

The Influence of Location on Small Firm Environmental Impact Management

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Abstract

Purpose: Small firms are not engaged in the environmental agenda and for real change to happen this is essential due to their significant contribution to global pollution. Although there are studies that compare small firm environmental response based on context variables such as industry or country, the influence of other more local context variables, such as geographic location, accesses to resources, and the influence of the local government authority have not been considered. This omission may be critical to achieving environmental engagement by small firms and a factor which has been overlooked in most of the literature.

Methodology: To address this gap, a one-on-one survey-based data collection was employed whereby the researchers went to 226 businesses in Location A and 240 businesses in Location B in two respective light industrial areas.

Findings: Results show that small firm environmental management practices concerning waste, energy and water differed depending on the local context variables.

Value: The implication here is that if the local context in which these businesses operate influences the practices employed, developing strategies that acknowledge the influence and consequences of local context may be more effective than those currently available. New strategies may result in better engagement and responses by small firms in the environmental agenda and assist government and environmental organisations to achieve reduction in environmental harm and realise climate change targets.

Keywords: small firms, environmental management, environmental impact, context, local government authorities

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1. Introduction

Knowledge used by governments and environmental organisations regarding how to engage small firms in environmental impact management, has generally relied on information applicable and relevant to large firms, but gives little acknowledgment or importance to the context of small firm operations. We believe that policy needs to also focus specifically on small business and firms for numerous reasons.

Firstly, the sheer number of small firms globally and their associated negative environmental impact, substantiates the need for these businesses to be appropriately engaged in environmental impact management (EIM). For example, estimates in the UK suggest that the collective negative impact of small firms on the environment is significant, accounting for approximately 60% of all commercial carbon emissions (Marshall Report, 1998) and 60% of all commercial waste (Environmental Agency, 2002). Secondly, small firms are very different to large firms, meaning that policies aimed at large firms are unlikely to apply or be relevant to small firms. Small firms are different in terms of their size and resources, and they have flatter organisational structures, fewer staff and customers. Thirdly, even though small firms make up the majority of the business cohort, they are not homogeneous. Finally, they tend to be operationally rather than strategically focused and therefore do not see the importance of changing any of their current business practices, as they have yet to be convinced of the business case to do so (Hudson *et al.*, 2001; Walker, *et al.*, 2008). These macro and micro reasons make it hard to engage them in the environmental debate.

In addition, small firms do not operate in a vacuum; they function across multiple layers, which have their own culture, level of resources, they operate in specific industries or professions, and function in specific geographic locations, be it a city, town or regional area. They are therefore under the authority of different levels of government for different purposes, including macro issues such as taxation but micro issues such as environmental regulation.

Each of these context variables help shape how a small firm responds to issues such as the impact they have on the environment. The literature on small firm engagement in (EIM) does acknowledge some of these context variables, such as the impact of industry and the personal characteristics of the business and that of the owner. However, little consideration is given to whether other context variables of the small firm have an effect on their level of engagement in EIM.

The findings presented in this paper provide some indicative support for our conclusion that the specific location of a small firm does appear to influence their engagement in good environmental impact management and practices. Our findings make important theoretical contributions to the debate because they suggest that future studies should differentiate samples of small firms based on location as well as on the basis of the industry or the personal characteristics of the business and its owner.

This paper is structured as follows. The next section defines the key terms used in the paper. This is followed by a review of the literature, which provides an insight into the current knowledge and understanding of both large and small firms and their responses to EIM. The methodology and the results of the research are then given and these lead into the final section, where a discussion, a conclusion and implications for policy makers, practitioners and researchers are presented.

2. Definitions

The concepts of environmental impact management (EIM) are often viewed in the widest sense and may appear obvious. However, this burgeoning area has a proliferation of many different terms so that definitions need to be more precise (Parker, Redmond & Simpson, 2009). To avoid further criticism in this regard and to inform the reader, the definitions to be used in this paper are as follows:

- In Australia, which is the national context of this study, small businesses are referred to in several ways, normally defined by number of employees. A ‘micro business’ is one that employs less than 5 staff, a ‘small business’ (which subsumes a micro business) employs less than 20 staff, and a ‘medium sized business’ employs more than 20 but less than 200 staff (ABS, 2007). A more contemporary description is to refer to a small business or enterprise as a *small firm*, which will be the descriptor used in this paper to refer to the businesses being investigated.
- *Environmental impact management* (EIM) refers to efforts within a business to reduce their current level of negative or improve their positive impact on the environment.
- The business *context* encompasses all aspects of the situation in which a small firm operates and by which it is affected.
- Given the numerous ways that the level of government which has the most direct interface with its constituents, those being their ratepayers, is described, i.e. councils,

shires, municipalities, local government, this tier of government will be referred to as the *local government authority* (LGA).

- The term *location* will refer to a specific physical location within a local government authority (LGA) in a large metropolitan city in Australia. LGAs handle local community needs, including environmental issues such as waste collection, recycling activities and local planning.

3. Literature review

3.1 Importance of engaging small firms in environmental impact management

The significance of the EIM by small firms cannot be under estimated and we posit in this paper that it will differ depending on the owner and, of equal significance, the local context of the firm, a variable that has not previously been examined in great detail in the literature. EIM has primarily been practiced in large multi-national companies (Runhaar *et al.*, 2008), therefore, EIM practices are predominantly understood from a large business perspective (Aragon-Correa *et al.*, 2008).

While it has long been recognised that small firms make a significant contribution to all national economies and the social structure of communities (Gerstenefeld and Roberts, 2000) their collective negative impact on the environment is still not fully understood but is estimated to be substantial. This would not be surprising as small firms make up the largest business sector in every national economy and produce the majority (up to 60%) of the world's economic output (Gerstenefeld and Roberts, 2000). For example in Australia, 96% of all actively trading businesses (over 2.1 million enterprises) are small firms (ABS, 2008). Small firms with less than 20 employees employ 3.7 million people or 46% of the private non-agricultural sector workforce (ABS, 2004) and generate an estimated 39% of Australia's economic production (Department of Industry, Tourism and Resources, 2007). Thus, they are clearly a significant business sector. There are however significant barriers that small firms face which impede them in engaging in the whole environmental debate, as the majority of the small firms fly under the radar when it comes to changing their environmental management practices.

3.2 *Factors affecting small firm EIM engagement*

There are several reasons for small firm non-engagement in voluntary EIM and much of the literature has focused on the owner-managers' particularly their attitude to EIM, and the barriers and drivers of their environmental behaviour (Bowen, 2002; Condon, 2004).

The main barriers are that for most small firms:

- Their operations are disparate, diverse, and they are resource poor (Revell and Blackburn, 2007);
- The owner-managers do not perceive that the firm has a substantial impact on the environment (Hillary, 2000; Redmond *et al.*, 2008) and they cannot see a business case in the form of either economic advantage or supply chain demand to encourage their engagement (Simpson *et al.*, 2004, Walker *et al.*, 2008).
- The owner-managers have a lack of environmental legislation awareness (Mir and Feitelson, 2007; Revell and Blackburn, 2007), and are often lacking in strategic management foresight (Walker *et al.*, 2009), which includes attitudes and behaviours regarding environmental management (Gonzalez-Benito and Gonzalez-Benito, 2006; Masurel, 2007).

Both theoretical and practical solutions have been offered to encourage owner-managers' behaviour change including: the Theory of Planned Behaviour (Ajzen, 2001) and education/training programs (Condon, 2004; Katos and Nathan, 2004; Tilbury *et al.*, 2005; Tilley, 1999, Walker *et al.*, 2008). Changing the behaviour of the small firm owner-manager is thought to be crucial however it is complicated.

The main policy approaches to drive EIM by small firms are:

- Compulsory legislation/regulation (Bradford and Fraser, 2008; Pimenova and van der Vorst, 2004; Williamson *et al.*, 2006);
- Education and training (Condon, 2004; Redmond *et al.*, 2008; Tilbury *et al.*, 2005, Walker *et al.*, 2008);
- Financial incentives and penalties (Revell and Blackburn, 2007; Tilley, 1999);
- and a mixed method approach (Parker *et al.*, 2009).

Other macro factors have been identified within the literature that influence the engagement of small firms in EIM including the country in which the small firm operates. Studies have been conducted in and across countries on a range of issues. For example, some studies have been conducted within a single country such as Australia (McKeiver and

Gadenne, 2005), Spain (Aragon-Sanchez and Sanchez-Marin, 2005; Anglada, 2000) and the UK (Simpson *et al.*, 2004).

Less common have been studies which report on cross-country studies, but notable exceptions include Cummings' (2008) study in Australia, China and Indonesia, Hitchens *et al.*'s (2005) study in Germany, Italy, UK and Republic of Ireland, and Baumast's (2002) study in Germany, UK and Sweden. A key reason for focusing research on a particular country is to control for broad policy, regulation and business culture differences, because these issues can influence EIM by small firms (Parker *et al.*, 2009). Overall these macro level studies found clear differences in the outcomes achieved from small firms due to the diverse approaches taken by each country's respective government. For example, voluntary engagement has been the approach taken by Governments in several countries including Australia and the UK, and this has proven ineffective as the majority of small firms have still not engaged in EIM (McKeiver and Gadenne, 2005).

Not only do the macro level influences affect small firm response to EIM, it has been shown that these responses are moderated by the industry sector in which the small firm operates. At the industry or micro level there have also been a number of studies conducted to determine the environmental response of small firms from specific or a variety of different industry sectors. For example, Masurel (2007) studied the printing sector and Tzschentke *et al.* (2004) examined the hospitality sector.

It is apparent from this research that the industry in which the small firm operates has an effect on the response of the business to environmental issues. Some industries are more proactive than others, as each industry's potential for environmental issues such as pollution is different and has commensurately different external pressures placed on it (Gonzalez-Benito and Gonzalez-Benito, 2006). In addition some industries are by their nature far more prone to potential environmental issues, such as industries that deal with chemicals (e.g. printing and cleaning industries), so there is added pressure and often specific regulations that small firms in these industries have to be cognisant of.

The final context variable is the local level. Studies have been conducted within specific states/provinces within a country (Gadenne *et al.*, 2008; Naffziger *et al.*, 2003; Williamson *et al.*, 2006) or specific cities or towns (Mir and Fietelson, 2007; Pimenova *et al.*, 2004; Simpson *et al.*, 2004). Some studies have examined individual counties, shires, municipalities or councils within metropolitan cities (Bradford and Frasier, 2008; Mir, 2008; Revell, 2003; Vernon *et al.*, 2003; von Malmberg, 2007). However, the concept that is raised

here is that the location itself makes a difference to EIM response, and this has not been explored to any great extent in the extant literature.

3.4 *Influence of small firm local context variables on EIM engagement*

We posit that the lack of research which focuses on or compares the location variable of small firms on EIM needs to be corrected because studies which have involved different locations suggest that:

- the business culture and networking of small firms, environmental services and perception of benefits of environmental improvement appears to vary even between industrial estates in a single location (Peters and Turner, 2004);
- customer pressure for small firms to engage in EIM can vary depending on their location within a council (Vernon *et al.*, 2003); and
- LGAs which govern each location may have different approaches to engaging small firms in EIM.

There is also some evidence in the literature that LGAs, can vary widely in terms of their approach to EIM and to small firm engagement and this could be a key contributor to EIM response. For example, von Malmborg (2007) found, when looking at EIM knowledge transfer in regional small firm business networks, that there were similarities and differences in the 'relative activeness' of the two LGAs which were studied. In addition, Noren and von Malmborg (2004), when assessing the use of environmental management systems (EMS), found that functionality of the standardised EMS used in LGAs appeared to depend on which LGA was using it.

Further, there is evidence that environmental legislation compliance and monitoring can be location specific. For example, Beattie *et al.* (2001) discussed legislation compliance and monitoring in UK businesses, whereby legislation takes into account the location of the business, the state of the local environment, exposure and health of residents, and the responsibilities and action taken at a local level by the LGAs. All of the results above suggest that the behaviour of LGAs may differ where environmental management issues and small firm engagement are concerned.

While none of these studies specifically set out to compare the EIM of small firms in different locations, the insights from these previous studies suggest that EIM must be contextualised and that the specific location of the business must be acknowledged and used as an independent variable before the behaviour of small firms can be fully understood.

Therefore the purpose of this paper was to look at the context (specific geographic location) of the small firm and see if this, and in particular the LGA, was a factor in the environmental impact management by small firms on a variety of measures.

4. Research Method

4.1 Research question

The following research question underpins the objectives of this paper:

Is the specific geographic location of a small firm more important to understanding their EIM engagement than previously thought?

4.2 Overview of the two locations studied

Two different light industrial areas, located in two different LGAs in an Australian state capital formed the context for this study during the period 2007-2009. The two LGAs were selected because both were seeking to achieve environmental performance improvements in their respective areas. We therefore provide some general information about each location and provide a brief outline of some key environmental practices within each LGA which appeared to contribute to the impact of location on the small firms' EIM engagement.

Location A is situated 22 kilometres south of the capital city and serves a population of over 75,000. It has approximately 2,000 businesses within its boundaries. In comparison the second location, Location B, is located 17 kilometres south-east of the capital city and serves a population of more than 95,000. Information on the number of firms within Location B was not readily available although it was thought to be higher than Location A because it was an 'older' development with a higher population.

There is a website which ranks each LGA based on a series of sustainability practices (www.howgreen.net.au). In 2009 the results showed that while both LGAs were actively engaged in helping residents reduce their environmental impact, only Location A offered environmental/sustainability awards to business/industry and offered businesses incentives to reduce their general waste. However, Location B did support businesses to improve their water efficiency and promote recycling within its industrial zone.

In Location A there was a Materials Recovery Facility (waste disposal site) where commercial and household waste was recycled. This facility was nearly at capacity during the

period of the study and there was concern that future recycling rates would deteriorate as a consequence. To exacerbate the problem, shortly after the research was completed, a fire closed much of the facility and reduced its recycling capacity by 40% (Wilkie, 2009). On the other hand, Location B used a designated recycling contractor to collect recyclables and its LGA no longer operate their own waste disposal site. It was assumed, as no other information was given, that waste was recycled outside the LGA's boundaries. It was therefore hypothesised that the differences in infrastructure within the LGA boundaries and waste disposal practices between the two locations made a difference to the recycling practices of small firms within the locations.

Another example of differences between the two locations was related to the LGA's expectation of what its constituent ratepayers could reasonably achieve in regard to environmental impact management given the number, options, and type of waste recycling contractors available in each location. For example, within the study period, not only did the number of recycling contractors reduce overall, as did the services they provided (either free or at cost) and the type of waste collected altered (e.g. steel became less attractive with the reduction in commodity prices), the actual recycling contractors' services were also not sustained, as several closed or moved operations. No backup solutions appeared to be available in either LGA for businesses to rely upon, especially when services became unavailable or became more costly than landfill.

Of interest is that environmental policies had been developed by both LGAs. Location A had a sustainability policy that it had adopted in June 2006 and its latest annual report (2007/08) indicated that the LGA had a focus on natural environmental management. Location B's environmental management plan was adopted in 2001 and modified in 2005. The LGA's 2008 annual plan had only limited discussion of environmental management and this suggested that the level of environmental communication, performance and enforcement of LGA policies and underlying regulations was different between the two locations. This gave some credence to the original research question, which was, Is the specific geographic location of a small firm more important to understanding their EIM engagement than previously thought?

4.3 *Research design, survey instrument and data analysis*

For this study, EIM practices formed the outcome variable of interest. Three specific EIM practices relating to two environmental resources, energy and water were investigated.

Whereas as a composite score may appear a desirable outcome, with the many environmental practices that can be investigated this research sought to delineate the outcomes of checking, tracking and informing practices in regard to energy and water. This decision is justifiable on the basis that there is currently no established measure of EIM practices. For both energy and water usage owner-managers were asked whether they check, track and inform themselves about the efficient use of energy and water. The response format for each of these questions was yes/no. The primary predictor variable of interest for this research was firm location and owner-manager and business characteristics were measured as potential control variables.

The data used to answer the research question posited in this study came from one-on-one survey-based data collection whereby the researchers went to 226 businesses in Location A and 240 businesses in Location B in two different light industrial areas. There was a response rate of 88% in Location A ($n= 199$) and 85% in Location B ($n= 205$). The protocol of one-on-one data collection contributed to the high response rate to the survey.

A 47 item instrument was developed which included of a mixture of qualitative and quantitative questions, focusing on waste, energy and water management and included questions related to the business (e.g. What is your business?), the environment (e.g. How do you rate your interest in the environment?), waste management (e.g. What type(s) and approximate volume of waste is produced and disposed of during your business operations each week?) and water and energy usage (e.g. Do you check on your energy and water usage?). Likert scales were used with response options ranging from 1 (not at all important, never, very low or very poor) to 6 (highly important, always, very high or very good - respectively) depending on the question being asked. Prior to conducting the main survey, checks of the instrument for both face validity and content validity were made (Cavana et al, 2001), verifying that the survey instrument was sound.

The data analysis was conducted in three steps. Firstly, frequency analyses were conducted to provide demographic data of the businesses and the respondents. Secondly, a series of Kruskal-Wallis tests were conducted on the waste, energy and water issues and the method of waste disposal and awareness of energy and water usage to establish if practices of owner-managers differed in the two locations. All the statistics were considered significant when their computed p-values were smaller than 0.05. The results are reported in this order and in all instances Location A's data is reported first. This univariate procedure does not control for all other possible influences on EIM practices such as owner-manager and business characteristics. So finally, a block entry logistic regression analyses were conducted

to determine if location makes a significant contribution to explaining the variance in EIM practices over and above owner-manager and business characteristics.

To test the unique impact of location on these six EIM practices block-entry logistic regression was used. This analytical technique is appropriate because the dependent variables were measured as dichotomous variables and the independent variables included both categorical and interval measures (Field, 2005, p.218). In the first block the owner-manager and business characteristics were entered as control variables (i.e. gender, age, education and number of employees). In the second block location was entered to see if it had a significant additional impact on EIM practices. A five percent level of significant was used for all analyses.

5. Results

5.1 *Profile of the businesses and their stability*

The combined profile of the two light industrial areas shows that the majority of the small firms were:

- at the small firm level (88%) with only 12% employing more than 20 staff;
- independently owned (92%);
- operated by males (84%);
- owned by people who are aged 50 and under (75%); and
- had high school or trade related qualifications (63%)

The research question will be answered first in regard to the small firms' waste volume and disposal methods and then their energy and water awareness and activities.

5.2 *Relationship between location and waste volume and disposal methods*

Data recording the waste produced and sent to landfill in one week was collected in both locations to establish the waste volume and recycling practices of the small firms in each area. The waste results for steel, combined card and paper, and oil are shown in Tables 1 and 2. A full list of waste production results is provided at Appendix A (Table 3 and 4).

Table 1. Waste produced by small firms in both locations in one week.

Product	Producers (n)		Kg		m ³		Litres	
	Location A	Location B	Location A	Location B	Location A	Location B	Location A	Location B

Steel	95	113	109774	44142				
Card & paper combined	173	165			98	137		
Oil	31	66					985	5239

Note: Figures are rounded to nearest whole number and exclude cases where no response was given.

Table 2. Waste sent to landfill by small firm respondents in both locations in one week.

Product	Landfill % of waste Location A	Landfill % of waste Location B
Steel	14	0.2
Card & paper combined	51	33
Oil	0	.003

Note: Figures are rounded to nearest whole number and exclude cases where no response was given.

Within each location there were differences in both the volume of waste being produced and the use of landfill for disposal. While it could be argued that the number of producers and different volumes in each location were contributing to the differences in disposal, it is worthwhile to note that these factors were often mitigated by other local factors such as the economic climate and market demand (that is, the influence and availability of contractors to recycle and pay for waste).

Statistical tests were used to investigate the possibility of there being two different location groups in the dataset for volume of waste. Kruskal Wallis Tests were chosen as this allows for the fact that the volume of each waste item was not normally distributed. In this case, only the three items (metal, combined cardboard and paper and oil) in which there were significant volumes of waste being produced were analysed. Based on the location, it can be seen that the volume of steel had significantly different values. That is, the volume of recycled steel is significantly larger in Location A than it was in Location B ($X^2=3.997$, <0.05).

A cross tabulation was then used to investigate the possibility of a statistical association between disposal of waste and location to determine if there was a difference between methods of disposal between the two locations. The cross tabulation revealed a statistical association in regards to combined cardboard and paper disposal ($X^2=28.388$, <0.05). Further scrutiny of the data showed that the difference in combined cardboard and paper disposal to landfill was influenced by those in Location A more frequently reporting sending this waste item to landfill (67%) compared to Location B (33%), where recycling was the preferred option.

These results verified that volume of waste (by type) and disposal methods varied across locations, resulting in the specific location of the business appearing to have some influence on the environmental responses from these small firms. However, a compounding

factor is the availability and ease of recycling for the small firm. Given the previously stated barriers that small firms face with regard to improving their environmental performance, i.e. resources, if recycling options are made available, small firms are more likely to avail themselves of it. Conversely, if there is no help from intermediaries, then small firms have to make a conscientious decision to be environmentally responsible. That decision may very well cost the small firm money, and given that most small firms think at an operational (day-to-day) level rather than a strategic (1-5 year) level, having to make a decision that instantly affects the businesses bottom line, may well result in a conscientious decision to make a business rather environmental decision.

5.3 *Influence of location on energy and water awareness and activities*

The responses from the owner-managers to questions regarding their knowledge and practices in regard to energy and water highlight that there is still considerable work to do to improve awareness and practices in small firms in regard to these natural resources. It also suggests that education needs to be focused more on water than energy because the frequency of 'yes' responses were less for water when compared to energy (see Table 5 and 6).

Table 5. Energy efficiency awareness and activities of responding small firms in both locations.

Questions	Percentage of positive answers (Yes)	
	Location A	Location B
Check on energy use	49	61
Keep track of energy costs	51	69
Know ways to use energy efficiently	77	64

Note: Figures are rounded to nearest whole number and exclude cases where no response was given.

Table 6. Water use efficiency awareness and activities of responding small firms in both locations.

Questions	Percentage of positive answers/responses	
	Location A	Location B
Check on water use	19	39
Keep track of water costs	43	44
Know ways to use water efficiently	20	29

Note: Figures are rounded to nearest whole number and exclude cases where no response was given.

Kruskal Wallis Tests were chosen in order to investigate the possibility of two different location groups in the dataset on energy and water issues. Six individual behaviours were included in the analysis to investigate if there were any differences between the responses from the two locations and the results are reported below.

In regard to energy the following three behaviours were analysed: energy checking, energy cost monitoring and knowledge of energy efficiency use. The Kruskal Wallis Test results revealed that location was only a factor on energy checking ($X^2=6.088$, <0.05).

In regard to water the following three behaviours were analysed: water checking, water cost monitoring and knowledge of water efficiency use. The Kruskal Wallis Test results revealed that location was a factor on two issues: water checking ($X^2=20.169$, <0.05) and knowledge of water efficiency use ($X^2=4.502$, <0.05).

These results verify that energy and water management did appear to vary between the two locations. Therefore, specific location appears to be having some influence on the environmental responses of these small firms in regards to energy and water.

6. Discussion and Conclusion

The interest, proactivity and involvement of the LGA appear to be a differentiating factor in regard to the EIM engagement of small firms. Therefore, the specific location does appear to be important to small firm engagement in EIM. This was evident in the different environmental outcomes achieved in the volume of waste of steel, variation in waste disposal methods (e.g. card and paper to landfill), energy checking, and water checking and knowledge of water efficiency methods. Therefore, the relationship between location and environmental responses appears to be significant, but the level of importance is variable and has yet to be quantified.

Waste disposal methods were, in part, influenced by the LGA's provision of on-site recycling facilities, for example recycling bins. The lack of recycling bins in one location meant that the small firms sent more card and paper to landfill, which is not best practice. This result raises again the issue of the influence of different LGA environmental priorities (Inter-American Development Bank, 2007) and highlights that this is an important small firm context variable. Also the types of waste produced are related to the types of business being operated within industrial areas and these are more difficult to change. Initial improvements may be achieved by providing small firms with different recycling options for individual items.

It is generally accepted that small firms *do* engage and manage waste, albeit not perfectly, and this research provides further support for this. It also highlighted that they still do not always use best practice for disposal and need more support to improve. Small firms need to be offered both better education on what is best practice, and alternative local options

when there is insufficient infrastructure or materials to support best practice. In this research the provision of recycling bins was an issue because of the limitations it placed on the small firms acting in an environmentally responsible way due to a lack of local infrastructure. This had been raised previously by Vernon *et al.*, (2003). Government policy changes are also necessary to ensure that all small firms have access to best practice facilities and materials.

Governments at all levels in Australia and elsewhere have moved toward greater regional planning and management of natural resources in the quest to deliver better policy and program implementation (Bradford and Fraser, 2008 (United Kingdom); the Local Agenda 21 program (Jennings and Moore, 2000) (Australia); von Malmborg, 2008 (Sweden), yet it is still unknown whether this will bring positive results (Lane *et al.*, 2004; Mercer and Jotkowitz, 2000). Regardless of the approach taken, there is clearly a need for greater engagement by all tiers of government with small firms, and for the delivery of consistent and appropriate local policy and programs.

LGAs in particular are seen to have an important role in this engagement process because they have closer relationships with small firms than other tiers of government (Jennings and Moore, 2000), their policies and strategies can be more flexible, innovative and sector specific (Bradford and Fraser, 2008), and solutions can be developed more easily due to the close geographical proximity of LGAs to local small firms (Peters and Turner, 2004; Wolf *et al.*, 2007). In addition, LGAs can establish different local targets (such as reduced waste), policies and environmental programs which could affect the engagement of small firms more successfully than state/provisional or national programs. This research has highlighted that particular attention needs to be paid to the influence of location on small firm EIM.

The results regarding waste, energy and water management add to the body of literature by highlighting that the different locations of small firms can lead to disparate environmental outcomes and by showing that location should be considered when developing strategies to engage small firms in EIM. The inclusion of a consideration of location may also contribute to achieving better environmental outcomes than those that are currently being realised from small firms. The context of small firms, and their location in particular, needs to be considered in all efforts (e.g. education program design, research and policy decisions) by intermediaries when attempting to engage small firms in EIM.

Finally this research has identified that the geographic location of the small firm may be more important than previously acknowledged in the literature when contemplating engaging small firms in EIM. Therefore, developing strategies that acknowledge the

influence and consequences of the location, particularly the contribution of the local government authority, may be more effective than those currently available. These strategies may result in better engagement and responses by small firms in the environmental agenda, and also assist government and environmental organisations to achieve a reduction in environmental harm and to realise their climate change targets. Changes also need to be made to small firm education programs, in future research and in government policy to ensure that location is given due consideration.

References

- Ajzen, I. (2001), "Nature and operation of attitudes", *Annual Review of Psychology*, Vol. 52, pp. 27-58.
- Anglada, M.L. (2000), "Small and medium enterprise perception of the environment: A study from Spain", in Hillary, R. (Ed.), *Small and Medium Enterprises and the Environment*, Greenleaf, Sheffield, UK, pp. 49-60.
- Aragon-Correa, J.A., Hurtado-Torres N., Sharma, S. and Garcia-Morales, V.J. (2008), "Environmental strategy and performance in small firms: A resource-based perspective", *Journal of Environmental Management*, Vol. 86, pp. 88-103.
- Aragon-Sanchez, A. and Sanchez-Marin, G. (2005), "Strategic orientation, management characteristics, and performance: A study of Spanish SMEs", *Journal of Small Business Management*, Vol. 43 No. 3, pp. 287-309.
- Australian Bureau of Statistics (2004), *Characteristics of small business*, Catalogue No. 8127.0, Commonwealth Government of Australia, Canberra.
- Australian Bureau of Statistics (2007), "Australia's environment: Issues and trends, 2007", available at: <http://www.abs.gov.au> (accessed 20 April 2008).
- Australian Bureau of Statistics (2008), *Forms of employment*, Catalogue No. 6359.0, Commonwealth Government of Australia, Canberra.
- Baumast, A. (2002), "Environmental Management Systems and Cultural Differences: An Explorative Study of Germany, Great Britain, and Sweden", available at: <http://miami.unimuenster.de/servlets/DerivateServlet/Derivate-678/baumast.pdf.6> (accessed 20 April 2008).
- Beattie, C.I., Longhurst, J.W.S. and Woodfield, N.K. (2001), "Air quality management: evolution of policy and practice in the UK as exemplified by the experience of English local government", *Atmospheric Environment*, Vol. 35, pp. 1479-1490.
- Bowen, F.E. (2002), "Does size matter? Organizational slack and visibility as alternative explanations for environmental responsiveness", *Business and Society*, Vol. 41, pp. 118-124.
- Bradford, J. and Fraser, E.D.G. (2008), "Local authorities, climate change and small and medium enterprises: identifying effective policy instruments to reduce energy use and carbon emissions", *Corporate Social Responsibility and Environment Management*, Early View.
- Cavana, R.Y., Delahaye, B.L. and Sekaran, U. (2001), *Applied Business Research: Qualitative and Quantitative Methods*, Wiley, Australia.
- Condon, L. (2004), "Sustainability and small to medium sized enterprises - How to engage them", *Australian Journal Environmental Education*, Vol. 20 No. 1, pp. 57-67.
- Cummings, L.S. (2008), "Managerial attitudes toward environmental management within Australia, the People's Republic of China and Indonesia", *Business Strategy and the Environment*, Vol. 18, pp. 16-29.
- Department of Industry Tourism and Resources (2007), "Encouraging enterprise: Growing business. A report on small business 2006-07", available at: <http://www.business.gov.au> (accessed 20 April 2008).
- Environmental Agency (2002), "How green are small businesses? A snapshot of environmental awareness and practice in small and medium enterprises (SMEs)", available at: <http://www.netregs.gov.uk/netregs/links/98674.aspx> (accessed 17 August 2007).
- Gadenne, D.L., Kennedy, J. and McKeiver, C. (2008), "An empirical study of environmental awareness and practices in SMEs", *Journal of Business Ethics*, Vol. 23 No. 5, pp. 45-63.

- Gerstenenfeld, A. and Roberts, H. (2000), "Size matters: barriers and prospects for environmental management in small and medium enterprises", in Hillary, R. (Ed.), *Small and Medium Enterprises and the Environment*, Greenleaf, Sheffield, UK, pp. 106-118.
- Gonzalez-Benito, J. and Gonzalez-Benito, O. (2006), "A review of determinant factors of environmental proactivity", *Business Strategy and Environment*, Vol. 15, pp. 87-102.
- Hillary, R. (2000), *Small and medium enterprises and the environment*, Greenleaf, Sheffield, UK.
- Hitchens, D., Thankappan, S., Trainor, M., Clausen, J. and De Marchi, B. (2005), "Environmental performance, competitiveness and management of small businesses in Europe", *Tijdschrift voor Economische en Sociale Geografie*, Vol. 96 No. 5, pp 541-557.
- Hudson M., Lean J. and Smart P.A. (2001), "Improving control through effective performance measurement in SMEs", *Production Planning & Control*, Vol. 12 No. 8, pp. 804-813
- Inter-American Development Bank (2007), "The context of urban environmental management", available at: www.iadb.org/sds/ENV/site_7024_e.htm (accessed 20 April 2008).
- Jennings, S.F. and Moore, S.A. (2000), "The rhetoric behind regionalization in Australian natural resource management: myth, reality and moving forward", *Journal of Environmental Policy & Planning*, Vol. 2, pp. 177-191.
- Karp, I. (2003), "Socially responsible leadership", *Foresight*, Vol. 5 No. 2, pp. 15-23.
- Katos, G. and Nathan, S. (2004), "SME Delivery Mechanisms - Presentation of Key Quantitative Research Insights", available at: www.sustainability.vic.gov.au/resources/documents/04_sept_15_TQA_fin_report (accessed 26 April 2007)
- Lane, M.B., McDonald, G.T. and Morrison, T.H. (2004), "Decentralisation and environmental management in Australia: A comment on the prescriptions of The Wentworth Group". *Australian Geographical Studies*, Vol. 42 No. 1, pp. 103-115.
- Marshall Report (1998), *Economic instruments and the business use of energy*, Government Task Force on the Industrial Use of Energy, London.
- Masurel, E. (2007), "Why SMEs invest in environmental measures: Sustainability evidence for small and medium enterprise", *Business Strategy and the Environment*, Vol. 16, pp. 190-201.
- McKeiver, C. and Gadenne, D. (2005), "Environmental management systems in small and medium businesses", *International Small Business Journal*, Vol. 23 No. 5, pp. 513-537.
- Mercer, D. and Jotkowitz, B. (2000), "Local agenda 21 and barriers to sustainability at the local government level in Victoria, Australia", *Australian Geographer*, Vol. 31 No. 2, pp. 163-181.
- Mir, D. F. (2008), "Environmental behaviour in Chicago automotive repair micro-enterprises (MEPs)", *Business Strategy and the Environment*, Vol. 17 No. 3, pp. 194-207
- Mir, D.F. and Feitelson, E. (2007), "Factors affecting environmental behavior in micro-enterprises: laundry and motor vehicle repair firms in Jerusalem", *International Small Business Journal*, Vol. 25 No. 4, pp. 383-415.
- Mohai, P. (1992), "Men, women, and the environment: An examination of the gender gap in environmental concern and activism", *Society and Natural Resources*, Vol. 5, pp. 1-19.
- Naffizger, D.W., Ahmed, N.U. and Montagno, R.V. (2003), "Perceptions of environmental consciousness in the US small business an empirical study", *SAM Advanced Management Journal*, Vol. 68 No. 2, pp. 23-32.

- Noren, H. and von Malmborg, F. (2004), "Are standardized EMSs useful in local authorities? A study of how a tool from the private sector is used in the public sector", *Business Strategy and the Environment*, Vol. 13, pp. 187-197.
- Parker, C.M., Redmond, J. and Simpson, M. (2009), "A review of interventions to encourage SMEs to make environmental improvements", *Environment and Planning C: Government and Policy*, Vol. 27 No. 2, pp. 279-301.
- Peters, M. and Turner, R.K. (2004), "SME environmental attitudes and participation in local scale voluntary initiatives: some practical applications". *Journal of Environmental Planning and Management*, Vol. 47 No. 3, pp. 449-473.
- Pimenova, P. and van der Vorst, R. (2004), "The role of support programmes and policies in improving SMEs environmental performance in developed and transition economies", *Journal of Cleaner Production*, Vol.12 No. 6, pp. 549-559.
- Redmond, J., Walker, E. and Wang, C. (2008), "Issues for small business with waste management", *Journal of Environmental Management*, Vol. 88, pp. 275-285.
- Revell A. (2003), "Environmental policy and the small firm in Japan: Comparisons with the Netherlands", *Journal of Environmental Policy and Planning*, Vol. 5 No. 4, pp. 397-413.
- Revell, A. and Blackburn, R.A. (2007), "The business case for sustainability? An examination of small firms in the UK's construction and restaurant sectors", *Business Strategy and the Environment*, Vol. 16 No. 6, pp. 404-420.
- Revell, A. and Rutherford, R. (2003), "UK environmental policy and the small firm: broadening the focus" *Business Strategy and the Environment*, Vol. 12 No. 1, pp. 26-35.
- Runhaar, H., Tigchelaar, C., and Vermeulen, W.J.V. (2008), "Environmental leaders: Making a difference. A typology of environmental leaders and recommendations for a differentiated policy approach", *Business Strategy and the Environment*, Vol. 17, pp. 160-178.
- Simpson, M., Taylor, N. and Barker, K. (2004), "Environmental responsibility in SMEs: does it deliver competitive advantage?" *Business Strategy and the Environment*, Vol. 13 No. 3, pp. 156-171.
- Tilbury, D., Adams, K. and Keogh, A. (2005), *A national review of environmental education and its contribution to sustainability in Australia: business and industry education*, Report 4, Australian Government Department for the Environment and Heritage and Australian Research Institute in Education for Sustainability, Canberra.
- Tilley, F. (1999), "The gap between the environmental attitudes and the environmental behavior of small firms", *Business Strategy and the Environment*, Vol. 8, pp. 238-248.
- Vernon J., Essex S., Pinder D. and Curry K. (2003), "The 'greening' of tourism micro-businesses: outcomes of focus group investigations in South East Cornwall", *Business Strategy and the Environment*, Vol. 12 No. 1, pp. 49-69
- von Malmborg, F. (2007), "Stimulating learning and innovation in networks for regional sustainable development: the role of local authorities", *Journal of Cleaner Production*, Vol. 15 No.17, pp. 1730-1741
- Walker, B., Redmond, J. and Strahan, B. (2009), *Small business and environmental management: Its value and importance*, Small and Medium Enterprise Research Centre, Joondalup, Western Australia.
- Walker, E.A., Redmond, J. and Wang, C. (2008), "Waste recycling – Local methods for successful interaction with small business" *International Journal of Environment and Sustainable Development*, Vol. 7 No. 4, pp. 362-382.
- Wilkie, D. (2009), "Fire fuels waste facility's woes", Western Australian Business News June 4-10, available at: www.wabusinessnews.com.au (accessed 15 August 2009).

- Williamson, D., Lynch-Wood, G. and Ramsay, J. (2006), "Drivers of environmental behaviour in manufacturing SMEs and the implications for CSR", *Journal of Business Ethics*, Vol. 67 No. 3, pp. 317-330.
- Wolf, A., Eklund, M., and Soderstrom, M. (2007), "Developing integration in a local industrial ecosystem – an exploration approach", *Business Strategy and the Environment*, Vol. 16, pp. 442-455.

Appendix A

Table 3. Waste produced by Small Firms in 2 Locations in one week.

Product	Producers		Kg		m ³		Units		Litres	
	A	B	A	B	A	B	A	B	A	B
Metals										
Steel	95	113	109774	44142						
Other metals	29	27	1559	1575						
Plastics										
Polystyrene	3	5			2	14				
Plastic drums	49	19			24	43				
Shrink wrap	73	39			30	58				
Car bumpers	7	7					12	13		
Other plastic	15	13			10	251				
Card & paper										
Combined	173	165			98	137				
Wood										
Solid timber	57	14			11	43				
Pallets	26	19					25	37		
Dust	21	15			15	55				
Particle board	16	10			12	13				
MDF	15	10			8	9				
Liquids										
Oil	31	66							985	5239
Radiator coolant	11	24							127	905
Paint	3	2							3	1
Thinners	7	9							72	139
Degreasers	5	19							38	195
Rubber										
Tyres	6	28					459			
Rubber buffed	1	0			1200					
Glass										
Combined	8	7			3	15				
Other waste										
Vehicle batteries	13	43					50	97		
Electronic	2	1			3	0.2				

Table 4. Waste sent to landfill by small firms in two locations in one week.

Product	Landfill % of waste Location A	Landfill % of waste Location B
Metals		
Steel	14	0.2
Other metals	0.7	0
Plastics		
Polystyrene	100	100
Plastic drums	39	14
Shrink wrap	91	66
Car bumpers	42	8
Other plastic	50	20
Card & paper		
Combined	51	33
Wood products		
Solid timber	65	13
Pallets	68	73
Dust	87	17
Particle board	100	61
MDF	100	87
Liquids		
Oil	0	.003
Radiator coolant	0	36 ^c 0.6 ^b
Paint	0	83
Thinners	0	0.2 ^b
Degreasers	26 ^a	3 ^b
Rubber		
Tyres	.005	15
Rubber buffed	0	0
Glass		
Combined	100	93
Other waste		
Vehicle batteries	.06 ^b	0
Electronic	33	100