Front. Environ. Sci. Engin. China 2009, 3(2): 210–220
DOI 10.1007/s11783-009-0014-7

RESEARCH ARTICLE

Drivers and barriers to engage enterprises in environmental management initiatives in Suzhou Industrial Park, China

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Abstract Small- and medium-sized enterprises (SMEs) play an important role in sustainable development not only for their significant contribution to China's economy, but also for their large share of total discharged pollutants. Therefore, this research takes the enterprises in Suzhou Industrial Park, China as the case study to investigate the environmental management practices of SMEs, and identify drivers and barriers to engaging businesses in environmental management initiatives. It is shown that, as in other countries, SMEs are less active in adopting environmental management initiatives than larger companies. Legislation remains the key driver to engage SMEs in environmental management initiatives. Based on the analysis, policy recommendations are also presented.

Keywords small- and medium-sized enterprises (SMEs), environmental management initiative, Suzhou Industrial Park

1 Introduction

Being the largest developing country, China has undergone rapid economic development, which has resulted in severe environmental deterioration. As the major cause of, and an important part of the solution to environmental issues, the companies in China are now facing unprecedented challenges to implement more sustainable practices to support the current pace of economic growth. China's economy has been in the post-reform period, characterized by the rapid proliferation of small- and medium-sized enterprises (SMEs). It has brought new impetus to domestic production, contributing more than half of China's gross national industrial output. However, SMEs have the highest pollution intensities among enterprises of all ownership types. SMEs play an ever-increasing role in sustainable development not only for their significant contribution to China's economy—accounting for 99% of the country's enterprises, 40% of GDP, 60% of exports, and 75% of job opportunities, but also for their large share of total discharged pollutants—more than half of industrial pollution and 70% of production accidents [1]. By the end of 2001, the pollution load of SMEs in total industrial pollution had increased to 55% for COD, 25% for SO_2, 62% for solid waste, and 35% for soot [2].

Since the 1980s, a number of environmental policies and items of legislation have been developed in China. However, it seems that conventional policy discussion was too narrow, focusing only on the firm-state interaction as the single determinant of environmental performance. There is a growing recognition that policy makers need to improve their understanding of how firms behave environmentally [3], so that more theoretical conceptualizations of sustainability can be developed [4,5]. Indeed, firms have become more aware of the importance of environmental issues at all levels of their operations, and have been influenced not only by governments but also by stakeholders such as shareholders, employees, neighborhood residents, and trade associations [6]. Each of these pressures presents firms with a daunting array of potential environmental risks [7]. Alternative approaches such as financial incentives, business-led voluntary programs, information disclosure, and green labeling could achieve the same or better environmental objectives. The difficulty is to know whether the alternative approaches are best suited and effective. Therefore, it is important to identify the elementary motivation and principal factors which shape SMEs to engage them in environmental protection initiatives.

Although a wealth of SME surveys and case studies have been conducted in Europe, the issue has so far attracted relatively little research interest in China. Therefore, the present study attempts to close this gap by examining drivers and barriers to engage China's SMEs in environmental management initiatives. In a

Received May 29, 2008; accepted November 27, 2008

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questionnaire-based survey, SMEs as well as larger companies were asked about the key incentives and barriers for their engaging in environmental change in Suzhou Industrial Park, China. It is anticipated that the insights of this study could help identify effective and realistic incentives to encourage firms, particularly SMEs, in China to start moving beyond simple regulatory compliance with environmental legislation.

2 Corporate environmental management in SMEs

Increasing pressures are being put on firms, from different sources, to engage them in environmental management initiatives. Government regulation is the major initial environmental pressure. However, research also finds that community and market have become the determinant factors as they play more active roles in environmental protection in developed countries [8].

Certain strategic choices can be imposed coercively through sanction or threat, as in the case of a government legally mandating environmental standards [9,10]. Government regulation, including inspections and enforcement actions, is one of the most important factors affecting a firm's decision making process [7]. SMEs present a similar situation in relation to environmental regulation, and the regulatory domain has been identified as a key factor to the environmental behavior of firms [11]. O'Laoire and Welford pointed out that legislation rather than any other factors was the driving force for environmental management in the SMEs [12]. Small firms would be afraid of regulatory attention [11,13,14]. In the Netherlands for example, SMEs have engaged more actively in environmental measures as a consequence of such efforts backed up by a robust legislative, licensing, and inspection system [15,16]. However, studies suggest that in the absence of regulatory pressure, SMEs are less likely to be proactive despite encouragement for innovation and self-regulation [13,15,17]. Thus, compliance with existing legislation is a key motivating factor behind SMEs' environmental consciousness [18–21]. Recent empirical studies also show that government regulation is the principal factor forcing SMEs to improve environmental performance [22–24].

However, some economic studies examine the effects of non-regulatory factors on corporate environmental performance and/or behavior, and particularly explore the reasons for over-compliance, which cannot be explained by regulatory pressure. Arora and Cason explored firms' desire to present a 'green' image to consumers [25]. Vachon and Klassen pointed out that, by interacting with their suppliers and customers, manufacturing organizations could potentially develop and implement more effective solutions to environmental challenges they are facing [26]. Zhu et al. found that market pressure is a strong driver for the adoption of the green supply chain management practice by Chinese automobile supply chain enterprises [27]. For SMEs' environmental management system implementation, Hillary argued that customers are the most important drivers [28], as well as eco-design in Dutch SMEs [29]. In addition, growing public awareness and a sense of social responsibility are further drivers for environmental action among SMEs [19]. SMEs generally depend on good relations with their local communities and customers, and public pressure could potentially "regulate" SMEs activities through zoning changes or complaints triggering government inspections and enforcement [30,31]. Interestingly, some case studies of more pro-active companies reveal that a pro-active approach towards environmental initiatives is not closely linked with environmental compliance [32]. Petts et al. suggested that embarking on environmental initiatives does not stem from pressures of environmental compliance, and appears rather to be driven by the personal commitment of individual managers who take over a leadership role and initiate change [21].

In addition, SMEs' limited resources always affect their ability to adopt new practices [33]. SMEs often lag to respond to the requirements of improving their environmental performance [34]. Lack of technology, knowledge, and financial support are commonly considered to be the most important constraints to environmental actions [24,35,36]. Hopkins found that the average cost per employee of environmental compliance decreased with the increasing size of the firm, and SMEs pay almost twice as much per employee as large firms do to comply with environmental laws. Smaller firms also have limited financing opportunities [37], while higher debt-equity ratios and reliance on relatively short-term loans lead to increased debt, which deters investments in regulatory compliance [32]. Blackman and Bannister illustrated the importance of financial assistance for environmental compliance in Mexican brick-makers reverting to burning refuse [38]. However, Vernon et al. indicated that the belief that small businesses have a minimal impact on the environment is an important perceptual barrier [26]. Although some SMEs accept that better environmental practice could save costs and improve relationships with customers, they regard the environment to be peripheral to their business practices [39] and environmental protection to be an unnecessary cost burden [17].

On the other hand, the small size of SMEs limits their probability to adopt environmental management initiatives. First, the size and informal organization of SMEs make SMEs contact few information sources and fail to recognize business benefits of good environmental practices [40]. Second, most of the tools and techniques for improving environmental performance have been developed by and for larger firms and fail to take the unique characteristics of SMEs into account [24,35]. This may help to explain the low uptake of environmental

management systems (EMSs) in small companies. Most SMEs do not see any relevance for such systems in their business [24].

Since 1990, China has incessantly enhanced the industrial pollution treatment. Regulation such as Total Pollution Load Management Systems (TPLMS) was the main instrument to deal with industrial pollution. In 1996, the decision of the "State Department about Some Questions in Environmental Protection" propounded the task which required all industrial enterprises discharging pollutants to meet the discharging standard before 2000 [2]. In addition, small firms with low energy and resource efficiency and serious pollution were shut down by the government. Economic incentive systems such as pollution levy based on emission permits are designed to induce voluntary environmental management activities or emission reduction by internalizing the cost of environmental management. To date, the pollution levy system is the main instrument of China's environmental policy [41]. In addition, voluntary programs such as EMSs, eco-design, life-cycle analysis, environmental auditing, and cleaner production also have been introduced and in practice [42].

However, corporate environmental management in China is still in its early stages, especially for SMEs. Human, financial, and technological resources, as well as incentives to adopt a comprehensive environmental management system, have to be developed and strengthened [42]. Peng et al. [43] and Shi et al. [44] investigated barriers for promoting cleaner production in SMEs of China, and found that the exterior barriers of policy and financial barriers should be stressed rather than the internal technical and managerial barriers. Absence of incentives on economic policies, lax enforcement of environmental regulations, and high initial capital cost were the most important barriers to adoption of clean technologies in China. Peng and Ren examined the drivers and barriers for SMEs to implement EMSs in China, and pointed out that the requirement from customers, government regulation, and corporate environmental awareness were the most important factors [45].

As can be seen from the review of relative literatures, there are various barriers and incentives to engaging SMEs in environmental change. Finding out the key factors of engaging companies in environmental management initiatives is helpful for policy-makers to improve local corporate environmental performance.

3 Research methodology

3.1 Background of research site

The Suzhou Industrial Park (SIP) in Jiangsu Province, China, was chosen as the research site in this study. SIP is an important collaboration project between China and Singapore. The establishment of the park was approved by the State Council in February 1994, and the construction was started in May of the same year. Located by the Jinji Lake, the park covers 288 km^2 and has a population of 2.6×10^5. At the end of 2005, the Gross Domestic Product (GDP) reached 5.087×10^{10} RMB yuan.

Enterprises in SIP face requirements of various environmental standards and policies. Enterprises should discharge pollutants under the concentration standards set by local governments, which is higher than state level. Firms are also charged for their emissions according to the total amount and contents of the pollutants. Cleaner production and ISO14000 certification are encouraged by the government but not imperative. When enterprises are caught on non-compliance status, fine is the most usual punishment in SIP. The fine value is applied by the local environmental protection bureau (EPB) according to the degree of non-compliance. Apart from the fine, they are forced to return to the compliance. However, agreements are usually set between violators and local EPB, which allows firms a grace period to achieve compliance. The contents of agreements often account for economic constraints faced by firms and the need to compromise with the regional development. Local EPB, however, in extreme cases, can demand plants to stop emission discharge.

Since 2001, the corporate environmental information disclosure program has been conducted in SIP. The color-coded ratings are generated by a detailed accounting of environmental performance, whose major elements are summarized. The system divides industrial firms' environmental performance into five symmetric rating categories: two (black and red) denoting inferior performance; one (yellow) denoting compliance with minimum emission regulations but failure to comply with stricter requirements; and the other two ratings (blue and green) denoting superior performance. The color-coded ratings results are disclosed to public, firms, and banks via media and the Internet. Although the information is limited, it can attract public attention and promote firms to improve environmental performance.

3.2 Data collection

There is no universally accepted definition of SMEs, the way of which varies across national statistical systems. According to the new Tentative Classification Standards on the SMEs, Chinese industrial SMEs are defined as having less than 2000 employees, presenting sales lower than 3×10^8 RMB yuan or total assets lower than 4×10^8 RMB yuan. Compared with the definition of SMEs in other countries, the Chinese classification is more complicated and varies across industrial sectors. Because of the large population and the labor-intensive characteristics of the SME sector, China's SMEs tend to be much larger in employee numbers than those elsewhere (Table 1). In consideration that enterprises in SIP are compound of local

Table 1 Classification of SMEs [46]

	employee number		annual sales /10^6 RMB yuan		total assets /10^6 RMB yuan	
	SMEs	MEs	SMEs	MEs	SMEs	MEs
industry	<2000	$\geqslant 300$	<300	$\geqslant 30$	<400	$\geqslant 40$
construction	<3000	$\geqslant 500$	<300	$\geqslant 30$	<400	$\geqslant 40$
wholesale	<200	$\geqslant 100$	<300	$\geqslant 30$	–	–
retail	<500	$\geqslant 100$	<150	$\geqslant 10$	–	–
transportation	<3000	$\geqslant 500$	<300	$\geqslant 30$	–	–
posts	<1000	$\geqslant 400$	<300	$\geqslant 30$	–	–
hotel/restaurant	<800	$\geqslant 400$	<150	$\geqslant 30$	–	–

enterprises and foreign enterprises, sales was chosen as the primary classification standard in this study.

As mentioned above, this study aims to identify the environmental initiatives in SMEs and the key incentives and barriers for their engaging in environmental change in Suzhou Industrial Park. Therefore, the following research questions are addressed:

- Which types of environmental initiatives do firms engage in?
- Which drivers have led them to adopt these initiatives?
- Which barriers prevent them from engaging in these initiatives?
- Which incentives are likely to persuade them to engage in these initiatives in the future, if they do not do so at present?

A questionnaire survey among companies from a variety of industries in SIP was conducted in 2007 (see Appendix). Companies were selected with the help of local EPB. In the China-Singapore core cooperation zone, there are 947 enterprises on record. Stratified sampling method was used in this study to choose the samples. The enterprises were sorted by value of 2006, and one sample was chosen from every three enterprises. Finally, 293 samples were selected, excluding the invalid samples. In the 3 townships, random sampling was used to choose samples. 50 samples were chosen from every township. Thus 443 samples in total were selected for this research[1)].

A questionnaire was devised to assess the implementation of various environmental initiatives in the surveyed firms, such as environmental management systems, environmental, social or sustainability reporting, etc. Respondents were also required to choose the three most important drivers/barriers that had led or limited them to adopt those initiatives from a given list. Furthermore, they were asked to identify possible incentives that might lead them to consider implementing these initiatives in the future. Finally, participants had to provide general information regarding industry sector and the number of employees in SIP.

In addition, face-to-face interviews and mail survey were applied to gain the highest possible number of participants. The face-to-face interviews lasted two weeks and more than 60 company managers/operators were interviewed. The mail survey required the managers/operators of companies to complete questionnaires and send them back in two weeks.

4 Results and discussion

In this study, 60 respondents from China-Singapore core cooperation zone and 78 from 3 sub-townships were collected. The total response rate from the companies was 31.1% (138 responses in total were collected). Except for the unqualified available questionnaires[2)], 104 responses were employed for further data analysis. Finally, the survey collected 49 SEs and 32 MEs, and totally 81 SMEs, as well as 23 large companies.

4.1 Environmental practice of enterprises in SIP

In this research, selected enterprises were asked to indicate whether they engaged in 10 different volunteer environmental activities, including reducing toxic material, environmental requirement for suppliers, implementing environmental design, adopting green supply chain management, establishing environmental management system, recycling waste material, carrying out ISO14000 certification, environmental training, environmental information disclosure to local communities, supporting local environmental initiatives, and environmental planning.

Figure 1 presents an overview of environmental initiatives implemented by enterprises in SIP. As expected, large companies were more likely to engage in such initiatives than SMEs with their typically limited resources. However, the distinction of 2 groups was not significant. Both large companies and SMEs had considered the environmental impacts of their products at the

1) The sample size was decided by the population proportion of Simple Random Sampling and should be more than 435.
2) The questionnaires were not finished and cannot be used for further analysis.

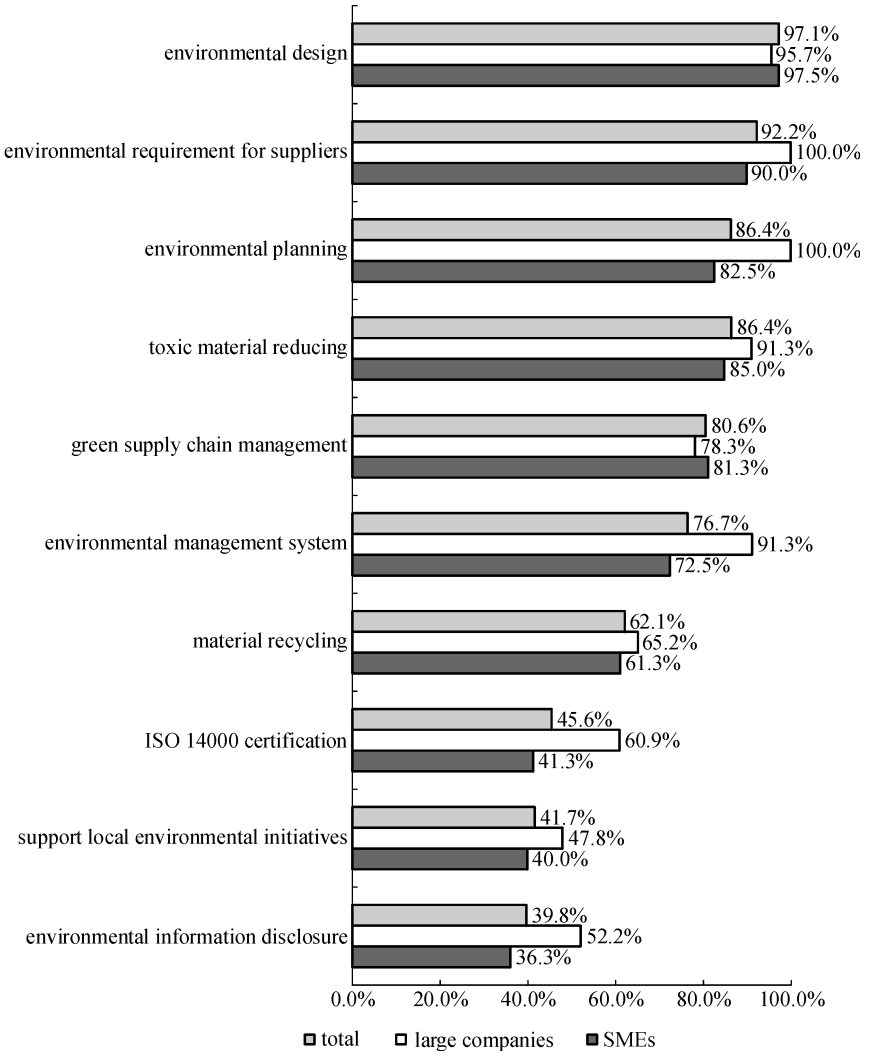

Fig. 1 SMEs engagement in 10 selected environmental management initiatives in SIP

beginning of product design, and had environmental requirement to their suppliers in order to improve their own environmental performance. In addition, 91.3% of large companies and 85.0% of SMEs had used nontoxic material to replace toxic material to reduce environmental risk. It is obvious that both large companies and SMEs had considered environmental issues to the development strategies of enterprises.

On the other hand, 78.3% of large companies and 81.6% of the SMEs had engaged in green supply chain management practice (GCSM). Referring to EMS and IS014000, 91.3% of large companies and 72.5% of SMEs had applied EMS, and 65.2% of large companies and 41.3% of SMEs had ISO14000 certification. Large companies were more likely to apply EMS and achieve ISO14000 certification. In addition, 65.2% of large companies and 61.3% of SMEs had recycled their waste material, indicating the same degree of waste reuse.

However, with regard to stakeholders' engagement, 47.8% of large companies and 40.0% of the SMEs participated in voluntary environmental initiatives of local communities. Even if internal policies were in place and environmental audits were conducted, many enterprises in SIP did not disclose environmental information to the public. Only 39.8% of all respondents and 36.3% of SMEs had disclosed environmental information to communities and the media.

4.2 Major drivers for adopting environmental initiatives

For environmental initiatives covered in the survey, respondents were asked to choose, from a given list, the most relevant drivers for engaging in this activity. Figure 2 provides an overview of the relative importance of various drivers for environmental change in large companies and SMEs.

According to Fig. 2, the key drivers were increasing legislation/regulation, competitive advantage, and social and environmental responsibility. The other two named demand from customers (30.8%) and cost reduction (24%).

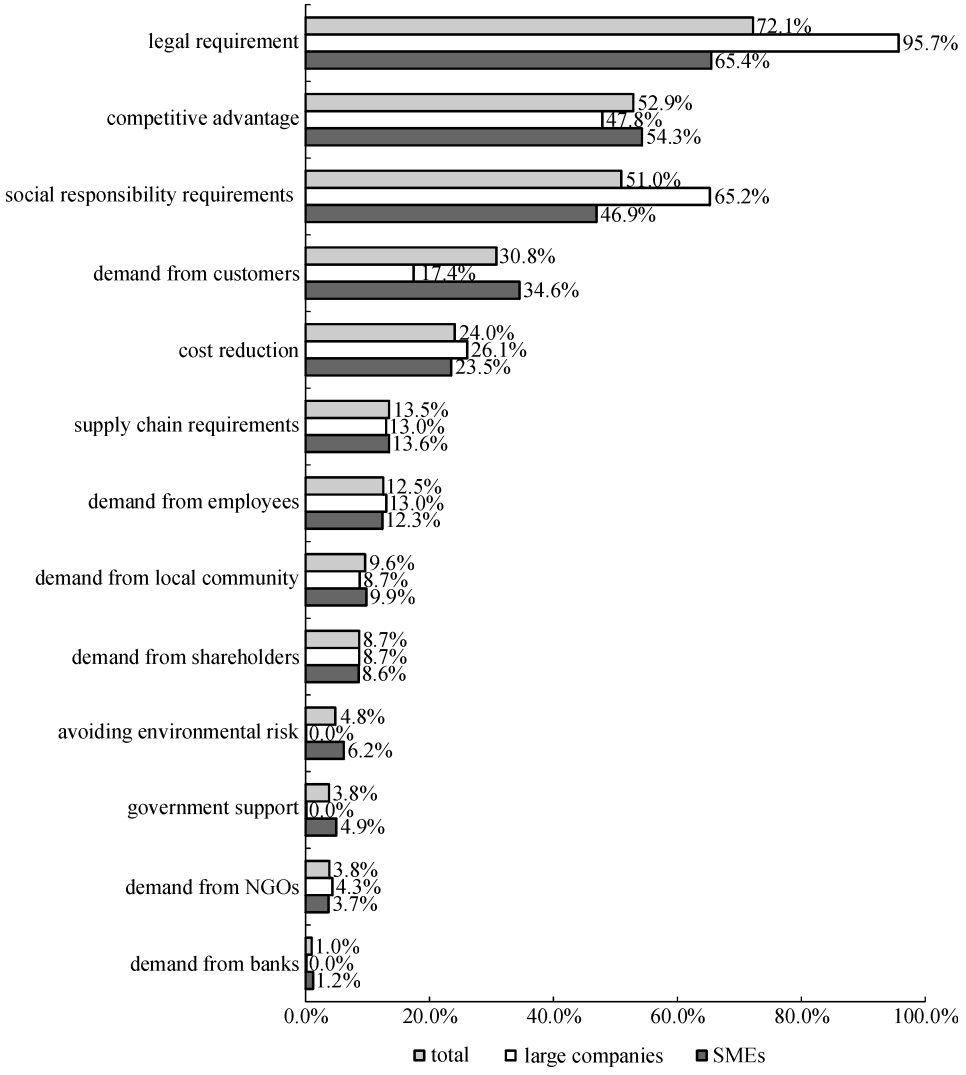

Fig. 2 Importance of various drivers for engaging SMEs in environmental management initiatives

Supply chain requirements, demand from employees, demand from stakeholders, avoiding environmental risk, government support, demand from NGOs, and demand from banks appeared to be minor drivers for environmental change in SIP.

Though most drivers were rated rather similarly by both small and large companies, significant differences occurred in some cases. Large companies responded more strongly to legal requirement and social responsibility requirements than SMEs. However, SMEs put more emphasis on competitive advantage and customers' demand than large companies.

4.3 Barriers to engaging in environmental change

Respondents who did not engage in some environmental initiatives covered by the survey were asked to choose the main barriers from a given list. Results are given in Fig. 3.

An overwhelming 42.0% of the SMEs stated that they did not engage in environmental activities because there were no demand from employees and local communities. Although large companies also considered no demand from employees and local communities as important factors, the major barrier for large companies was a lack of legal demand (47.8%), more than SMEs (40.7%). Large companies (39.1%) also mentioned the high cost of environmental initiatives as another major barrier, while SMEs considered it was less important (22.2%). Other less important barriers were lack of technology, creating competitive disadvantage, no demand from stakeholders, and lack of government support. The least frequently cited barriers were no benefits to improve reputation (4.8%) and no demand from banks (2.9%).

4.4 Incentives for adopting new environmental initiatives

A similar pattern emerged when respondents were asked to rate the relevance of incentives from a given list (see Fig. 4

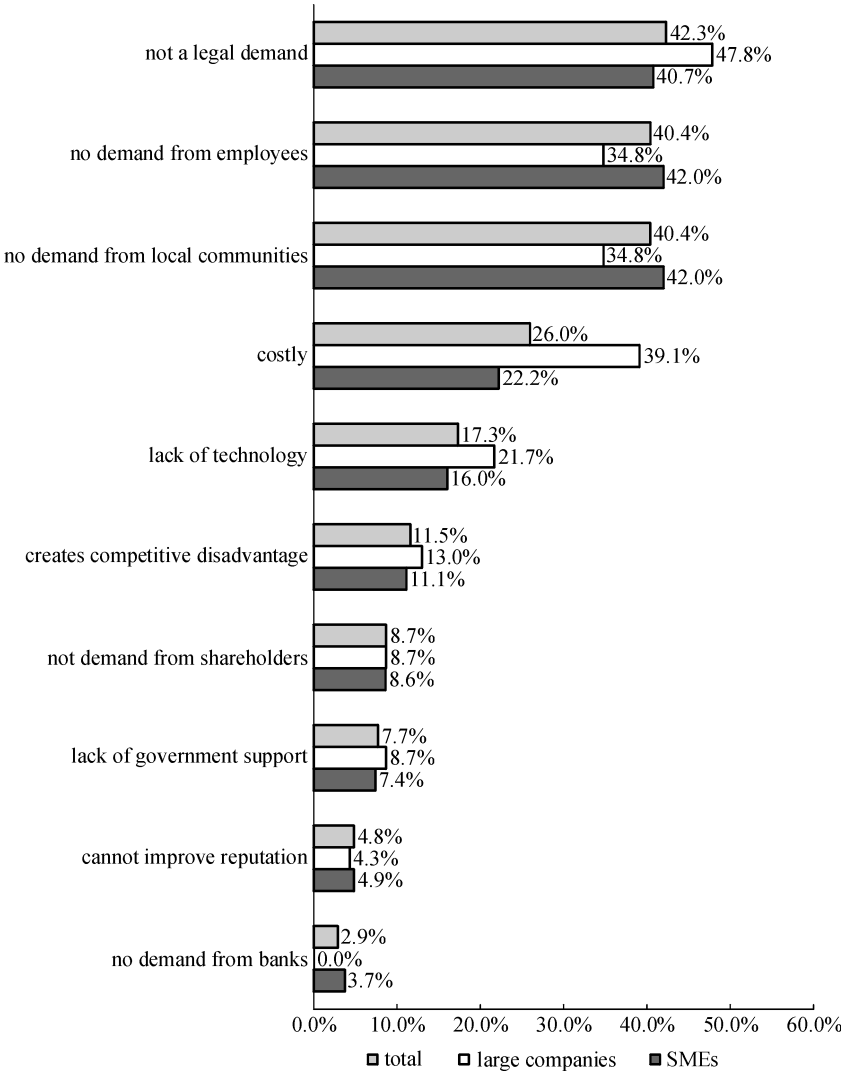

Fig. 3 Importance of various barriers against engaging SMEs in environmental management initiatives

for an overview of results). Just as for barriers, a significant difference between the answers of SMEs and large companies was observed. Both SMEs and large companies cited legislative requirements as a major incentive (44.4% of SMEs and 52.2% of larger companies). However, large companies considered cost reduction (43.5%) as the secondary important incentive, while SMEs selected demand from employees (42.0%) and competitive advantage (42.0%). Demand from local communities (16.0%), obtaining the key technology (14.8%) and government support (13.6%) played a minor role in encouraging SMEs to adopt new environmental initiatives, and none of the large companies selected it as an important incentive. As before, demands from stakeholders and banks still had little impact on enterprises' environmental initiatives, both for large companies and SMEs. The results of key incentives were revealed to be consistent with the result of key barriers as a whole.

5 Conclusions and policy implication

The environmental management practice of SMEs in Suzhou Industrial Park, China was investigated in this research, in order to identify drivers and barriers to engaging businesses in environmental management initiatives and how these factors differ between large companies and SMEs. Although SIP is not a typical industrial park in China in terms of composition of enterprises and the results may not reflect the environmental performance of SMEs in China, the analysis may make sense at least to environmental management in SIP.

In general, SMEs engaged significantly less in environmental management activities than larger companies as shown in other researchers' results [15,24,44]. On the other hand, those who adopt a more proactive approach do so for similar reasons. Regardless of company size, legal requirements, competitive advantage, and social

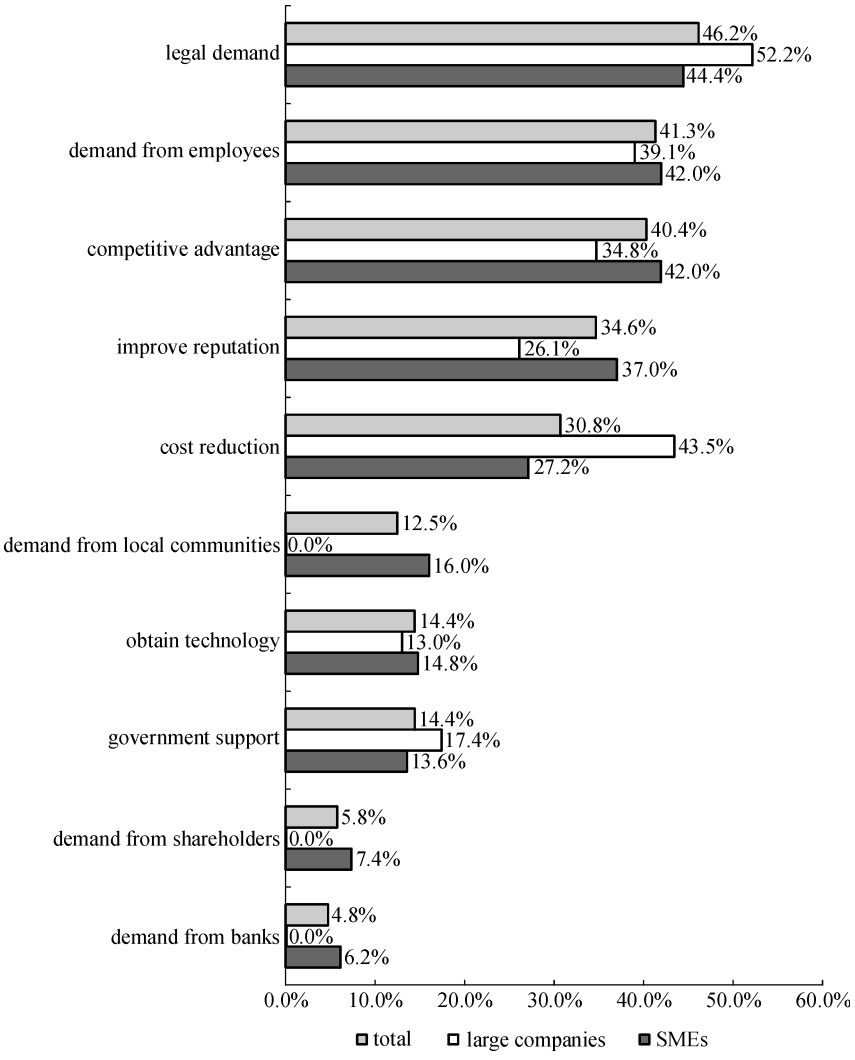

Fig. 4 Importance of various incentives for engaging SMEs in new environmental management initiatives

responsibility appeared to be the most important drivers. Just as mentioned above, legislation/regulation was the most important factor to engage enterprises in environmental management initiatives. Rather than engaging proactively in environmental initiatives, companies preferred to wait for the certainty of impending legislation. This attitude was particularly prominent among large companies, which is different from other researches' result showing that SMEs were more likely to be legislation/regulation driven [24]. However, regulators and legislators also play a key role in initiating environmental change in SMEs. Various authors have therefore suggested that regulation may be the most appropriate mechanism to improve the environmental performance of small firms [24,39,47].

The importance of legislation/regulation in engaging SMEs in environmental change could also be found in the barriers and incentives questions. Thus, at least for the time being, command-and-control mechanisms appeared to be the most effective policy option for minimizing the environmental impacts of SMEs in SIP. However, since more stringent regulation and enforcement can certainly help to achieve a higher degree of environmental performance, it is unlikely to elicit more pro-active business practices. Regulatory compliance can become an end in itself rather than lead to fundamental changes in environmental attitudes [24,48], though economic incentive policies were suggested to encourage SMEs to improve environmental performance by other researchers in China [44].

Because most of the firms in SIP are foreign enterprises and export-oriented enterprises, it could be expected that they want to improve environmental performance to achieve competitive advantage. The results also confirm that many companies, including SMEs, are willing to engage in environmental projects if they perceive them as adding business value and help them to perform better in their core business. However, SMEs are more realistic and think more about their short-term interest. On the contrary, large companies are more likely to have strategic vision,

considering their social responsibility and improving environmental performance as a result. Corporate Social Responsibility (CSR) asks companies to consider the interests of society by taking responsibility for the impact of the organization's activities on customers, employees, shareholders, communities, and the environment in all aspects of its operations. While CSR is becoming a mainstream issue for many organizations, most of the research has addressed the relationship of CSR and environmental performance [23]. Recent analysis revealed that large companies are more likely to form CSR strategies than SMEs [49]. This research also provided such evidence.

Since the growing trend of public participation and information disclosure in recent years, the results also showed that the demand from stakeholders (such as employees, local communities, etc.) was another major driver, although it is not currently obvious. Demand from employees was a crucial factor both in blocking and promoting SMEs to engage in environmental management initiatives in this study. The increasing environmental attitudes and demands of the local community has become a new pressure for SMEs to promote their environmental performance, as was found in other researches [19,28]. SIP also has established a mechanism to disclose corporate environmental information to the public. However, in the survey, only 39.8% of all respondents have disclosed their environmental information to the public. Embodying stakeholders in corporate environmental management and environmental regulation could promote SMEs to improve their environmental performance.

In addition, lack of skills and knowledge were commonly identified as constraints to environmental action [19,36,50]. However, the results did not illustrate the hypothesis. The demand of banks was also revealed to be less important. Chinese banks, especially among the commercial institutions, currently view environmental issues as a matter of charity rather than a core business issue [51]. Fortunately, SEPA, the People's Bank of China (PBC), and the China Banking Regulatory Commission (CBRC) jointly launched the Green Credit Policy which will stop loans from any bank or financial institution to heavy polluters [52].

In summary, government regulation, competitive advantage, and demand from stakeholders are major factors influencing environmental management initiatives among companies in SIP. With the current focus on end-of-pipe solutions in the environmental policies and the low level of environmental awareness in local society, truly sustainable improvements are difficult to be achieved. Based on the analysis of drivers and barriers to engage SMEs in environmental management initiatives, this study identified various factors that prevent these companies from adopting environmental initiatives. This leads to the following three policy recommendations:

First, since regulatory requirement reveals the most important incentives at present, environmental regulation still plays an important role in environmental management in SIP. However, policy makers should better consider the situation of SMEs to avoid slipping SMEs through the regulatory framework. In addition, flexible types of regulation, such as marketable instrument, are suggested to substitute for simple regulation and compliance in order to make it possible for firms to internalize compliance costs to their business strategies.

Second, financial support is not always the main issue in adopting environmental management initiatives, thus such environmental policy is not suggested in SIP, although for some other areas in China it is still an important issue [44].

Finally, since demand from employees and local communities are significant for firms to adopt environmental initiatives, policy makers should pay more attention to public participation to engage firms in environmental management. The government should establish mechanisms to facilitate local communities and employees to access more information about the firms' environmental performance. It can be done with low-cost initiatives, such as inventory of pollution release and list of best or worst firms according to specific parameters on compliance status.

Acknowledgements This research was supported by the National Key Social Science Foundation of China (Grant No. 06&ZD026), the Scientific Research Foundation of Graduate School of Nanjing University (No. 2006CW04), and the National Environmental R&D Project on Public Interest (200809074).

References

1. China Council for International Cooperation on Environment and Sustainable Development (CCICED), Recommendations of the CCICED to the government of China. In: CCICED Phase 3 Second Meeting. Beijing: 2003, http://www.harbour.sfu.ca/dlam/recommendations/2003%20recommen.html
2. Su Y. Policy recommendations on financial mechanisms for pollution control of SMEs in China. Consultation and Decision, 2004, 2: 8–11 (in Chinese)
3. Geiser K, Crul M. Greening of small and medium-sized firms: Government, industry and NGO initiatives. In: Groenwegan P, Kischer K, Jenkins E, Schot J, eds. The Greening of Industry Resource Guide and Bibliography. Washington DC: Island Press, 1996
4. Bansal P, Roth K. Why companies go green: A model of ecological responsiveness. Academy of Management Journal, 2000, 43(4): 717–736
5. Sharmaand S, Starik M. Research in Corporate Sustainability: The Evolving Theory and Practice of Organizations in the Natural Environment. Northampton MA: Edward Elgar, 2002
6. Clark M. Corporate environmental behavior research: Informing environmental policy. Structural Change and Economic Dynamics, 2005, 16: 422–431
7. Henriques I, Sadorsky P. The determinants of an environmentally

responsive firm: An empirical approach. Journal of Environmental Economics and Management, 1996, 30(3): 381–395
8. Chen W, Soyez D. The greening of industry: A research approach of industrial environmental geography. Geographical Research, 2003, 22(5): 601–608
9. Meegeren P. Blue bags or refuse tourism: Social acceptance of closed policymaking. Society and Natural Resources, 2001, 14: 77–86
10. Delmas M. The diffusion of environmental management standards in Europe and in the United States: An institutional perspective. Policy Sciences, 2002, 35: 91–119
11. Patton D, Worthington I. SMEs and environmental regulations: A study of the UK screen-printing sector. Environment & Planning C: Government & Policy, 2003, 21(4): 549–566
12. O'Laoire D, Welford R. The EMS in the SME. In: Welford R ed. Corporate Environmental Management, System and Strategies. London: Earthscan, 1998
13. Mir D F. Environmental behavior in Chicago automotive repair micro-enterprises (MEPs). Business Strategy and the Environment, 2006, 17(3): 194–207
14. Rigby M, Lawlor T. Health and safety in small firms with particular reference to Spain. International Small Business Journal, 2001, 19 (2): 31–48
15. Revell A, Rutherfoord R. UK environmental policy and the small firm: Broadening the focus. Business Strategy and the Environment, 2003, 12(1): 26–35
16. Dean T, Brown R, Stango V. Environmental regulation as a barrier to the formation of small manufacturing establishments: A longitudinal examination. Journal of Environmental Economics and Management, 2000, 40(1): 56–75
17. Simpson M, Taylor N, Barker K. Environmental responsibility in SMEs: Does it deliver competitive advantage? Business Strategy and the Environment, 2004, 13(3): 156–171
18. Hillary R. Environmental management systems and the smaller enterprise. Journal of Cleaner Production, 2004, 12: 561–569
19. Pimenova P, van der Vorst R. The role of support programmes and policies in improving SMEs environmental performance in developed and transition economies. Journal of Cleaner Production, 2004, 12(6): 549–559
20. Fryxell G E, Szeto A. The influence of motivations for seeking ISO 14001 certification: An empirical study of ISO 14001 certified facilities in Hong Kong. Journal of Environmental Management, 2002, 65: 223–238
21. Petts J, Herd A, O'hEocha M. Environmental responsiveness, individuals and organizational learning: SME experience. Journal of Environmental Planning and Management, 1998, 41(6): 711–730
22. Yu J Q. Building a sustainable business in China's small and medium-sized enterprises (SMEs). In: 12th Sustainable Development Conference. Hong Kong: Hong Kong University, 2006
23. Williamson D, Lynch-Wood G, Ramsay J. Drivers of environmental behaviour in manufacturing SMEs and the implications for CSR. Journal of Business Ethics, 2006, 67: 317–330
24. Studer S, Welford R, Hills P. Engaging Hong Kong businesses in environmental change: Drivers and barriers. Business Strategy and the Environment, 2006, 15: 416–431
25. Arora S, Cason T N. Why do firms volunteer to exceed environmental regulations? Understanding Participation in EPA's 33/50 Program Land Economics. 1996, 73(4): 413–432
26. Vachon S, Klassen D R. Green project partnership in the supply chain: The case of the package printing industry. Journal of Cleaner Production, 2006, 14: 66–71
27. Zhu Q H, Sarkis J, Lai K H. Green supply chain management: Pressures, practices and performance within the Chinese automobile industry. Journal of Cleaner Production, 2007, 15: 1041–1052
28. Hillary R. Evaluation of Study Reports on the Barriers, Opportunities and Drivers for Small and Medium Sized Enterprises in the Adoption of Environmental Management Systems. UK: DTI, 1999
29. van Hemel C, Cramer J. Barriers and stimuli for ecodesign in SMEs. Journal of Cleaner Production, 2002, 10(5): 439–453
30. Verheul H. How social networks influence the dissemination of cleaner technologies to SMEs. Journal of Cleaner Production, 1999, 7(3): 213–219
31. Gombault M, Versteege S. Cleaner production in SMEs through a partnership with (local) authorities: successes from the Netherlands. Journal of Cleaner Production, 1999, 7(4): 249–261
32. Mir D F, Feitelson E. Factors affecting environmental behavior in micro-enterprises: Laundry and motor vehicle repair firms in Jerusalem. International Small Business Journal, 2007, 25(4): 383–415
33. Hadjimanolis A, Dickson K. Innovation strategies of SMEs in Cyprus, a small developing country. International Small Business Journal, 2000, 18(4): 62–79
34. Rowe J. Hollingsworth D. Improving the environmental performance of small and medium-sized enterprises: A study in Avon. Eco-Management and Auditing, 1996, 3: 97–107
35. Gerstenfeld A, Roberts H. Size matters: Barriers and prospects for environmental management in small and medium-sized enterprises. In: Hillary R ed. Small and Medium-Sized Enterprises and the Environment. Sheffield: Greenleaf, 2000. 106–118
36. Willard B. The Next Sustainability Wave: Building Boardroom Buy-In. Gabriola Island: New Society, 2005
37. Hopkins T D. Regulatory costs in profile. Policy Sciences, 1998, 31: 301–320
38. Blackman A, Bannister G. Community pressure and clean technology in the informal sector: An econometric analysis of the adoption of propane by traditional Mexican brickmakers. Journal of Environmental Economics and Management, 1998, 35(1): 1–21
39. Rutherfoord R, Blackburn R A, Spence L J. Environmental management and the small firm: An international comparison. International Journal of Entrepreneurial Behaviour and Research, 2000, 6(6): 310–325
40. NetRegs. SME-environment 2003: A survey to assess environmental behaviors among smaller UK businesses. 2003, http://www.bitc.org.uk/docs/SMEnvironment_UK_2003_1.pdf
41. Wu D, Wu C Y. Analysis of the evalution of Chinese environmental policies since the founding of new China. Journal of Dalian University of Technology (Social Sciences), 2006, 27(4): 48–52 (in Chinese)
42. Ministry of Environment of Korea, Korea Environment Institute, and the World Bank. Environmental Management of SMEs and Industrial Zones for China. Environmental Briefing Note. 2004
43. Peng S Z, Liu Y, Shi H, Zhong P. Studies on barriers for promotion

of clean technology in SMEs of China. Chinese Journal of Population, Resources and Environment, 2005, 3(1): 9–17
44. Shi H, Peng S Z, Liu Y, Zhong P. Barriers to the implementation of cleaner production in Chinese SMEs: Government, industry and expert stakeholders' perspectives. Journal of Cleaner Production, 2008, 16(7): 842–852
45. Peng H Z, Ren R M. The stimuli and barriers for EMS in the SMEs. Shanghai Management Science, 2003, 1: 27–28 (in Chinese)
46. State Economic and Trade Commission, State Development Planning Commission, Ministry of Finance and National Statistics Bureau. Tentative Classification Standards on the Small and Medium-sized Enterprises (SMEs). 2003, http://www.setc.gov.cn/qyggyfz/200303070004.html
47. Tilley F. The gap between the environmental attitudes and the environmental behaviour of small firms. Business Strategy and the Environment, 1999, 8: 238–248
48. Drake F, Purvis M, Hunt J. Meeting the environmental challenge: A case of win-win or lose-win? A study of the UK baking and refrigeration industries. Business Strategy and the Environment, 2004, 13: 172–186
49. Perrini F, Russo A, Tencati A. CSR strategies of SMEs and large firms. Evidence from Italy. Journal of Business Ethics, 2007, 74(3): 285–300
50. Hitchens D, Clausen J, Trainor M, Keil M, Thankappan S. Competitiveness, environmental performance and management of SMEs. Greener Management International, 2003, 44: 45–57
51. Chan-Fishel M. Time to Go Green: Environmental Responsibility in the Chinese Banking Sector. Washington DC: Bank Track and Friends of the Earth, 2007
52. Xia C. New policies to reinforce environmental protection. 2007, http://www.china.org.cn/english/environment/224226.htm

Appendix: Questionnaire

PART I GENERAL COMPANY INFORMATION

Company name:
Sector:
Number of employees:
Annual sales in 2006:
Interviewee name:
Organizational role of interviewee:
Contact information (phone, fax, e-mail):

PART II MULTIPLE CHOICE QUESTIONS

1. Does your company have a published policy statement on environmental matters or information?
□ yes
□ no
2. Does your company have supported the local environmental initiatives?
□ yes
□ no
3. Does your company have ISO 14000 certification?
□ yes
□ no
4. Does your company recycle the waste material?
□ yes
□ no
5. Does your company have established an environmental management system?
□ yes
□ no
6. Does your company engage in supply chain management (e.g. providing code of conduct to or imposing environmental requirements on suppliers and contractors)?
□ yes
□ no
7. Does your company have reduced toxic material in recent years?
□ yes
□ no
8. Does your company have environmental planning for company's future development?
□ yes
□ no
9. Does your company have environmental requirement for suppliers?
□ yes
□ no
10. Does your company have taken environmental issues into consideration at beginning of products design?
□ yes
□ no
11. Which are the three most relevant reasons for your company to engage in above environmental management initiatives?
□ Demand from banks
□ Demand from NGOs
□ Governmental support
□ Avoid environmental risk
□ Demand from shareholders
□ Demand from local community
□ Demand from employees
□ Supply chain requirements
□ Cost reduction
□ Demand from customers
□ Social responsibility requirements
□ Competitive advantage
□ Legal requirement
12. Choose the three most relevant reasons for your company not to engage in above environmental management initiatives from the list below
□ No demand from banks
□ Cannot improve reputation
□ Lack of government support
□ Not demand from shareholders
□ Creates competitive disadvantage
□ Lack of technology
□ Costly
□ No demand from local communities
□ No demand from employees
□ Not a legal demand
13. Which are the three most relevant drivers would encourage your company to adopt the above practice in future?
□ Demand from banks
□ Demand from shareholders
□ Government support
□ Obtain technology
□ Demand from local communities
□ Cost reduction
□ Improve reputation
□ Competitive advantage
□ Demand from employees
□ Legal demand