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## **BARRIERS TO THE IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PRACTICES BY SPECIALIST ACCOMMODATION OPERATIONS IN FAR NORTH QUEENSLAND**

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### **ABSTRACT**

This paper discusses the situational variables affecting the implementation of environmental management practices by specialist (or boutique) accommodation operators located near protected areas in Far North Queensland. The styles of accommodation included in the study are owner-operated bed & breakfasts, farm stays, cottages and cabins, licensed public hotels, ecolodges, retreats and spas, caravan and camping parks, backpacker hostels and houseboat operations. The environmental management practices examined within the study are water conservation, energy management, liquid waste and solid waste management, sustainable design and other sustainable practices. From a survey sample of 101 specialist accommodation operations, 30 owners were personally interviewed at their establishment to better understand key factors affecting the implementation of environmental management practices for conservation and sustainability. These findings are related to the Framework of Environmental Behaviour (Barr, 2004). Environmental management techniques that are both simple and cost-effective are often implemented by specialist accommodation operators. However, situational factors such as cost, lack of knowledge, climatic conditions, available municipal infrastructure and legislation appear to impede the uptake of some sustainable management practices. This research is part of a wider doctoral study examining the environmental attitudes and ecological sustainability of specialist accommodation operators located near protected areas in Far North Queensland.

### **KEYWORDS**

Environmental management techniques, Framework of Environmental Behaviour, North Queensland, specialist accommodation operations

### **INTRODUCTION**

With increased interest in nature-based tourism, the specialist accommodation sector is meeting demand for small or boutique styles of accommodation. Specialist accommodation is characterised by five key qualifying criteria (Morrison, Pearce, Moscardo, Nadkarni & O'Leary, 1996). These criteria are 1) a personal interaction between the guests and owner-hosts; 2) a special opportunity or advantage is offered to guests through location, features of the establishment, or services; 3) special activities are offered to guests; 4) owner-operated; and 5) small guest accommodation capacity (less than 25 rooms). Specialist accommodation operations include bed and breakfasts, farm stays, cottages and cabins, caravan parks, houseboats, guesthouses, backpacker hostels and licensed public hotels (Beeton, 1998; Wight, 1997; Morrison, et al, 1996). There are an increased number of these styles of specialist accommodation establishments located near or neighbouring protected areas in regional areas of Australia. The growth of this style of accommodation is parallel to the increasing interest in protected areas, nature-base attractions and the visitor's desire to learn about the natural environment. Nature-based tourism is any type of tourism, including adventure tourism, that relies on attractions directly related to the natural environment (Tourism Victoria, 2006). Participation in nature-based tourism is significant, with approximately 45% of domestic visitors indicating they would prefer to stay more than three days in alternative accommodation styles such as a nature resort, lake retreat or holiday house (Australian Government, 2004). The objective of this paper is to identify the situational variables affecting the implementation of environmental management practices by specialist accommodation operators located near protected areas in North Queensland.

### **ENVIRONMENTAL MANAGEMENT IN TOURISM**

Tourism can act as a vehicle for promoting environmentally and socially responsible attitudes and behaviour (Hawkes & Williams, 1993). Much has been said about the benefits of environmental management for the conservation, protection and ecological sustainability of the nature-based tourism industry (Pigram, 1997, 2000; Hawkes & Williams, 1993; Wight, 1993). There is a suite of environmental management techniques suitable for the greening of the specialist accommodation sector to achieve future sustainability. Voluntary codes of conduct and environmental certification schemes (e.g. Ecotourism Australia, Green Globe, AAA Tourism) have contributed to the establishment of benchmark standards in water

conservation, energy management, waste management, sustainable design and other sustainable practices for the accommodation sector.

The concept of sustainability within the tourism sector implies meeting current uses and demands without impairing natural and cultural heritage systems or future opportunities for their collective enjoyment. Within the development stage of a specialist accommodation facility, sustainable design and sustainable use and disposal of water, energy, and waste need to be considered. Once the facility is operational, the implementation of environmental codes of conduct or voluntary environmental practices is recommended. Environmental education and interpretation offered to the guest, as part of the tourism experience, will further encourage the conservation and preservation of nature-based destinations (Crabtree & Newson, 2000; Beaumont, 2001). For nature-based tourism accommodation operators to express a conservation ethic and concern for the environment, a close examination of internal practices such as environmentally sensitive infrastructure development, efficient use and conservation of natural resources, waste disposal and management, recycling, air quality and emissions, green purchasing policies, and locally produced foods and goods should be considered (Tourism Queensland, 2002; Wight, 1993). Evaluation and continuous monitoring of environmental management techniques in place should be a routine exercise ensuring minimal impact on surrounding natural areas. The key principle of environmental management is to minimize negative impacts and maximise positive benefits. Environmental excellence is fostered by management practices which incorporate new, cleaner or alternative technologies, and has an emphasis on resource conservation, recycling, reuse and recovery, in continuous progress towards sustainability (Pigram, 2000).

### **The Adoption of Environmental Management Practices**

Considering the dynamics of the tourism industry, voluntary approaches to environmental management practices are more appropriate for small businesses due to the small and possibly cumulative nature of tourism impacts from this size of business (Carter, Whitley & Knight, 2004). To voluntarily adopt environmental practice can be reduced to two, not necessarily exclusive extremes: motives driven by economic reasons and motives driven by ethics (Carter et al 2004). It appears from previous research there are four main motivations for the adoption of environmental management practices in the tourism industry. Firstly, to reduce costs (Buckley & Araujo, 1997; Firth & Hing, 2001) particularly implementing basic and easy to install techniques (e.g. energy efficient light bulbs; water efficient shower heads). Schaper and Carlsen (2004, p. 207) determine "the simplest environmental improvement programs, and those with the greatest obvious financial return, are more likely to be undertaken than more complex measures whose benefits are hard to quantify". Secondly, there is a desire to conserve natural resources (Middleton & Hawkins, 1998; Carlsen, Getz & Ali-Knight, 2001). This is often the reason for many small family businesses in rural areas establishing a tourism accommodation venture and indicatively these operators have a strong personal interest in heritage and nature conservation. It is in the long-term self interest of tourism operators to conserve and maintain renewable resources before environmental impacts cause damage to their own survival (Schaper & Carlsen, 2004). Thirdly, compliance with legislative requirements or tourism association codes of conduct may dictate the implementation of environmental management techniques (Middleton & Hawkins, 1998; Schaper & Carlsen, 2004). Lastly, there is a desire to "act as good neighbours" (Middleton & Hawkins, 1998), that is, having a social responsibility or ethics towards the sustainability of the environment (Tzschentke, Kirk & Lynch, 2004; Donovan & McElligott, 2000). Social responsibility or ethics are also a prime reason for the adoption of sustainable practices, albeit, "the responsible thing to do" (Horobin & Long, 1996; Tzschentke, et al 2004; Donovan & McElligott, 2000).

However, Vernon, Essex, Pinder and Curry (2003) indicate many of these smaller tourism operations tend to have a limited realisation of their individual and collective impacts on the environment, and where environmental measures have been implemented, financial and practicality factors are important considerations in adopting environmental best practice. However, issues such as a lack of knowledge and resources, compliance obligations and consumer recognition can have a significant impact on the extent to which environmental management systems and practices are effectively implemented in the small tourism business sector (Carter et al, 2004).

### **Limitations of Environmental Management Techniques**

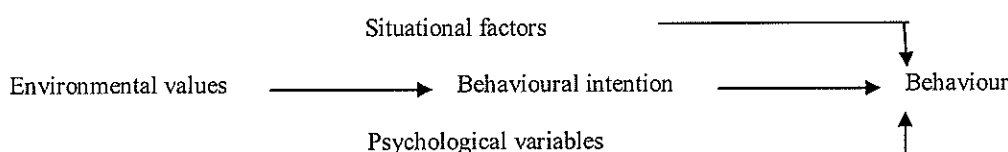
The various reasons for a slow, minimal or no uptake of environmental management practices in the tourism industry by operators have previously been discussed. There is often a genuine concern for the environment from individuals, but there remains an issue as to why some individuals do not adopt easy to implement environmental actions or those that require little change in lifestyle and habit (Barr, 2004). For the small home-based tourism accommodation sector, the adoption and operationalisation of environmental management techniques may appear difficult. Limited resources, limited knowledge and lack of expertise are indicated as impeding the improvement of environmental practice implementation by many small businesses (Vernon, et al, 2003; Donovan & McElligott, 2000). Related to this lack of knowledge, perceptions that any improvements might have minimal environmental effects and complacency (Barr, 2004; Hillary, 2000), the benefits of improved environmental performance may not be easily identifiable for many small firms (Hillary, 2000). The perceived costs of changes may act as a disincentive, and operators may genuinely be unable to raise the capital necessary to fund any

change in environmental practices (Barr, 2004; Donovan & McElligott, 2000; Wei & Ruys, 1999). There are also those who are willing to accept some environmental damage in order to increase their personal income (Dewhurst & Thomas, 2003). Others indicate many small tourism operators establish tourism ventures to mainly support their lifestyle goals and if there is a conflict between the maintenance of lifestyle or environmental management practices for conservation, the lifestyle will often win (Carlsen et al, 2001). Other reasons identified for not implementing environmental management techniques include time, a lack of interest by the operator, perceptions that service quality will be reduced (Donovan and McElligott, 2000), and not being a member with a tourism or trade association may result in small tourism operations remaining unaware of current best practice environmental management options (Stabler & Goodall, 1997).

The above are all internal factors which may affect the improvement or implementation of environmental management techniques; however there are external factors also considered to impede on the adoption of environmental management practices by tourism accommodation operations. Firstly, climatic conditions and geographical location will affect the type and extent of environmental management practices that can be installed (Buckley, 2003; Barr, 2004). Secondly, the availability and access to municipal waste and water infrastructure needs must be considered (Buckley, 2003; Barr, 2004). Costs, knowledge, personal perceptions and external factors have explained various reasons why small tourism operations often fail to adopt best practice environmental performance, or even simply improve their performance beyond the current levels.

### The Framework of Environmental Behaviour

Based on the Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1980), the Framework of Environmental Behaviour (Figure 1) includes situational and psychological values believed to predict an individual's intention to act environmentally (Gilg & Barr, 2005). Previous research has conceptualised environmental action around the intention-behaviour relationship (Barr, 2004; Hines, Hungerford & Tomera, 1986-1987). Barr (2003) determined from a review of environmental literature that environmental values, situational variables and psychological variables influence the essential intention-behaviour (behavioural intention) relationship for the implementation of environmental actions. Environmental values are an individual's personal orientations towards the environment and represent a general worldview of the natural environment (Barr, Ford & Gilg, 2003).



**Figure 1: Framework of Environmental Behaviour (Barr, 2004)**

Situational variables include at the basic level the service and availability of facilities that affect an individual's ability to act sustainably (Barr, 2004). Previous research also indicates socio-demographic variables (Hines et al, 1986-1987); an individual's involvement in other environmental actions (Barr, 2004); and knowledge of environmental problems plus the awareness of how to perform environmental behaviours (Barr, 2004), can all explain an individual's degree of environmental behaviour. Psychological variables (environmental attitudes) are perceptual and personality traits that determine an individual's overall attitude regarding environmental behaviour. Environmental attitudes "reflect the specific perceptions that individuals hold towards particular behaviours and have been used extensively to examine how people react to certain policy choices" (Gilg & Barr, 2005, p. 597). These include intrinsic motivation, subjective norms, concern for the environment, the extent to which an individual feels competent to perform an environmental action, and practical issues. Subjective norms refer to an individual's perception that most people who are of importance to the individual think they should or should not perform a particular behaviour (Ajzen, 1980, p. 57).

It appears from Barr's (2004) primary study of waste management (specifically recycling) behaviour and environmental values by 981 residents of Exeter, United Kingdom that certain environmental actions (for example, recycling) have become socially acceptable norms. Whilst there was a moderately strong relationship between stated intention and behaviour proven by Barr (2004), there are several factors influencing these two constructs. Barr's (2004) study indicates access to services; knowledge of behaviours and ecological consequence; and moral obligations underlie much of the behaviour-intention relationship held by citizens. The focus of this paper is identifying those situational variables within the Framework of Environmental Behaviour (Barr, 2004) that affect the implementation of environmental management techniques by specialist accommodation operators in North Queensland.

## METHODOLOGY

A study of 101 specialist accommodation operators located near protected areas, focused on the environmental management techniques adopted and an owner-operator's personal attitude towards ecological sustainability. Thirty (30) owner-operators from this sample were personally interviewed from November 2004 to May 2005 at their specialist accommodation located on the Atherton Tablelands, Daintree region or the Mission Beach region. All three regions are areas of ecological significance within the Wet Tropics World Heritage Area in North Queensland and within two hours driving distance from Cairns, a popular tourist destination. The Atherton Tablelands are located to the west of Cairns rising to approximately 1000 metres above sea level having tropical rainforest, waterfalls and significant wildlife species such as the Lumholtz tree kangaroo, platypus, and endemic possum species. Mission Beach to the south of Cairns is characterised by significant rainforest cassowary habitat adjacent to beaches. The Daintree region is also known for its World Heritage listed rainforests at Cape Tribulation and Mossman and limited development north of the Daintree River. Interviews were held with the owner-operators of specialist accommodation operations at the Atherton Tablelands (n=15), Daintree region (n=9) and Mission Beach region (n=6). Table 1 shows the styles of specialist accommodation operators interviewed within each region from the survey respondents. The average size of the establishments is 5.8 rooms.

**Table 1: Survey Respondents and Interviews by Specialist Accommodation Style**

	Atherton Tablelands		Daintree		Mission Beach	
	Survey	Interview	Survey	Interview	Survey	Interview
Ecolodge	6	-	5	1	-	-
Retreat	-	-	2	1	1	-
B&B	14	4	11	3	5	1
Farmstay	6	2	4	1	2	-
Cottages/Cabins	8	4	3	-	2	1
Caravan Park	8	3	6	3	5	2
Licensed Hotel	6	2	-	-	1	1
Backpackers	1	-	-	-	3	1
Houseboat	1	1	-	-	-	-
Other	-	-	1	-	-	-
<b>TOTAL</b>	<b>50</b>	<b>15</b>	<b>32</b>	<b>9</b>	<b>19</b>	<b>6</b>

Fifteen semi-structured interview questions focused on the adoption of environmental management practices, and an understanding of the situational factors also discouraging the implementation of various environmental management practices. Note taking was used to record responses throughout the interviews and memos were added directly after the interview. The three main stages of qualitative data analysis used involved a deductive approach of data reduction, display and the drawing and verifying of conclusions (Punch, 2005; Huberman & Miles, 1998). Data reduction is the representation of qualitative data into identifiable categories, themes and concepts (Jennings, 2001). Coding of the interview results in the qualitative data analysis process identified similar themes and concepts within the environmental management practices and allowed the situational variables impeding environmental management implementation to be identified.

## RESULTS

Overall, the implementation of environmental management practices is high and synonymous with the operators' personal concern for the surrounding natural environment within this specialist accommodation sample. Environmental management techniques predominantly in use at specialist accommodations are dual flush toilets (85.1%), the installation of ceiling fans only and not air conditioners (59.4%), energy efficient light bulbs (55.4%), and grey water reuse (21.8%). As well, operators purchase goods in bulk (78.2%) and locally (97.0%). Buildings take advantage of natural light (91.1%) and ventilation, while the landscaping reflects the surrounding environment (89.1%). Biodegradable cleaning products are used (85.1%) and regular mulching of gardens (80.2%) is undertaken for water conservation. The interviews held with the specialist accommodation operations in North Queensland focused on energy techniques, water management, waste management, purchasing practices, cleaning practices and gardening practices amongst other topics.

### Energy Management

The use of solar energy for power and hot water was indicated as inefficient and costly by 17 of the 30 interviewees. On the Atherton Tablelands, ten operators commented on the abundance of grey overcast days, installation costs and the style of accommodation which rendered this energy management technique as unsuitable. Comments typical of these reasons include "solar was decided against due to installation costs and the use of electricity still needed" was the response from one cottage operator and "solar is no good for the cloud cover is fairly constant" was proffered by a caravan park operator. A cottage operator targeting the couples market and providing spa baths in each cottage stated "Solar is not used due to the

worry of hot water running out on guests". In the Daintree region where rainfall is high, rainforest cover, cloud cover and cost were indicated as reasons for not installing solar hot water or power. An ecolodge operator summed up the situation and characteristic of the region by stating there is "not enough rainforest clearance for solar power and water". The cost of installing solar hot water or power was the most stated reason for not using this alternative energy management technique. As one farm stay operator on the Atherton Tablelands pointed out "the Queensland government pathetically give a rebate and grants for installing solar panels; I lobby Peter Beattie often". The use of generators for power is high north of the Daintree River where there is no state electricity supply and dense rainforest cover. Although not an optimum environmental management practice, generators are necessary with an estimated two million litres of diesel being taken across the Daintree River annually by residents and tourism operators.

Although a simple, efficient and easy to implement energy management technique, energy efficient light bulbs were found to be not viable by some operators with their shorter life span incompatible with the North Queensland climate and other sources of energy. One backpacker hostel operator in the Mission Beach region which also had a nightclub within the property stated "energy efficient light bulbs – try to keep in but keep on blowing quicker – apparently humidity and in the nightclub body heat and vibrations – they blow a lot". A Daintree caravan park operator with cabin facilities indicated "energy efficient light bulbs are not lasting with the generator – fluorescent tubes better". In consideration of guest comfort, this energy conservation technique was not used by a cabin operator who suggested "energy efficient light bulbs can't have a dimmer. Recessed lights replaced the fluorescent lights".

### **Water Management**

Regarding water management techniques, conversations revolved around the realities of installing rainwater tanks. A B&B operator in the Daintree region stated there is "no physical space for a rainwater tank and not viable, no access in the rainforest" and a Daintree caravan and cabin operator who had operated for more than 20 years was adamant, "rainwater tanks are not suitable – need too much. Low flow shower heads are not real good. Giardiasis is a problem when rain stops. It is hard to get guests to conserve water". In one town west of the Wet Tropics WHA, there is also the realities of high lime content in the water and rainfall usually only during the wet season. "Lime in the water causes hassles (calcium deposits) For example; lime content of water prohibits water evaporation coolers, tap aerators, lime on garden plant leaves. It builds up on the electric jug element - have to use rainwater in jug, supplied in every cabin fridge" stated a four-star cabin accommodation operator. In the Mission Beach area, similar comments were received for water management techniques. A characteristic statement is offered by one caravan park operator, "rainwater collection tanks wouldn't be useful and we haven't even had to put on sprinklers once in three years".

### **Waste Management**

Waste management techniques in all three geographical areas tended to be hindered by the lack of or limited kerbside recyclable rubbish collection. There is a general attitude that owner-operators are willing to participate in this important environmental management technique but "No recycle collection kerbside – so local council [are] not helping with recycling although would love to do this" and "recycling collection is not available roadside. Still collecting up aluminium cans – some guy was going to collect these before Christmas, still hasn't turned up and I have approached charity community groups, they are not interested" stated one caravan park operator. There are operators who will voluntarily separate recyclable rubbish and take this to the refuse depot themselves and often this is enabled by guests who will separate their rubbish of their own accord. Others indicated the size of the recyclable bins was inadequate for the volume of recyclable rubbish generated by guests, "the recycling bin is not large enough to accommodate all recyclable rubbish". In the Mission Beach region, similar comments were heard regarding roadside collection of recyclables with operators often keen to donate these to community groups for fundraising purposes. Similarly, a backpacker hostel operator indicated "we can't recycle due to any disposal / collection. Nowhere to store aluminium cans even if there was any community groups collecting and not been approached".

### **Other Sustainable Practices**

Gardening and organic gardening were also topics identified as having barriers to their successful implementation. More than 30% of the interviewed specialist accommodation operators indicated problems with native wildlife, white-tailed rats and feral pigs digging up and eating garden beds. Comments made by cottage operators included "vegetable gardens and fruit trees [are] hard to grow due to wildlife about – possums, wallabies, etc"; "not interested in growing fruit and vegetables – possums and wildlife into it all"; and "have own worm farm for food scraps but possum now trying to get into it". From eight caravan park operators interviewed, four of them also indicated similar problems "mulch always kicked out by scrub turkeys and wildlife – cost and labour not worth it"; "pigs and bandicoots get most compost"; "can't grow fruit and vegetables due to birds, wildlife, wallabies, rats, etc"; and "composting too hard – fish scraps in crab pots".

Finally, the reasons for not using environmentally friendly cleaning products were discussed. In all of the areas and in particular the Mission Beach and Daintree regions, the persistence of mould in these humid tropical areas was the reason for

the specialist accommodation operators' choices of cleaning products. Queries of biodegradable and alternative cleaning options such as vinegar and bi-carbonate soda being used were found to not be effective enough. "Mould is a constant problem, need to use bleach" stated one cottage operator and "mould grows quick due to the rainforest around" stated another B&B operator. Time was also indicated as a factor for the use of bleach instead, "Heaps of mould therefore really need to use bleach, tried vinegar but didn't really work and time is of essence in peak season" stated one caravan park operator in Mission Beach. The realities of employing casual staff were also highlighted by one licensed public hotel operator, "Enjo would be great but staff can easily use them for cleaning rags without thinking – they tore up new tea towels for cleaning cloths not that long ago". 'Enjo' cloths require no chemical cleaning agents with their use but are costly.

The qualitative interview results are indicative of the situational variables contributing to the lack of implementation of various environmental management techniques by some specialist accommodation operations. It appears the location and style of the specialist accommodation and external factors such as municipal facilities provided by local councils may either contribute to or limit the ecological sustainability of specialist accommodation operations located near protected areas in North Queensland. However, other internal factors should also be considered. A general consensus offered by one caravan park operator on the Atherton Tablelands is "environmental management is restricted by time and money".

## DISCUSSION

Installation costs, knowledge, personal perceptions and external factors have explained various reasons why small tourism operations often fail to adopt best practice environmental performance, or even simply improve their performance beyond the current levels (Barr, 2004; Buckley, 2003; Vernon, et al, 2003; Donovan & McElligott, 2000; Hillary, 2000; Wei & Ruys, 1999; Stabler & Goodall, 1997). Reviewing the qualitative results of this study it appears there are both internal and external situational factors affecting the implementation of various environmental management techniques. The 30 specialist accommodation operators interviewed appeared to be predominantly affected by external factors rather than internal factors. This may be a limitation of the study process which did not involve the measurement of an individual's knowledge or perception of environmental best practice methods. The results presented, however, may be classed into situational variables as shown in the Framework of Environmental Behaviour (Barr, 2004), where climatic conditions and geographical location (Buckley, 2003; Barr, 2004) can limit the adoption of environmental best practice. The situational factors indicated by the specialist accommodation operators can be divided into both internal and external variables. Internal situational factors include the style of accommodation (for example, separate dwellings to a main homestead); the incompatibility of some environmental management techniques with alternative sources of energy or the accommodation style; guest comfort; the employment of casual staff; cost; and available time. External situational factors include the tropical climate, lack of or limited kerbside recyclable collection and the availability of transfer depot stations for recyclable materials as suggested by Buckley (2003) and Barr (2004).

This study further indicated location and the tropical climate are also largely responsible for the inability to implement some environmental management techniques. For example, grey overcast days and rainforest cover were indicated as impeding the use of solar energy on the Atherton Tablelands and in the Daintree region. In the Chillagoe area west of the Wet Tropics, high lime content in the ground water affects the use of water management techniques such as low flow shower heads and tap aerators. Many of these specialist accommodation operations offer their guests the advantage of a special location (i.e. surrounded by tropical rainforest) and therefore there is little or no physical space for a rainwater tank or any other access in the rainforest. Another example of the location affecting the adoption of environmental management practices are the associated problems with native wildlife and feral pigs from nearby protected areas affecting gardening practices and the implementation of water conservation techniques in the garden, with animals digging up and eating garden beds. The tropical climate of North Queensland with high humidity impedes the use of biodegradable and natural cleaning products, particularly when trying to combat persistent mould and mildew on the accommodation establishment's walls. Humidity also affects the lifespan of energy efficient light bulbs. Differences in the situational factors influencing the decision to implement various environmental management practices by the different styles of specialist accommodation are related to the geographical location, climate variability, the owner's personal environmental concern, knowledge and understanding of environmental sustainability, and the style of accommodation.

## CONCLUSION

This paper has provided an insight into the reasons why specialist accommodation operators located near protected areas in North Queensland do not implement some environmental management practices for ecological sustainability. Based on the Framework of Environmental Behaviour (Barr, 2004), the situational factors include the level of guest service and availability of municipal facilities (e.g. recycling), involvement in other environmental actions, knowledge of environmental problems, and an awareness of performing environmental behaviours will all explain an individual's degree of environmental behaviour. Internal situational factors that appear to affect the adoption of environmental management

practices include not only the style of accommodation and the incompatibility of some environmental management techniques, but also guest comfort, staff and available time to research and implement specific best practice techniques. Expanding on the Framework of Environmental Behaviour, this study also indicates climate, the style of the accommodation, and geographical location can potentially affect the adoption of best practice environmental management techniques by this growing specialist tourism accommodation sector. Environmental protection agencies and local Shire councils responsible for the regulation of these owner-operated tourism establishments located near protected areas need to recognise these possible barriers and encourage suitable alternative environmental management practices for ecological sustainability.

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