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A review of interventions to encourage SMEs to make environmental improvements

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Abstract

Small and medium sized enterprises (SMEs) are an important part of the world economy but they are thought to be responsible for around 60% of all carbon dioxide emissions and 70% of all pollution. SMEs often have major problems with limited resources, limited knowledge and limited technical capabilities to deal with their own negative environmental impact. SMEs exhibit widely differing characteristics and commitment where environmental issues are concerned. Yet under these conditions they are all expected to engage in environmental improvement. Interventions that encourage environmental improvement are often polarised between regulation and legislation at one extreme and voluntary environmental agreement at the other. It is clear that a holistic mixture of interventions is necessary to achieve maximum engagement and environmental improvement by all SMEs. This paper categorises the different levels of environmental commitment observed in SMEs and develops a selection or 'tool kit' of intervention strategies that might be deployed within each category of SME.

Keywords: Interventions, SMEs, Environmental improvement, Regulation, Legislation, Voluntary Environmental Agreements.

Word Count: 8,060 (excluding tables).
Word Count (including references): 9, 943 (excluding tables).

Introduction

It is generally acknowledged that small and medium sized enterprises (SMEs) are an important part of all economies, accounting for 99 percent of businesses in the UK (Revell and Blackburn, 2007) and 99.7 percent of businesses in Australia (ABS, 2007). The typical SME has limited resources, limited cash flows, few customers, is often engaged in management 'fire-fighting', concentrates on current performance rather than taking a strategic focus, often has a flat organizational structure and possibly high staff turnover (Hudson et al., 2001). SMEs are a source of job creation and contribute both innovation and competition to the market but it is estimated that SMEs account for around 60 percent of carbon dioxide emissions (Marshall Report, 1998; Revell and Blackburn, 2007) and 70 percent of all pollution globally (Stokes et al., 2007). It is therefore important to examine how to encourage SMEs to make environmental improvements, which we define as *changes in technology and practices which reduce the current level of negative impact on the environment* (adapted from Simpson et al., 2004, page 157).

Most research has concentrated on the barriers and drivers that SMEs face when considering environmental improvements and many empirical studies have found that there is a lack of commitment by many SMEs owner-managers to reduce their negative environmental impact (Revell and Rutherfoord, 2003). This is because many SME owner-managers feel that their impact on the environment is minimal and often see no reason to engage in environmental improvement (Bradford and Fraser, 2008; Drake et al., 2004; Hillary, 2000; Pimenova and van der Vorst, 2004; Revell and Blackburn, 2007; Tilley, 1999). Often SME owner-managers believe that national and local government should take a lead on environmental issues (Revell and Rutherfoord, 2003) and that these issues are more important for larger firms (Drake et al., 2004) – indeed, environmental research and policy initially concentrated on larger firms. Many SMEs are unaware of the environmental legislation that affects their business (Hillary, 2000) or feel that it does not apply to them (Mir and Feitelson, 2007; Revell and Blackburn, 2007). SMEs are also dubious about the

business benefits of environmental improvement and therefore only make these improvements if there is a reduction in their business costs (Hillary, 2000; Revell and Blackburn, 2007).

Various government-level interventions to address these barriers and drivers have been introduced, but there appears to be no research which systematically compares their effectiveness. For example, some authors have only looked at the impact of regulations on SME environmental improvement either directly or indirectly (Hillary, 2004; Masurel, 2007; Williamson et al., 2006), while others have only looked at education (Cloquell-Ballester et al., 2008) or financial incentives (Clement and Hansen, 2003). There is also growing debate about whether specific interventions are effective. For example, some authors argue for increased education (Tilley, 1999) and others point out that SME owner-managers are generally unenthusiastic about educational interventions (Taylor et al., 2003), with similar debates occurring concerning the role of voluntary or compulsory regulation.

We believe that a key reason why research into environmental interventions has tended to produce conflicting results concerning effectiveness is that it has failed to distinguish between the different types of SMEs who have diverse business and environmental improvement aspirations. For this reason, no single intervention on its own is likely to be effective for all SMEs given their very diverse nature. This problem has been further exacerbated because environmental researchers have tended not to conduct research which examines a range of interventions on SME environmental improvement, and the different types of SMEs for which each intervention is most effective.

This paper addresses this issue by presenting an extensive literature review that identified four extreme types of SMEs which were categorised based on their business pursuits and their commitment to environmental improvement, and the current range of interventions. The primary objective of this conceptual paper is to show that there is evidence in the literature which suggests that each intervention is likely to be most effective for a subset of the SME categories, and that future research must therefore examine a broader mix of interventions in order to understand how the majority of SMEs collectively can be encouraged to engage in environmental improvement.

This paper also adds significantly to the practical ways in which policy and actions by interested parties could encourage SMEs to commit to environmental improvement.

Method

The method for this paper involved a systematic review of journal articles (Cooper, 1998) concerning SMEs and their environmental improvement following the approach of Parker and Castleman (2007). We used peer-reviewed journals because we believe their findings are of higher quality when compared to conference papers, reports and non-reviewed journals. We searched for articles in online databases (e.g. EBSCOHost) and Google Scholar using search terms relating to SMEs (e.g. SME, small business, small firm etc) and the environment (e.g. environment, sustainability). In our review we focused on articles reporting empirical results because this enabled us to explore how SMEs are reacting to interventions and to present findings which will be of practical (not just theoretical) significance. We ensured the currency of our review by using recent studies (2003-8). Finally, we only included articles which studied large firms and other stakeholders when we could distinguish the findings relating to SMEs. This method resulted in nearly 50 journal articles (see Table 1) which we used for this review.

The review was carried out using a deductive thematic approach (Parker and Castleman, 2007). We examined the empirical findings and summarised the types of SMEs and the interventions described by the authors. We then analysed the summaries and grouped the SME types and interventions based on the themes which emerged. Our categorisation resulted in a new typology (see Massey, 2006) of SMEs (see Figure 1) which has not been used by the reviewed articles. The typology comprises analytically unique and extreme categories of SMEs, and therefore offers researchers and policy makers a useful framework for analysing the effectiveness of interventions for each SME category. The results of our thematic analysis are presented later and are shown in Table 3.

There are a number of observations from the literature review which are important to highlight concerning the countries studied, definitions of SMEs and definitions of environmental terms:

- Most articles define SMEs only in terms of the number of employees, but the definitions vary widely between countries (see Table 1). European studies mainly use the European Union (EU) definition of SMEs “fewer than 250 staff”, while Australian studies use less than 200 staff, USA and South Korean studies use less than 500 staff, and New Zealand studies use less than 100 staff. We addressed these inconsistencies by defining SMEs within their national context because, as an example, Collins et al. (2007) point out that firms with 250 staff (using the EU definition) in New Zealand would be large firms.

- It was not possible to compare the article findings on the basis of SME size. Table 1 shows that some studies differentiated between small and medium firms (e.g. Bradford and Fraser, 2008), while others examined only micro (Mir and Feitelson, 2007) or small firms (e.g. Gunningham and Sinclair, 2002; Revell, 2003). However, many studies did not distinguish between SME sizes when presenting their findings, or did not provide totals of the SME sizes studied. We know from studies in other disciplines that SME size has an effect, such as on performance (e.g. Serrasqueiro and Nunes, 2008), which suggests that greater effort is required in future research to distinguish between SME sizes such as micro, small and medium. But it must be emphasised that firm size alone is an insufficient determinant of SME environmental improvement behaviour. While some surveys found an association between firm size and environmental improvement (e.g. Collins et al., 2007; Hitchens et al., 2005; Lee, 2008), another survey found that environmental improvement depends more on firms’ internal capabilities than their size (Aragon-Correa and Cordon-Pozo, 2005). These conflicting findings suggest that SMEs should be categorised on internal characteristics, not just size. Our SME typology in Figure 1, discussed later, therefore uses SME internal characteristics to differentiate between SMEs and their environmental improvement behaviour.

Table 1. Journal articles comprising the literature review

Empirical journal articles	Countries	SME size by employees	Method (Number participants)
Aragon-Correa et al. (2008)	Spain	SME < 250	survey (108 SMEs)
Bradford & Fraser (2008)	UK	small 0-49, medium 50-249	interview (112 SMEs) survey (15 small, 40 medium)
Cloquell-Ballester et al (2008)	Spain	SME 1-250	survey (1415 workers in SMEs)
Gadenne et al. (2008)	Australia	SME 1-200	survey (166 SMEs)
Knez-Riedl (2008)	Slovenia	micro 0-9, small 10-49, medium 50-249	survey (224 micro, 302 small, 146 medium)
Lee (2008)	South Korea	SME 21-499	survey (142 SMEs)
Mir (2008)	USA	SME 1-499	survey (54 SMEs)
Redmond et al (2008)	Australia	SME 1-200	survey (120 SMEs)
Roy & Therin (2008)	Canada	SME 20-249	interview (136 SMEs)
Collins et al (2007), Lawrence et al. (2006)	New Zealand	small 0-9, medium 10-99	survey (226 small, 324 medium, 193 large)
Halila (2007)	Sweden	Small 10-99	case study (9 small)
Masurel (2007)	Netherlands	SME <= 100	survey (56 SMEs, 1 > 100 staff)
Mir & Feitelson (2007)	Israel	Micro 0-15	survey (107 micro)
Revell & Blackburn (2007), Revell (2007)	UK	SME 1-249	interview (40 SMEs, 12 industry & government informants)
von Malmborg (2007)	Sweden	no SME definition	interview (22 SMEs)
Studer et al. (2006)	Hong Kong	SME 1-99	survey (32 SMEs, 23 large)
Williamson et al (2006)	UK	SME < 250	interview (31 SMEs)
Hitchens et al. (2005), Hitchens et al. (2003)	UK, Germany, Italy, Ireland	SME < 500	survey (844 SMEs) interview (294 SMEs, 320 advisers)
McKeiver & Gadenne (2005)	Australia	SME < 200	survey (166 SMEs)
Worthington & Patton (2005), Patton & Worthington (2003)	UK	small 25-99, medium 100-499	survey (33 small, 32 medium) interview (2 small, 3 medium)
Condon (2004)	Australia	SME 1-200	action research (18 SMEs)
Drake et al (2004)	UK	small 0-49, medium 50-249	interview (6 small, 4 medium, 10 large, 2 trade group)
Hillary (2004)	8 EU countries	SME 1-249	survey (unclear, approx. 120 SMEs)
Peters & Turner (2004)	UK	no clear SME definition	interview (62 SMEs)
Pimenova & van der Vorst (2004)	UK	micro 1-9, SME 10-249	survey (13 micro, 9 SMEs)
Rothenberg & Becker (2004)	USA	small <= 20, medium > 20	survey (54 small, 74 medium) interview (7 SMEs, 9 advisers)
Simpson et al (2004), Taylor et al (2003)	UK	SME < 250	survey (63 SMEs) interview, site visit (15 SMEs)
Ammenberg & Hjelm (2003)	Sweden	SME 0-249	interviews (25 SMEs)
Kannan & Boie (2003)	Germany	SME < 500	case study (1 SME)
Lefebvre et al. (2003)	Canada	SME < 500	survey (368 SMEs)
Naffziger et al. (2003)	USA	SME <= 500	survey (100 SMEs)
Revell (2003)	Japan	small < 50	interview (20 small)
Vernon et al. (2003)	UK	micro < 10	focus group (25 micro, 34 staff)
Friedman & Miles (2002)	UK	SME < 250	interview (61 SMEs, 21 stakeholders)
Gunningham & Sinclair (2002)	Australia	small < 50	interview (13 small, 8 stakeholders)
Hansen et al. (2002)	5 EU countries	SMEs <= 250	interview (20 SMEs)
Schaper (2002)	Australia	small < 20	survey (154 small)
Rutherfoord et al. (2000)	UK, Netherlands	small < 50	interview (40 small)
Tilley (2000), Tilley (1999)	UK	small < 50	interview (60 small)
Non-empirical journal articles			
Clement & Hansen (2003)	Content analysis of documents on Nordic SME environmental funding schemes		
Hoevenagel & Wolters (2000)	Secondary data on Dutch SME (< 100 staff) use of environmental intermediaries		
Shearlock et al (2000)	Studied a database of environmental service firms, but not SMEs using the services		
Walley & Taylor (2002)	Literature review which identified and defined a typology of green entrepreneurs		

- The majority of the articles are European studies (the UK in particular) with only some covering Australia, Canada, Hong Kong, Israel, Japan, New Zealand, South Korea and the USA. While authors have pointed out that findings should be interpreted in a national context (e.g. Revell, 2003), our review found surprising similarities concerning how SMEs respond to interventions irrespective of their country. For this reason, our review combines these various studies and identifies any national differences when these were apparent. However, this observation highlights the need for more research in non-European and developing countries.
- Various terms are used to describe SMEs and their relationship with the environment including environmental impact, sustainability, responsibility, credentials, improvement, commitment, good practice and performance. However, when we reviewed the literature we found that researchers tended not to define these terms, or they use them interchangeably and inconsistently. It appeared that many authors believe these terms are self-evident, with their definitions being implied when they describe what, if anything, SMEs do with respect to the environment. While it is beyond the scope of this paper to examine these issues, our observation emphasises the need for researchers (and this paper) to provide clear, concise definitions for terms, to specify which terms are use interchangeably and to use them consistently throughout the paper.

As stated in the introduction, we define environmental improvement (adapted from Simpson et al., 2004, page 157) as *changes in technology and practices which reduce the current level of negative impact on the environment.* In the context of this definition: changes in technology can include replacing old equipment with energy saving equipment; changes in practices can include recycling, energy and water conservation; and negative environmental impact can include depleting natural resources, and producing carbon emissions and waste. We use this definition because it does not set targets as though there is some clear (and highly debatable) end point, but instead suggests that SMEs (just like all individuals and businesses) should strive to make environmental improvements wherever possible relative to their current level of negative environmental impact. Our use of

“current level” in the definition also avoids the divisive argument about what constitutes acceptable levels of environmental improvement, and instead advocates the need for ongoing improvement.

Typology of SMEs and environmental improvement

During our literature review we found that many studies focus on identifying the factors which influence the decisions by SME owner-managers to engage in environmental improvement (e.g. Gadenne et al., 2008; Knez-Riedl, 2008; Mir, 2008; Studer et al., 2006). These factors act as drivers or barriers depending on the extent to which they exist (on a continuum from weak to strong), with the key factors emerging from the literature summarised in Table 2.

It can be seen from Table 2 that the key factors influencing SME environmental improvement can be external (regulations, financial incentives, assistance/education, and external demand) and internal (knowledge of, commitment to and increased business performance achievable from environmental improvement). There are two main problems with this factor (or barrier/driver) approach to studying SME environmental improvement. First, it does not distinguish between the analytically distinct concepts of the internal characteristics which govern SME behaviour (e.g. their environmental commitment and knowledge, and their business performance commitment) and the interventions which Tilley (1999) suggests are actions which external parties (such as government) can use to change SME behaviour (e.g. regulation, financial incentives and assistance/education). Second, the factor approach does not result in a framework that researchers can use to guide their studies, or that policy makers can develop into programmes (taking into account interventions and SME characteristics) which encourage SMEs to make environmental improvements.

Table 2. Drivers/barriers of SME environmental improvement

Barrier/Driver	Description
Regulations	Extent to which regulations exist and are extensive enough to force SMEs to engage in environmental improvement (Bradford and Fraser, 2008; Pimenova and van der Vorst, 2004; Studer et al., 2006; Williamson et al., 2006), and whether these regulations are enforced fully among all SMEs by authorities (Mir and Feitelson, 2007; Revell and Blackburn, 2007).
Environmental commitment	Extent to which SME owner-managers or employees believe they have a responsibility to engage in environmental improvement (Collins et al., 2007; Masurel, 2007; Pimenova and van der Vorst, 2004; Simpson et al., 2004), proactively undertake environmental improvement actions (Aragon-Correa and Cordon-Pozo, 2005; Roy and Therin, 2008) and believe their business has an environmental impact (Bradford and Fraser, 2008; Drake et al., 2004; Mir and Feitelson, 2007).
Business performance commitment	Extent to which the direct and indirect costs of and resources needed for environmental improvement are exceeded by the short-term economic benefits of and competitive advantage for the business from such actions (Bradford and Fraser, 2008; Clement and Hansen, 2003; Collins et al., 2007; Drake et al., 2004; Revell and Blackburn, 2007; Simpson et al., 2004; Studer et al., 2006).
Financial incentives	Extent to which financial support or incentives are provided to offset the costs or increase the short-term benefits of environmental improvement (Mir and Feitelson, 2007; Studer et al., 2006), or taxes/charges/fines are introduced to discourage negative environmental impact by making it financially unattractive (Revell and Blackburn, 2007; Simpson et al., 2004; Studer et al., 2006).
External demand	Extent to which customers demand environmental improvement of their suppliers or demand products/services with reduced negative environmental impact, and are willing to pay for this (Collins et al., 2007; Drake et al., 2004; Mir and Feitelson, 2007; Revell and Blackburn, 2007; Simpson et al., 2004). This in turn influences the perception by SME owner-managers of potential image enhancement (Borga et al., 2008; Collins et al., 2007; Pimenova and van der Vorst, 2004; Studer et al., 2006), competitive advantage (Borga et al., 2008; Clement and Hansen, 2003; Drake et al., 2004; Pimenova and van der Vorst, 2004; Revell and Blackburn, 2007; Studer et al., 2006) and new business opportunities (Simpson et al., 2004) from environmental improvement.
SME environmental knowledge	Extent to which SME owner-managers or employees have knowledge about how to engage in environmental improvement and the time to acquire this knowledge (Bradford and Fraser, 2008; Collins et al., 2007; Hoevenagel and Wolters, 2000; Masurel, 2007; Pimenova and van der Vorst, 2004; Roy and Therin, 2008; Tilley, 1999).
Assistance / education	Extent to which SMEs have easy access to assistance and education programmes on how to engage in environmental improvement (Bradford and Fraser, 2008; Pimenova and van der Vorst, 2004; Simpson et al., 2004; Studer et al., 2006).

Our thematic analysis of the literature shown in Table 3 provides support for the need to separate SME characteristics and interventions. Table 3 shows that there is empirical evidence that there are *at least* four *extreme* types of SMEs (profit, compliance, advantage and environment driven) with different internal characteristics, and a range of interventions which external parties can use to influence SME environmental improvement. In this paper we therefore distinguish between SME internal characteristics and interventions by showing there is evidence in the literature that different types of SMEs are likely to respond to the various interventions in quite different ways.

The four types of SMEs we identified from our thematic analysis appeared to differ primarily on the combination of two of the internal SME factors shown in Table 2: environmental commitment and business performance commitment. This resulted in our typology of SME types shown in Figure 1. We recognise that SMEs are multi-dimensional entities and that our typology is based on only two

dimensions and are extreme cases. However, the purpose of this paper is to argue that engaging the majority of SMEs in environmental improvement will be more successful when we thoroughly understand which intervention strategies are most appropriate for particular categories of SMEs.

DEGREE OF BUSINESS PERFORMANCE COMMITMENT	**High**	**Profit-driven**	**Advantage-driven**
	Low	**Compliance-driven**	**Environment-driven**
		Low	**High**
		DEGREE OF ENVIRONMENTAL COMMITMENT	

Figure 1. Typology of SME types for analysing environment improvement

Defining the term "environmental commitment" was problematic because most articles using the term "commitment" in connection with SME environmental improvement (e.g. Collins et al., 2007; Kannan and Boie, 2003; Lee, 2008; McKeiver and Gadenne, 2005; Peters and Turner, 2004; Pimenova and van der Vorst, 2004) do not provide explicit definitions. Instead this term is implied by the way authors describe the attitudes of SME owner-managers to the environment as either: (1) a sense of *duty* or moral obligation (usually of the SME owner-manager) to reduce the negative environmental impact of the business (e.g. Collins et al., 2007; Masurel, 2007); or (2) the proactive, voluntary *actions* taken by SMEs to make environmental improvements (e.g. Aragon-Correa and Cordon-Pozo, 2005; Roy and Therin, 2008). The problem with environmental commitment being defined based on duty/moral obligation is that research has shown an SME owner-manager's desire to engage in environmental improvement does not always result in associated action (e.g. Tilley, 1999). In this paper we therefore use an "action" perspective to define environmental commitment: *a continuum of SMEs who take actions intended to have a negative impact on the environment (at one extreme) through to those who use all actions available to them to engage in environmental improvement (at the other extreme).* The latter actions may include, *inter alia*, environmental accreditation, recycling, remanufacturing, reverse logistics or extended producer responsibility, safe and appropriate disposal of waste, finding uses for waste products, using emission filters/controls, and so on (Aragon-Correa and Cordon-Pozo, 2005).

Table 3. Interventions and SME types identified from thematic analysis

	Interventions							SME Types			
Empirical journal articles	Voluntary regulation/standards	Compulsory regulation	Financial penalties	Financial support	Self-directed/facilitated education	Environmental audits / reviews	Business advice / help lines	Profit driven firms	Compliance driven firms	Advantage driven firms	Environment driven firms
Aragon-Correa et al. (2008)									✓	✓	
Bradford & Fraser (2008)		✓	✓	✓	✓	✓	✓				
Cloquell-Ballester et al (2008)					✓						
Gadenne et al. (2008)		✓			✓						
Knez-Riedl (2008)	✓	✓							✓	✓	
Lee (2008)				✓	✓		✓				
Mir (2008)		✓		✓	✓		✓		✓		
Redmond et al (2008)											
Roy & Therin (2008)					✓				✓	✓	
Collins et al (2007), Lawrence et al. (2006)											
Halila (2007)	✓						✓				
Masurel (2007)	✓										
Mir & Feitelson (2007)	✓	✓		✓	✓			✓	✓		
Revell & Blackburn (2007), Revell (2007)	✓	✓	✓					✓	✓		✓
von Malmborg (2007)				✓	✓		✓				
Studer et al. (2006)	✓	✓	✓	✓	✓				✓		
Williamson et al (2006)	✓	✓							✓		
Hitchens et al. (2005), Hitchens et al. (2003)		✓					✓		✓	✓	
McKeiver & Gadenne (2005)		✓			✓				✓		
Worthington & Patton (2005), Patton & Worthington (2003)	✓	✓				✓			✓	✓	
Condon (2004)					✓	✓	✓				
Drake et al (2004)	✓	✓	✓	✓				✓	✓	✓	
Hillary (2004)	✓	✓									
Peters & Turner (2004)					✓	✓	✓		✓		
Pimenova & van der Vorst (2004)	✓	✓		✓	✓		✓				
Rothenberg & Becker (2004)		✓			✓				✓		
Simpson et al (2004), Taylor et al (2003)		✓	✓				✓		✓	✓	
Ammenberg & Hjelm (2003)	✓		✓								
Kannan & Boie (2003)						✓	✓			✓	
Lefebvre et al. (2003)	✓	✓									
Naffziger et al. (2003)	✓										
Revell (2003)		✓						✓	✓		
Vernon et al. (2003)					✓	✓	✓		✓		
Friedman & Miles (2002)					✓	✓	✓				
Gunningham & Sinclair (2002)	✓	✓			✓			✓	✓		
Hansen et al. (2002)		✓			✓				✓	✓	
Schaper (2002)					✓						
Rutherfoord et al. (2000)		✓			✓			✓	✓		
Tilley (2000), Tilley (1999)	✓	✓	✓		✓		✓	✓	✓		
Non-empirical journal articles											
Clement & Hansen (2003)				✓		✓					
Hoevenagel & Wolters (2000)					✓		✓				
Shearlock et al (2000)							✓				
Walley & Taylor (2002)										✓	✓

Defining "business performance commitment" is similarly contentious, because the SME literature shows that owner-managers have a very wide range of objectives for running their business (Walker and Brown, 2004). In addition, SMEs are very much at the mercy of economic conditions in the particular industry in which they operate. It would be hard to incorporate all of these arguments and features into a single measure but we have assumed that for the sake of simplicity of our arguments that business performance commitment is focused on turnover and profit. Turnover is necessary to maintain the business, pay overheads and salaries while profit is necessary in order to continue trading without reducing the capital asset base of the firm and allow for the development of new business ideas and products. Profit improvement might also be achieved through cost reduction and this is an important area where environmental issues are concerned (Taylor et al., 2003). We therefore define business performance commitment (based on Walker and Brown's 2004 research on the success factors which are important to small business owners) as *a continuum of SMEs who believe non-financial goals (e.g. lifestyle and social conscience) are the most important (at one extreme) through to those who believe that financial goals (e.g. high growth and profit maximisation) are the most important (at the other extreme)*.

We now describe each of these extreme types of SMEs shown in Figure 1.

Environment-driven SMEs

The owner-managers of these firms focus on environmental improvement goals, not financial goals. They have a <u>very high degree of environmental commitment</u> because they focus on reducing their negative impact on the environment as much as they can. They are driven by duty/moral obligation to make environmental improvements (Walley and Taylor, 2002) and to acquire know-how so they can minimise the firm's negative environmental impact. These firms have a <u>low degree of business performance commitment</u> because they do not have financial goals such as growth or profit maximisation. Instead they focus on reducing their negative environmental impact (Walley and Taylor, 2002) and/or encouraging customers to reduce their negative environmental impact (Revell

and Blackburn, 2007), but are not interested in business growth or making profit. Indeed, they will reduce their negative environmental impact even if it means it reduces their competitiveness.

Advantage-driven SMEs

The owner-managers of these firms focus on financial goals, but they achieve these goals by pursuing environmental improvement goals. They have a very high degree of business performance commitment because they are focused on growth and/or profit maximisation (Walley and Taylor, 2002). They are innovative, opportunistic and proactive because they acquire or have environmental improvement capabilities and knowledge (Aragon-Correa and Cordon-Pozo, 2005; Hansen et al., 2002; Patton and Worthington, 2003; Roy and Therin, 2008) which enables them to pursue new business opportunities and markets among customers who demand low environmental impact and are prepared to pay for this (Simpson et al., 2004). They have a high degree of environmental commitment because they see this commitment as their competitive advantage. Environment-driven firms, by contrast, have an even higher commitment but do not have business performance commitment or goals like advantage-driven firms.

Compliance-driven SMEs

The owner-managers of these firms focus on survival in very competitive industries (Mir and Feitelson, 2007; Revell and Blackburn, 2007) and are not proactive (in contrast to advantage-driven firms) and instead react to customer demand (Aragon-Correa and Cordon-Pozo, 2005) or regulatory requirements (Mir, 2008). For this reason, they have a low degree of business performance commitment. The owner-managers only make environmental improvements to the extent required for regulatory compliance (Bradford and Fraser, 2008; Pimenova and van der Vorst, 2004; Studer et al., 2006; Williamson et al., 2006). They will not make environmental improvements beyond compliance because they perceive this as costly and impacting negatively on their survival, and because there is no demand from their customers (Drake et al., 2004; Revell and Blackburn, 2007; Simpson et al., 2004). These firms also lack knowledge of environmental improvement, or how to

achieve this in the context of their firm (Pimenova and van der Vorst, 2004). For this reason, these firms have a low degree of environmental commitment.

Profit-driven SMEs

The owner-managers of these firms focus on price leadership in very competitive industries and adopt a clear strategy of reducing costs at every opportunity (Simpson et al., 2004). These firms are described by compliance-driven firms in particular as "free riders" or firms which ignore regulations to save money because enforcement is weak and they can "get away with it" (Drake et al., 2004; Gunningham and Sinclair, 2002; Mir and Feitelson, 2007; Revell, 2003; Revell and Blackburn, 2007). For this reason, these firms have a high degree of business performance commitment, but in contrast to advantage-driven firms they are not strategic or innovative. These firms also have a very low degree of environmental commitment because they will engage in business practices which have a negative impact on the environment if it means making profit. Like compliance-driven firms, profit-driven firms lack knowledge about environmental improvement but, in contrast, they will not comply with environmental regulations if it will reduce profit.

Interventions to engage SMEs in environmental protection

It is clear from the previous section that there are at least four extreme types of SMEs with different aspirations concerning environmental improvement and business performance. We therefore believe it is inappropriate that the literature only tends to examine a few interventions without considering how their effectiveness applies to different types of SMEs (see Table 3). Even the articles covering a number of interventions (e.g. Bradford and Fraser, 2008; Studer et al., 2006; Tilley, 1999; 2000) did not examine how different types of SMEs respond to them. This is problematic because this approach will not assist policy makers in developing the required broad policy mix of interventions which is needed to enable all types of SMEs to make environmental improvements. In this section we examine the literature to show that there is indicative support for our conclusion that developing a policy mix using our typology of SMEs will be useful to policy makers.

Voluntary regulations and standards

The broad consensus in the literature is that voluntary regulations and standards (including certifications such as ISO 14001), self management and industry-driven approaches are ineffective interventions for promoting environmental improvement among all SMEs because very few SMEs adopt them (e.g. Masurel, 2007; Pimenova and van der Vorst, 2004; Revell and Blackburn, 2007). Revell and Blackburn (2007) explain that policy-maker motivations for voluntary regulations is that firms, including SMEs, are expected to investigate and identify business benefits (such as cost reductions) which can be achieved from environmental improvement. Our typology and Revell and Blackburn's findings suggest that compliance-driven and profit-driven firms will not seek out these benefits because of their lack of environmental commitment. Indeed, research has found that compliance-driven firms believe that these voluntary, non-enforced regulations result in a competitive disadvantage because these regulations are perceived as costly and because profit-driven "cowboys" in their industry do not follow the regulations (Drake et al., 2004; Revell and Blackburn, 2007; Tilley, 2000). In addition, compliance and profit driven SMEs see market driven forces as more compelling than weak regulations (Mir and Feitelson, 2007), however such market conditions do not yet exist to encourage them to change their practices (Collins et al., 2007; Drake et al., 2004; Mir and Feitelson, 2007; Revell and Blackburn, 2007; Simpson et al., 2004).

By contrast, Ammenberg and Hjelm's (2003) study provides evidence that voluntary standards such as ISO 14001 can be an incentive for advantage-driven firms because they found some SMEs obtained certification to provide them with a long-term advantage even though there was no current customer demand. While we did not find empirical evidence concerning environment-driven firms, we anticipate they might also find voluntary standards to be an incentive because of their environmental know-how and commitment.

Compulsory regulations

An alternative intervention to voluntary regulations and standards is compulsory regulations which are defined as "A set of 'incentives' established either by legislature, Government or public

administration that mandates or prohibits actions of citizens and enterprises…Regulations are supported by the explicit threat of punishment for non-compliance." (Poutziouris and Chittenden, 2003). Compulsory regulations are ranked highly by owner-managers of compliance-driven SMEs as a driver of environmental improvement (Bradford and Fraser, 2008; Pimenova and van der Vorst, 2004; Revell and Blackburn, 2007; Studer et al., 2006; Williamson et al., 2006). The rationale for this perception by compliance-driven firms is the belief that compulsory regulations will force the profit-driven "cowboys" in their industries to conform (or leave the industry) and will result in an even playing field (Drake et al., 2004; Revell and Blackburn, 2007; Rutherfoord et al., 2000). Advantage-driven firms also benefit from compulsory regulations because they see these interventions as new business opportunities which will help other firms satisfy these requirements (Walley and Taylor, 2002). Environment-driven firms would be influenced less because they are more likely to exceed compliance due to their high environmental commitment.

Compulsory regulations will not engage compliance or profit-driven firms in environmental improvement unless the regulations are enforced and applied to all SMEs equally and fairly (Mir and Feitelson, 2007; Revell and Blackburn, 2007; Simpson et al., 2004). This is highlighted by Rutherfoord et al.'s (2000) study of Dutch SMEs. The Netherlands sets mandatory environmental improvement parameters for all firms including SMEs. Municipalities conduct inspections at least every 2-5 years (depending on the firm's potential for environmental harm) to ensure compliance. Mir and Feitelson (2007) warn that enforcement is challenging for authorities in some countries due to the cost of regular monitoring. In The Netherlands funding is provided by the central government so that local authorities can fulfil this role, but this is not evident in countries such as the UK (Rutherfoord et al., 2000). For these other countries the literature suggests that enforcement could be included in existing site visits such as health and safety for restaurants (Revell and Blackburn, 2007), or membership of industry associations could be contingent on regulatory compliance enforced by independent audits and annual progress reports (Gunningham and Sinclair, 2002). The need for regulatory enforcement is because SME owner-managers might not be aware of the

regulations (Condon, 2004; Mir and Feitelson, 2007; Revell and Blackburn, 2007) and fail to comply due to ignorance rather than active avoidance. Regular site visits would help identify this problem so that support can be provided in the form of education (which is discussed later).

Some authors state that compulsory regulation might encourage compliance-only behaviour rather than environmental commitment (Tilley, 1999), but Rutherfoord et al.'s (2000) comparison of Dutch and UK SMEs suggests this depends on national culture. They found that Dutch SMEs believe they have a responsibility to reduce their negative environmental impact and actively engage in environmental improvement even if there is a cost burden, which suggests a degree of environmental commitment. Rutherfoord et al. believe this is because Dutch policy (including enforcement) ensures that all firms of all sizes share the burden of environmental improvement. While Dutch compulsory regulation has not necessarily resulted in environmental commitment at the extreme end of the continuum, this approach has encouraged Dutch SMEs to internalise environmental improvement more than UK SMEs (Rutherfoord et al., 2000).

There is also debate in the literature about the extent to which compulsory regulations are a cost burden for SMEs. The literature suggests regulations are perceived by profit-driven firms to cost more than the benefits they offer, due to their business performance commitment, and compliance-driven firms, due to their emphasis on economic survival (Clement and Hansen, 2003; Drake et al., 2004; Revell and Blackburn, 2007; Simpson et al., 2004). However, research on the impact of non-environmental regulation on SMEs suggests that owner-manager perceptions of costs are over-estimated and do not reflect the real impact of regulation (Grayson, 2003; Williamson et al., 2006).

Our typology in Figure 1 suggests it will be challenging to convince all (especially profit-driven) SMEs to develop environmental commitment and means that *enforced* compulsory regulation or other unavoidable interventions will be needed, at least until external demand for environmental improvement becomes an important business driver.

Financial penalties

There is evidence that financial penalties (such as taxes and levies) are an intervention which can encourage SMEs with low environmental commitment (that is, compliance and profit-driven firms) to engage in environmental improvement. For example, Bradford and Fraser (2008) found that SMEs, especially in high-energy consumption industries, can be encouraged to reduce energy use if policies are introduced which result in increased energy costs. However, most research has found that financial penalties (such as landfill taxes and fees) have been (or will be) ineffective because practices which cause environmental harm are cheaper than environmental improvement (Revell and Blackburn, 2007; Simpson et al., 2004; Walker et al., 2007). In other words, financial penalties will only be effective when they reflect the true impact that environmentally harmful practices can have (Carter, 2007; Tilley, 1999) and result in environmental improvement being cheaper.

Revell (2007) warns that increasing landfill taxes could result in illegal waste dumping by profit-driven firms, but this can be addressed by ensuring that convenient cost-effective services such as daily waste or recycling collection are available (Revell, 2007; Revell and Blackburn, 2007). The effectiveness of financial penalties and associated services are likely to be even more compelling if new markets are developed in areas such as recycling (Revell, 2007), which might mean that even profit-driven firms will engage in environmental improvement if the market is sufficient enough for service providers to pay firms to collect their waste. However, this is likely to necessitate increased compulsory regulation to mandate increased use of recycled material.

The main disadvantage of financial penalties is that they typically do not change the environmental commitment of compliance and profit-driven firms (Tilley, 1999), although such interventions signal to these types of firms that they need to change their commitment in order to reduce the impact of the penalties (Carter, 2007). These penalties do, however, reinforce the existing values of environmental and advantage-driven firms (Drake et al., 2004). In addition, such penalties can make environmental harm more visible to SMEs when compared to the “command and control” nature of

compulsory regulation (Tilley, 1999). Revell and Blackburn (2007) argue that the main impediment to financial penalties, however, is that it is probably unpalatable to vote-sensitive politicians.

Financial support

Financial support interventions to engage SMEs in environmental improvement can come in the form of subsidies (Mir and Feitelson, 2007), grants, soft loans and tax concessions (Bradford and Fraser, 2008; Clement and Hansen, 2003). Bradford and Fraser (2008) found that SMEs believe grants, loans and tax concessions would encourage them to use energy efficiency measures. Similarly, Pimenova and van der Vorst's (2004) study showed that financial support was rated as the second highest to engage them in environmental improvement after information and advice.

These positive findings concerning financial support need to be interpreted with caution because these studies do not differentiate between the types of incentives. Distinguishing between the incentives is important because not all forms of support might appeal to all types of SMEs. For example, Mir (2008) found that SMEs rejected loans as an incentive, which is a response which might be expected from compliance and profit-driven firms because they would be concerned about paying back the loans. Subsidies and tax concessions, by contrast, might appeal to these firms because of the cost savings which might accrue. However, it would appear from Mir and Feitelson's (2007) findings that compliance and profit-driven firms would revert back to their previous practices which cause environmental harm when these incentives are removed, which is inevitable because such incentives from a policy perspective are not sustainable (Carter, 2007). In addition, Drake et al (2004) found that some small firms were not eligible for government funding initiatives because their absolute energy use was too low. These findings suggest that financial support will not change the environmental commitment of compliance or profit-driven firms unless the financial support can be maintained. These interventions would most likely be most effective for environment and advantage-driven firms because they would continue with their environmental improvements after the schemes are discontinued due to their environmental commitment.

Self-directed and facilitated education

Educational intervention to provide information about and raise awareness of environmental issues has considerable support in the literature because it is expected to encourage environmental commitment among SMEs so they will engage in environmental improvement (Condon, 2004; Simpson et al., 2004; Tilbury et al., 2005). For example, SMEs in Pimenova and van der Vorst's (2004) study rated educational information and advice as the most important for encouraging environmental improvement, and Walker et al.'s (2007) consultancy report stated that 40% of SME respondents felt education would encourage their environmental improvement. There are three types of environmental information and advice needed by SMEs: technical, technology and financial (Condon, 2004; Grayson, 2003; Pimenova and van der Vorst, 2004; Revell and Blackburn, 2007; Tilley, 1999; Walker et al., 2007). Such information can help SMEs to engage in environmental improvement and conduct cost-benefit analyses. There are two types of education explored in the literature: *self-directed learning* such as checklists, do-it-yourself (DIY) guides, fact sheets, case studies, newsletters and self-help toolkits (Condon, 2004; Friedman and Miles, 2002; Pimenova and van der Vorst, 2004; Schaper, 2002; Vernon et al., 2003; Walker et al., 2007); and *facilitated education* such as workshops, seminars and conferences (Condon, 2004; Pimenova and van der Vorst, 2004; Walker et al., 2007).

There are mixed findings in the literature concerning the effectiveness of self-directed learning. For example, Pimenova and van der Vorst (2004) found that SMEs had a preference for DIY information over more time-intensive facilitated education approaches. Friedman and Miles (2002), by contrast, discovered that self-help toolkits were largely ineffective without the use of "handholding" approaches such as workshops. Vernon et al's (2003) study of SMEs using their toolkit suggests that self-directed learning is most effective with SMEs which have high environmental values. This is expected because advantage and environment-driven firms would be more likely to take the time to use these resources, when compared to profit and compliance-driven firms, due to their higher environmental commitment.

The empirical research into facilitated education aimed at encouraging environmental improvement by SMEs also revealed mixed results. For example, many researchers have found that SMEs believe training, seminars and workshops are ineffective at promoting environmental improvement or are rated lowly by SMEs as an incentive (Bradford and Fraser, 2008; Mir, 2008; Pimenova and van der Vorst, 2004; Studer et al., 2006). Other authors have found these approaches effective at changing SME environmental commitment (Condon, 2004; Walker et al., 2007) and that they can be an incentive to encourage environmental improvement if they do not conflict with core business (Mir and Feitelson, 2007) or are combined with self-directed toolkits (Friedman and Miles, 2002). These findings are consistent with the general SME literature which shows that SMEs do not attend facilitated education unless it is proven to be financially beneficial and an operational imperative (Webster et al., 2005), otherwise it is seen as time-intensive, possibly too costly and therefore a waste of their time (Pimenova and van der Vorst, 2004). This will especially be the case with compliance and profit-driven firms because it is these firms who are unlikely to view environmental education as an "operational imperative" because of their lack of environmental commitment.

It is for this reason that greater attention is needed in future research to explore the generic principles of effective environmental education, although the literature provides insight. First, SME participation is more likely to occur if the content includes immediately useful practical information and case study examples showing what is possible (Grayson, 2003). Second, the content should be developed with consideration of the learning styles of the owner-manager, benefits to be derived from environmental improvement, as well as local knowledge about environmental improvement options available (Redmond et al., 2008). Third, adult learners have inherent knowledge that needs to be acknowledged and they must be given the opportunity to exchange information (Condon, 2004). Fourth, participants should include a mix of larger and higher profile firms that add credibility and encourage SMEs (Condon, 2004). Fifth, content must be communicated using language that is easily understood and applied, and builds trust and positive relationships between firms and stakeholders (Tilley, 1999). Sixth, the best facilitator will be an affordable, independent

trusted expert who can interpret the individual needs of SMEs (Tilley, 1999) and deliver either a self-paced or a mix of self-paced and classroom activity (Condon, 2004). Indeed, trust is a recurring theme in the SME environmental literature and is related to the exchange of communication and relationships that need to be developed between educational stakeholders and SMEs (de Bruijn and Lulofs, 2001; Tilbury et al., 2005; Tilley, 1999). Finally, education needs to raise the SMEs' knowledge-base and skills so they can identify environmental problems and apply solutions.

There is also evidence in the literature that education programmes will need to be tailored to the needs of the different SMEs in our typology. Education aimed at profit- and compliance-driven firms will be difficult to develop because they are less inclined to seek education because both types have little environmental commitment (Condon, 2004) and because compliance-driven firms lack a strategic mindset (Condon, 2004; Mazzarol, 2004; Wang et al., 2007). However, Walker et al.'s (2007) consultancy report suggests that well developed programmes can improve the environmental commitment of compliance-driven firms. Promotional material for both types of firms needs to emphasise the economic benefits they can achieve, not the benefits for the environment. Both types of SME also require ongoing monitoring to help them overcome problems (Friedman et al., 2000) and ongoing appeals to encourage environmental improvement. Compliance-driven firms are also likely to want information on regulations they must follow to avoid financial penalties. Finally, a different type of "champion of change" for compliance- and profit-driven firms might need to be cultivated as credible exemplars to be followed, because they have different business performance commitments and will not necessarily be persuaded by the same economic arguments.

Environment-driven firms, by contrast, are likely to be open to any knowledge which helps them satisfy their environmental commitment because these issues are part of their sense of responsibility to the environment. Advantage-driven firms might seek specific knowledge about how to gain a competitive advantage (Simpson et al., 2004), and could be interested in knowledge that stimulates creative thought about new opportunities arising due to environmental improvement trends.

Environmental audits and reviews

Table 3 shows that environmental audit and review interventions have not been widely studied in the literature. They involve visits by an external party to examine the business practices of SMEs to identify opportunities for environmental improvement. The limited research suggests that, in isolation of other interventions, audits are ineffective. For example, Vernon et al's (2003) study found very little use of environmental audits by SMEs and Bradford and Fraser (2008) found that SMEs did not see audits as useful (although the firms also admitted that they did not know what such audits entail). This response would be expected from compliance and profit-driven firms because of their perception that environmental improvement is a cost burden and means they would not anticipate business benefits and therefore see environmental audits as a waste of time.

Other studies mentioning environmental audits found that they have been more successful in conjunction with education such as workshops (Condon, 2004; Peters and Turner, 2004; Walker et al., 2007) and self-help toolkits (Friedman and Miles, 2002). Indeed, Walker et al.'s (2007) consultancy research showed that it was their education programme which largely resulted in firms becoming more interested in energy and water consumption audits. This relationship between audits and education suggests the effectiveness of audits is therefore likely to be similar to that of the education interventions we have discussed previously. As with education, environment and advantage-driven firms are more likely to want audits to achieve environmental improvements (due to their environmental commitment), while compliance and profit-driven firms are only likely to consider audits if convinced to undertake education (which we argued previously will be difficult).

Business advice and help lines

Business advice (via face-to-face interaction or telephone help lines) is seen in the literature as an important intervention to assist SMEs with questions or problems they encounter when engaging in environmental improvement. In some cases this advice and assistance is provided by consultants or experts as a component of education programmes (Condon, 2004; Walker et al., 2007), as an adjunct to self-help toolkits (Friedman and Miles, 2002), or as a form of support within groups of

SMEs (von Malmborg, 2007). This complementary nature of business advice and education as an intervention was most evident in Walker et al.'s (2007) consultancy research which found that SMEs rated education, laws and enforcement as the key drivers to encourage their environmental improvement, while business advice, self-management and industry-driven interventions rated much lower.

While there has been limited research into the effectiveness of business advice, there are a number of themes which emerged. First, the research suggests that SMEs do not perceive telephone help lines as useful for obtaining assistance with environmental improvement (Mir, 2008; Pimenova and van der Vorst, 2004). Second, advice/support needs to range from general through to highly specialised (Shearlock et al., 2000) to cater for the different environmental knowledge needs of the different SMEs in our typology. This would be especially so for compliance and profit-driven firms who would more likely lose interest in environmental initiatives very quickly if they experience any difficulty obtaining what they need (Vernon et al., 2003) due to their lack of environmental commitment. Third, SMEs prefer to obtain advice/support from existing parties they trust and deal with, and will go to different parties depending on what type of advice/support they want (Hoevenagel and Wolters, 2000). Fourth, advice which will engage compliance and profit-driven firms needs to promote the environmental agenda in terms that they can appreciate such as reducing costs (Grayson, 2003) and focusing on specific business objectives such as waste management cost reductions (Holt et al., 2000; Redmond et al., 2008). Sixth, many SMEs favour advice services which are free because they generally do not have the finances to pay for the services of commercial consultants (Holt et al., 2000). This would appear to apply to compliance and profit-driven firms because they have little environmental commitment to justify spending money. Finally, SMEs often have very little awareness of business advice/support services which are available (Tilley, 1999). This means these services must be promoted widely, designed to cater for the different needs of the SMEs in our typology and offered by parties each type of SME would trust.

In the case of profit and compliance driven firms, the advice/support would need to be focused on the short-term business benefits achievable from environmental improvement.

Business advice will therefore be most effective for environment and advantage-driven firms because they would actively seek advice and help on how to further their environmental commitment. Compliance and profit-driven firms, by contrast, would be less likely to seek advice because of their lack of environmental commitment. Environmental advisers and support services therefore need to target compliance and profit-driven firms, rather than wait for them to seek help, in order to engage them. Grayson (2003) suggests that direct contact with such SMEs might not be successful, and that contact instead could be made indirectly via parties with which these SMEs have trust such as accountants, banks and chambers of commerce.

A holistic intervention framework

In summary, it is evident from our literature review that a single isolated intervention is unlikely to engage all types of SMEs in environmental improvement. More specifically, our review suggests that commitment from various stakeholders and a coordinated mixture of interventions will be required to encourage all four extreme types of SMEs to make environmental improvements. Table 4 summarises the key points from our literature review by showing what features of each intervention are needed to improve their effectiveness, and which type of SME each intervention is likely to be most effective with. Thus, from this table it is possible to devise a mix of interventions that are likely to be highly effective in engaging a particular type of SME in environmental improvement. More importantly, our literature review suggests that future research is needed which compares the effectiveness of the wide range of interventions and takes into account the different types of SMEs rather than treating these firms as a homogeneous group.

Table 4. A mixed intervention framework to engage all SMEs in environmental improvement

Intervention	Effective when ...	Ineffective when ...	Most effective for …
Voluntary regulations and standards	• driven by personal ethics • external demand for compliance	• it is the only intervention • no awareness of regulations • barriers are greater than benefits • no demand for compliance	Environment-driven Advantage-driven
Compulsory regulations	• it is clearly communicated • provides equity for all firms • combined with financial penalties • financial support is provided	• it is the only intervention • no awareness of regulations • perceived as a business threat • not monitored or enforced	Compliance-driven Advantage-driven
Financial penalties	• linked to regulatory framework • makes bad practice unviable	• it is the only intervention • penalty too small to be noticed • no viable penalty possible	Compliance-driven Profit-driven
Financial support	• promoted clearly/directly to SMEs • simple to apply for • offset regulation compliance costs	• it is the only intervention • too difficult to apply for • criteria are too restrictive • only a temporary measure	Environment-driven Advantage-driven
Self-directed and facilitated education	• linked to regulatory framework • tailored to individual firm needs • it has a specific problem focus • run by trusted/credible parties • promotes a change in attitude • encourages learner interaction • it uses business language • helps firms gauge their progress • helps to identify opportunities • learning is actionable immediately • provided conveniently to firms • includes real examples/cases	• it is the only intervention • providers do not know SMEs • does not address specific needs • providers are not credible/trusted • too many information sources • lack of knowledge integration • it uses sustainability language • it is too expensive to attend	Environment-driven Advantage-driven *It is challenging but possible to provide education for:* Compliance-driven Profit-driven
Audits and reviews	• used with education • identifies short-term benefits • performed by trusted parties • their role is communicated to firms	• it is the only intervention • do not identify business benefits • performed by unknown parties • their role/benefits are unclear	Environment-driven Advantage-driven
Business advice and help lines	• provided by existing/trusted parties • addresses specific needs of firms • relevant service is easy to find • focused on short-term benefits • availability is widely promoted • providers target firms proactively • providers are coordinated • advice services are free	• it is the only intervention • does not address specific needs • provided by unknown parties • relevant service is hard to find • firms not aware of existence • firms expected to seek advice • too many providers of advice • advice is too general/generic	Environment-driven Advantage-driven *It is challenging but possible to provide business advice for:* Compliance-driven Profit-driven

Conclusions, recommendations for policy makers and future research

The environmental impact of SMEs is generally believed to be considerable and yet efforts to encourage SMEs to engage in environmental improvement have encountered considerable resistance and scepticism. Research on specific interventions that encourage SME owner-managers to engage in environmental improvement has produced conflicting results concerning their effectiveness. This appears to be due to the fact that SMEs are extremely diverse, operate under widely differing business conditions in terms of perceived pressures and drivers for environmental

improvement and therefore adopt quite different business models and levels of environmental commitment. Owner-managers of SMEs also exhibit widely differing views, understanding and aspirations where environmental issues are concerned. Some owner-managers believe that these issues are the responsibility of local and national government, often arguing that their individual company contribution to emissions and pollution is extremely small. It is therefore not surprising that specific, isolated interventions have failed to address the needs of all types of SMEs. This issue is extremely important for policy makers to consider when they are attempting to gain greater environmental commitment and engagement from SMEs. It is also important that researchers do not treat SMEs as a homogeneous group when studying their environmental improvement, but instead group them according to attributes such as business performance commitment.

We argue that by segmenting SMEs by their business and environmental commitment at least four extreme cases can be identified along a continuum and that a wider range of interventions can be used in combination to achieve greater engagement by each of these types of SME in environmental improvement. In addition, a more holistic intervention programme can perhaps be designed if policy makers and researchers consider industry-specific and other variables on which SMEs can be categorised in conjunction with the intervention framework outlined earlier (Table 4). The objective is to understand fully the attitudes and environmental commitment of these firms and to understand how a particular combination of interventions can maximize the number of SMEs engaging in environmental improvement.

We recognise that segmenting and categorising SMEs in this way is a multi-dimensional problem and that our analytical categories outlined earlier are based on only two dimensions and are extreme cases on a continuum. Massey (2006) discusses the problem that many conceptual frameworks (i.e. classification schemes) are not sufficiently well developed for the uses to which they are being put and that policy makers are confused by both the number of frameworks and the terminology being used. Policy makers then do not understand the difference between theoretical frameworks (typologies) and empirically derived frameworks (taxonomies). We agree and it is likely that many

other categories of SMEs exist in other dimensions (or classification schemes) of environmental commitment. In our view only this kind of analysis, illustrated in our extreme categories of SMEs, supported by empirical studies and combined with a thorough understanding of the intervention needs of these SMEs will result in greater engagement of these SMEs in environmental improvement. The argument we are putting forward is based on a systematic literature review showing that interventions are often researched in isolation (or as a small subset of those available) and/or do not take SME heterogeneity into account, and that is why the findings concerning the effectiveness of each intervention are often inconsistent. The logical conclusion is that a broader, possibly tailored, range of interventions will elicit greater engagement overall. Nevertheless, it is possible that some SMEs will remain recalcitrant no matter how many kinds of interventions policy makers adopt. However, in our view this number of SMEs is likely to be much smaller than is currently the case. It is also our view that policy makers need to understand how SMEs engage with or avoid certain interventions when designing a broader policy mix of interventions. This level of understanding can only be achieved by having a clearer view of the types of SMEs being targeted, their business behaviour and the conditions under which these SMEs operate. Further, governments are in a position to markedly alter the business conditions of SMEs and often do so. However, these policy changes can be crude and ineffective at achieving the goals set, particularly where environmental improvement is concerned, and often have unintended consequences. We argue that, again, a greater understanding of the various categories of SMEs and their respective business behaviour and response to interventions is likely to lead to better policy, a more effective and wider range of interventions and result in significantly greater environmental improvement by SMEs.

Thus, the conclusions of this work are that it is no longer possible, and it is naïve, to rely on the extremes of voluntary environmental agreements or regulation and legislation to engage SMEs in environmental improvement. Intervention strategies to assist SMEs to engage in environmental improvement need to be holistic and designed for the specific category of SME being targeted. It is argued that a properly coordinated and mixed strategy intervention approach is likely to be more

successful in engaging SMEs and it is recommended that such an approach as outlined in this paper should be developed into a practical tool kit for supporting agencies. Future research will need to evaluate and monitor mixed interventions targeted at different types of SMEs to ensure that they are effective and respond to the needs of their audience. Empirical work will be needed to fully establish a taxonomy of SME types and their responses towards the various interventions.

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