoption (Tan, 2005), in which only 370 firms were certified as in December 2003, which is about one percent (1 %) of the total certified firms in the world.

In addition, the number of firms was increased to 646 companies in Malaysia were certified as in 2012 according to SIRIM. According to ISO twelfth cycle, (2003) Standards and Industrial Research Institute of Malaysia (SIRIM) started an ISO 14001:2004-EMS pilot study project consisting of 32 companies, of which 5 companies were certified by end of 1996 and 22 companies by July 1997. However, only 38 contractor companies out of 68,092 contractors were certified as in 2012 according to the SIRIM.

It is thus, the important of this study is to address this issue by examining the awareness and barriers in implementing EMS among the contractors and to identify the effective ways on promoting implementation of ISO 14001:2004-EMS in Malaysia's construction industry.

#### **1.4 Aim and Objectives of Study**

The aim of this study is to investigate the level of contractor's awareness, motivation and barrier factors for the purpose of promoting ISO 14001:2004-EMS in Malaysian construction industry. Thus, this study embarks on the following objectives:

- i. To identify the level of contractor's awareness on practice towards implementation of ISO 14001:2004-EMS in Malaysia's contractor companies.
- ii. To establish barriers and motivation factors in the implementation of ISO 14001:2004-EMS in Malaysia's contractor companies.
- iii. To determine the effective ways on promoting implementation of ISO 14001:2004-EMS in Malaysia's contractor companies.



## **1.5 Scope and limitation of study**

The scope of this study is focused on identifying the level of contractor's awareness, establishing barriers and motivation factors and determining the effective ways on promoting implementation of ISO 14001:2004-EMS in Malaysia's contractor companies. Therefore, the limitation of this study is concentrated on 38 EMS certified contractor companies as recommended by SIRIM expert.

## **1.6 Significances of Study**

The importance of study on the implementation of Environmental Management System in Malaysia's construction industry is one of the method in order to overcome the various environmental impacts from construction activities.

Thus, there are several significance of this study as follows :

- i. Learn and gain knowledge related on standard ISO 14001:2004-EMS from experts.
- ii. Discover the barriers and motivation factors among the contractors towards implementation of ISO 14001:2004-EMS in Malaysia's construction industry.
- iii. To gain information on the benefits and effective measures of ISO 14001:2004-EMS implementation. in Malaysia's contractor's companies.
- iv. Reveal the level of contractor's awareness on practices towards ISO 14001:2004-EMS in Malaysia contractor's companies.

## 1.7 Research Methodology Framework

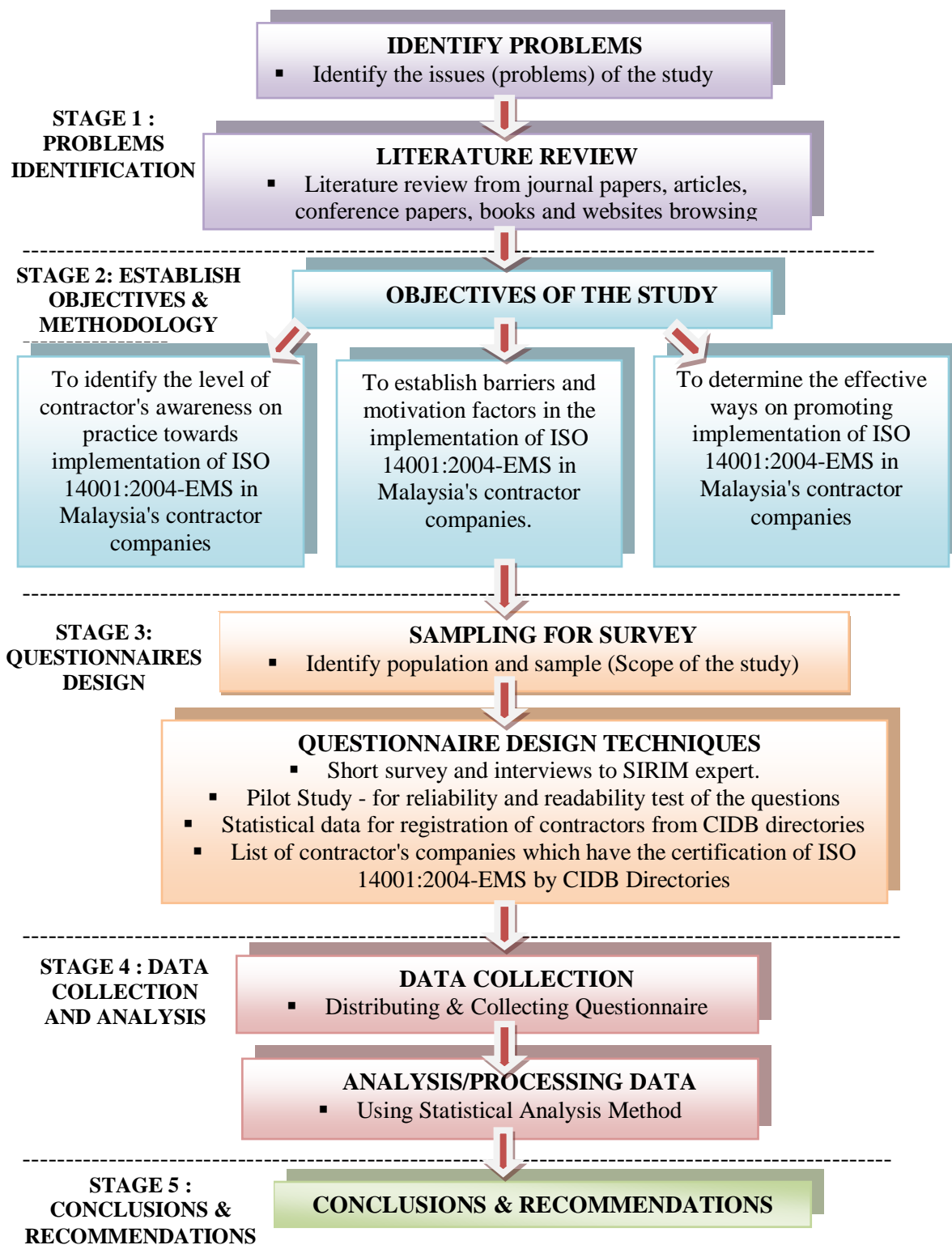


Figure 1.1 : Research Methodology Framework

## 1.8 Organisation of the Thesis

The thesis contains a total of 5 chapters. In Chapter I entitled *Introduction* consists of background of study, problem statement which is clearly defined leads to the aims and objectives of the study. The scope and limitation of the study are also clarified to avoid any confusion and misconception arises. In addition, the importance of the study and research methodology framework of the study is finally highlighted.

In Chapter II entitled *Literature Review* consists of Introduction, Environmental Management System (EMS), Benefits of ISO 14001 : 2004 EMS, Barriers of ISO 14001 : 2004 EMS , Effective ways on promoting ISO 14001 : 2004 EMS, Registration of contractors, Environmental Management Plan (EMP), Compilation of Environmental Acts, Laws and Legislation related to construction industry. The sources of literature are from reviewing the journal, thesis, articles, books and web pages.

Chapter III discuss on the *Research Methodology*. This chapter was clearly state how the related information and sample data are being collected such as through literature review, questionnaire survey and gaining information from Construction Industry Development Board (CIDB).

While, in Chapter IV discuss on the *Results and Discussions*. Basically, the data collection and feedback from the questionnaire survey was analysed by using Statistical Analysis Method.

Finally, in Chapter V entitled the *Conclusions and recommendations* which conclude all the findings that leads to the achievement of the objectives of the study as stated in Chapter I. Besides that, it is also suggested some recommendations to improve the current practices on site environmental management.

## REFERENCES

- Ann, G.E., Zailani, S and Wahid, N.A. (2006). A Study on the Impact of Environmental Management System (EMS) Certification Towards Firms' Performance in Malaysia. *Management of Environmental Quality :An International Journal*, 17(1),73-93. Emerald Group Publishing Limited.
- Abdullah, H. and Fuong, C.C. (2010). The Implementation of ISO 14001 Environmental Management System in Manufacturing Firms in Malaysia. *Asian Social Science*, 6(3), 100-107.
- Ambika, Z. and Amrik S.S. (2005). A Framework for Environmental Management System Adoption and Maintenance : An Australian Perspective. *Management of Environmental Quality: An International Journal*, 16(5), 464-475. Emerald Group Publishing Limited.
- Chua, Y.P. (2006). Asas Statistik Penyelidikan. McGrawHill.
- Construction Industry Development Board (CIDB). <http://www.cidb.gov.my/>  
Accessed on 14<sup>th</sup> October 2012.
- Fergusson, H. and Langford, D.A (2006). Strategies for Managing Environmental Issues in Construction Organizations. *Environmental, Construction and Architectural Management*, 13(2), 171-185. Emerald Group Publishing Limited.
- George, A.M *et al* (2007). SPSS For Introductory Statistics : Use and Interpretation. Third Edition. Lawrence Erlbaum Associates, Inc., Publishers.

- Mori, Y & Welch, E.W. (2008). The ISO 14001 environmental management standard in Japan : results from a national survey of facilities in four industries, *Journal of Environmental Planning and Management*, 5(13):421 - 445
- Morrow, D and Rondinelli, D. (2002). Adopting Corporate Environmental Management Systems : Motivations and Results of ISO 14001 and EMAS Certification. *European Management Journal*, 20(2), 159-171. Elsevier Science Ltd.
- McDonald B. (1996). RECON waste minimisation and Environmental Program, in : Proceedings of CIB Commission Meetings and Presentations, RMIT, Melbourne, Australia, 14-16.
- Malaysian Standard MS ISO 14001:2004 (2004). Environmental Management Systems - Requirements with Guidance for Use.
- Meena, C (2005). An appraisal of environmental management systems : A competitive advantage for small business . *Management of Environmental Quality : An International Journal*, 16(5): 444 - 463
- Nicholas, P.C (2006). Environmental Management Systems Handbook for Refineries. Gulf Publishing.
- Nee, G.Y (2010). The Effect of ISO 14001 Environmental Management System Implementation on SMEs Performance : An Empirical Study in Malaysia. *Journal of Sustainable Development*, 3 (2), 215-220.
- Nancy, L.L. *et al* (2005). SPSS for Intermediate Statistics : Use and Interpretation. Second Edition. Lawrence Erlbaum Associates, Inc., Publishers.
- Ofori, G. *et al* (2002). Implementation Environmental Management Systems in Construction: Lessons from Quality Systems. *Building and Environment*, 37, 1397-1407. Elsevier Science Ltd.

- Ofori, G. et al (2000). Impact of ISO 14000 on Construction Enterprises in Singapore. *Construction Management and Economics*,18, 935 - 947. Taylor & Francis Ltd.
- Psomas, E.L et al (2011). Motives, Difficulties and Benefits in Implementing the ISO14001 Environmental Management System. *Management of Environmental Quality :An International Journal*, 22(4), 502-521. Emerald Group Publishing Limited.
- Puvasvaran, A.P. et al (2010). A Review of Purpose, Benefits, Impediments and Structure of Environmental Management System (EMS). *Australian Journal of Basic and Applied Sciences*, 4(10), 4710-4716. INSInet Publication.
- Raymond, T.C (2001). The Implementation of EMS in Construction Firms : Case Study in Hong Kong. *Journal of Environmental Assessment Policy and Management*, 3(2), 177-194. Imperial College Press.
- Silva, G.C.S. and Medeiros, D.D. (2004). Environmental Management in Brazilian Companies. *Management of Environmental Quality : An International Journal*, 15(4), 380-388. Emerald Group Publishing Limited.
- Shen, L.Y. and Tan, V.W.Y (2002). Implementation in the Hong Kong Construction Industry. *International Journal of Project Management*, 20(7), 535-543. Elsevier Science Ltd.
- Sheridan , J.C and Lyndall G.S (2003). SPSS Analysis Without Anguish version 11.0 for windows. John Wiley & Sons Australia, Ltd.
- Standards and Industrial Research Institute of Malaysia (SIRIM). <http://www.sirim.com.my>. Accessed on 16<sup>th</sup> October 2012.
- Standards and Industrial Research Institute of Malaysia (SIRIM). <http://www.sirim-qas.com.my>. Accessed on 16<sup>th</sup> October 2012.

- Tam, C.M *et al* (2004). Green Construction Assessment for Environmental Management in the Construction Industry of Hong Kong. *International Journal of Project Management*, 22(7), 563-571. Elsevier Science Ltd.
- Zhang, Z.H. *et al* (2000). A Framework for Implementing ISO 14000 in Construction. *Environmental Management and Health*, 11(2), 139-148. MCB University Press.
- Zainol, R and Zailani, S (2009). Adoption Factors for EMS ISO 14001 in Malaysia. *International Journal of Environmental Engineering*, 1(3), 256-275. Inderscience Enterprises Ltd.
- Zeng, S.Z *et al* (2005). Towards Implementation of ISO 14001 Environmental Management Systems in Selected Industries in China. *Journal of Cleaner Production*. 13(7), 645-656. Elsevier Science Ltd.