Environmental Initiatives in the Hotel Industry: Environmental Certification and the Marginal Abatement Cost Curve (MACC)

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Climate change is a pressing issue that has and will continue affecting all industries and sectors. Some industries have used the Marginal Abatement Cost Curve (MACC) as an environmental-financial communication tool to decide which environmental initiatives to implement. This tool provides information on environmental initiatives with their associated costs in the form of positive and negative abatements. It is quite possible that the MACC can be adopted by the hotel industry. Currently, the hotel industry has tried to do their part by reducing the negative impacts by implementing environmental initiatives. Many types and areas of focus of environmental initiatives are available to hotels. These include environmental initiatives that would reduce and improve energy usage and efficiency, reduce waste, reduce water usage etc. The hotel industries' commitment to reducing its' negative impacts on the environment is strong. Environmental certification programs are considered one way in which hotels are actively showing environmental commitment. However, only a portion of hotels is certified under such programs. There exists hotels that are not certified under these programs, yet are still implementing sets of environmental initiatives.

This study sets to create industry-specific information in order to assist hotels in making decisions to adopt more environmental initiatives. In particular, the study will explore whether environmental certification programs influence the adoption rates of environmental initiatives in hotels and therefore to understand the reception of the MACC tool in the hotel industry. Study findings suggest that hotels that are environmentally certified under programs adopt more environmental initiatives than hotels that did not certify. The study notes that the level of interest for a proposed MACC in the hotel industry is low, but indicates that the possibility exists. Further, the improvement and development of environmental certification programs could assist and increase environmental initiatives adoption rates.

Key words: hotels, environmental certification, Marginal Abatement Cost Curve, environmental initiatives

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Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction

1.1 Background

Climate change affects all sectors and is caused by all sectors, including tourism. Tourism has become popular around the world and travel, including air travel, has increased due to tourism (UNWTO, 2009). In 2014, international tourism reached 1,135 million tourists, (UNWTO, 2014) and it is projected to increase further (UNWTO, 2015). In 2014, slightly over half of tourists travelled by air to their destinations (UNWTO, 2015). The UNWTO (2015) states that air travel has historically increased at a faster pace than other transportation methods. Air travel was the leading contributor of tourism-related Greenhouse Gasses (GHG) emissions, followed by other transportation and accommodation (UNWTO, 2007). Mitigation efforts in the form of sustainable tourism maybe a more viable option to reduce overall tourism GHG emissions in hotels. Examples of mitigation efforts include the development of cleaner energy production with renewable energy sources (Jainkun, Zhiwei & Da, 2012; VijayaVenkataRaman, Iniyan & Goic, 2012; Keleş & Bilgen, 2012). Further reduction could also be accomplished through environmental action, sustainability reports, and performance measurements (Jayawardena, Pollard, Chort, Choi & Kibicho, 2013).

Hotels play a significant part in facilitating the tourism process. Once tourists arrive at a destination, most require accommodation. Next to transportation, hotels are one of the largest contributors to GHG emissions (UNWTO, 2009). Environmental consumption in hotel buildings can contribute one-fifth of the tourism industry's five percent of global GHG emissions (Jayawardena et al., 2013). These tourism facilities are responsible for hosting tourists of all ages and at all hours (Deng, 2003); therefore, hotels have to provide facilities and services 24 hours a day, which make hotel operations energy intensive (Deng & Burnett, 2000).

With increased tourism in the past and projected further increases in tourism, sustainable tourism was developed to help tourist facilities overcome negative environmental impacts. Sustainable tourism is understood as "tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities" (UNWTO, 2011, p.1). Based on this understanding, hotels are also held to this standard.

Based on this definition of sustainable tourism, this research will focus on the environmental aspect of tourism impacts. Therefore, tools are needed to enable people and

organizations to decide which mitigation options should be prioritized to reduce the greatest amount of GHG while using the least amount of monetary investment. These mitigation options can be referred to as environmental initiatives. The two systems are environmental certification programs and the Marginal Abatement Cost Curve (MACC).

1.2 Energy usage in hotels

Hotels are one of the most energy intensive types of commercial buildings (Xuchao, Priyadarsini & Eang, 2010). In 1991, energy performance in several Ottawa, Canada, hotels was measured. A yearly average of 689 kWh/m^2 was reported (Zmeureau et al., 1994 as cited in Deng & Burnett, 2000). In 1995, energy usage was also reported for accommodation buildings in the United States. It was reported that 401 kWh/m^2 was used for electricity and gas (Energy Information Administration, 1995 as cited in Deng, 2003). Since then, the hotel industry worldwide was estimated to consume 97.5 TWh of energy in hotel facilities in 2001. The contribution of carbon dioxide emissions is estimated to be 160 kg of CO_2/m^2 to 200 kg of CO_2/m^2 annually (Hotel Energy Solutions, 2011).

In addition, the hotel on average consumes more resources as guests have the tendency to over-consume during their stays due to the non-responsibility of paying for utilities (Low Carbon Green Growth Roadmap for Asia and the Pacific, n.d.). This provides an even stronger argument as to why it is necessary for hotels to adopt environmental initiatives. Hotels that are located in colder and hotter areas would naturally consume more energy than those in milder climates (Wang, 2012). Consumption is also influenced by the thermal properties of the building envelope, efficiency of equipment, and the range of services provided.

Energy use in hotels, especially in hotter climates, can be attributed to lighting in hotel main buildings and in the outside area (Ali, Mustafa, Al-Mashaqbah, Mashal & Mohsen, 2008) and air conditioning (Deng & Burnett, 2000; Ali et al., 2008). Other areas of energy consumption are daily operations and recreational activities/facilities (Ali et al., 2008). Space heating, water heating, lighting, and cooling combined contribute to 75% of hotel's energy use (ENERGY STAR Building Manual, 2007). The large amounts of energy use within hotels are of growing concern for issues related to energy performance (Deng & Burnett, 2000) and natural resources use (Hunter, 2002). Due to the growing concern regarding energy use in hotels, there is a need

for environmental action to help reduce the environmental impacts caused by hotels and to reduce the impacts of tourism more broadly.

1.3 Environmental action in the hotel industry

Individual hotels in the hotel industry have voluntarily joined the movement to implement green environmental initiatives (Xu, Chan, & Qian, 2011; Zografakis, Gillas, Pollaki, Proylienou, Bounialetou & Tsagarakis, 2011). Environmental initiatives refers to deliberate actions that are intended to reduce the negative impact of certain activities and operations on the environment. Cost reduction and social responsibility appear to be driving forces in hotels (Tzschentke, Kirk & Lynch, 2004). Much of the past literature has focused on identifying the types of environmental initiatives that are currently adopted in hotels (Khemiri & Hassairi, 2005; Trung & Kumar, 2005; Nicholls & Kang, 2012b; Rahman, Reynolds & Svaren, 2012; Bohdanowicz, 2006; Knowles, Macmillan, Palmer, Grabowski & Hashimoto, 1999). Based on the findings of past literature, the environmental initiatives that have been prominent within the hotel industry around the world can be categorized as: energy efficiency retrofits, personnel training, technical upgrades, and environmental programs (Cheng & Fan, 2013, Khemiri & Hassairi, 2005; Nicholls & Kang, 2012a, Nicholls & Kang, 2012b, Rahman et al, 2012; Trung & Kumar, 2005). Although all categories of environmental initiatives are present in some form in hotels, not all hotels implement environmental initiatives from all categories.

There are deficiencies in literature and research related directly to environmental initiatives used in hotels in Canada. Furthermore, hotels may implement initiatives that are not suitable for their hotels. Therefore, more research needs to be conducted to provide a better understanding and identify, potentially, the most applicable environmental initiatives to implement in hotels within Canada.

1.4 Barriers inhibiting implementation of environmental initiatives in the hotel industry

The environmental literature has identified barriers inhibiting the implementation of environmental initiatives in the hotel industry. Barriers that were identified related to financial feasibility, staff attitudes, market response, and confusing eco-labels (Sloan, Chen & Legrand, 2009). Other potential barriers include information deficits, legislation, sustainability practices and costs, along with conflicting business priorities (Thuot Vaugeois & Maher, 2010).

Action needs to be taken in order to overcome barriers in hotels on the matter of environmental conservation. Areas that can be addressed include further enhancing the role of environmental champions, improving the level of commitment from upper management, educating and training hotel staff, bridging the information gap that exists, knowledge transfer of environmental information, and varying expectations from stakeholders (Halbe, 2013). It is evident that not all hotels will adopt the same environmental initiatives at the same time. This thesis will address the issue of bridging the information gap in hotels to improve environmental communication within and between hotels. In order to accomplish this, there are systems in place that cater to motivations thereby influences or dictates the environmental initiatives adopted by hotels. Therefore, it is paramount to understand how these motivations affect the adoption rates. Environmental certification programs and the application of the MACC will be of interest to assist environmental initiatives adoption rates.

1.5 Current progress in environmental sustainability

1.5.1 Environmental Certification Programs

Environmental certification programs in the hotel industry have been around for many years, starting in the 1980s and further developed in the 1990s (Font, 2002). Many of these programs are voluntary environmental certification programs, often developed by third-party organizations (Green Key Eco-Rating Program, 2015; GreenLeaders, 2014; Green Lodging Program, n.d.; EcoRooms & EcoSuites Certification Recognized by Industry Leaders, 2012; HospitalityGreen's Eco-Business Certification Program, 2011; Green Globe Certification, 2015; GS-33, n.d.). However, hotel chain programs (The 7 pillars of PLANET 21, n.d.; IHG Green Engage System, 2015; Carlson Hotels Worldwide Launches "Green Guide" Foundational Tool for Global Environmental Sustainability Program, 2008) and government related programs (Earn the ENERGY STAR for Your Hotel Properties, 2010; StayGreen Hotel Recognition Program, 2012) exist as well. These programs often focus on areas of energy saving, water saving, waste sorting and management, safe storage and correct handling of hazardous materials, noise control, and water discharge (Ayuso, 2007).

The business case for hotels to certify under an environmental certification program is well understood. A competitive advantage along with marketing benefits is associated with certifying hotels (Jarvis, Weeden & Simcock, 2010). Hotels will be able to reduce their energy,

water, and waste costs as a direct benefit of environmental programs (Bhaskaran, Polonsky, Cary & Fernandez, 2006; Pizam, 2009; Rivera & deLeon, 2005; Tzschentke et al, 2004; Tzschentke, Kirk, & Lynch, 2007).

Unfortunately, some hotels and guests may view environmental certifications in a negative light and may be deterred from associating with such programs. Further, the inconsistencies of minimum requirements across programs have posed a possible problem in certifying hotels (Rahman et al, n.d.), discouraging hotels from participating in certification programs.

With the arguments for both sides in mind, some hotels may choose to environmentally certify their hotel, while other hotels may decide against this course of action. It is possible that the two categories of hotels are equally environmentally sustainable. It is also possible that there is an environmental difference between the two categories of hotels. This thesis aims to compare environmental initiatives currently adopted by hotels to be able to assist hotels in increasing environmental initiatives adoption rates. These initiatives can also be considered and compared by individual hotels deciding on suitable environmental initiatives to implement. Decision support tools such as the MACC can be introduced to help this process.

1.5.2 Marginal Abatement Cost Curve (MACC)

The GHG MACC is a graphical diagram that presents information about specific environmental initiatives, the abatement potential associated with the environmental initiative, and the cost associated with the environmental initiative (McKinsey & Company, 2007b) (Figure 1). The MACC provides financial information in the form of bars that would communicate the net cost of each environmental initiative. Bars that are above the x-axis suggest that if the environmental initiative is adopted, it will cost the business. Conversely, bars below the x-axis suggest that if the environmental initiative is adopted, it will generate net benefits to the business (McKinsey & Company, 2007b).

The current use of the MACC is mostly at the national level (McKinsey & Company, 2015) with little use at industry level (Halsnaes, Mackenzie, Swisher & Villavicencio, 1994; Hasanbeigi, Menke & Price, 2010; Moran, Macleod, Wall, Eory, McVittie, Barnes, Rees, Topp & Moxey, 2011), especially in the hotel industry. Given, that the MACC has been used effectively at the national level to select and develop policy, there is an opportunity to present

this tool as a new method of information disseminating environmental and financial data to hotels at the operational level to reduce carbon dioxide emissions and operational costs. By introducing the MACC to the hotel industry, hotels would be provided with information that associates environmental performance to net costs enabling hotels to select environmental initiatives.

1.6 Rationale of the study

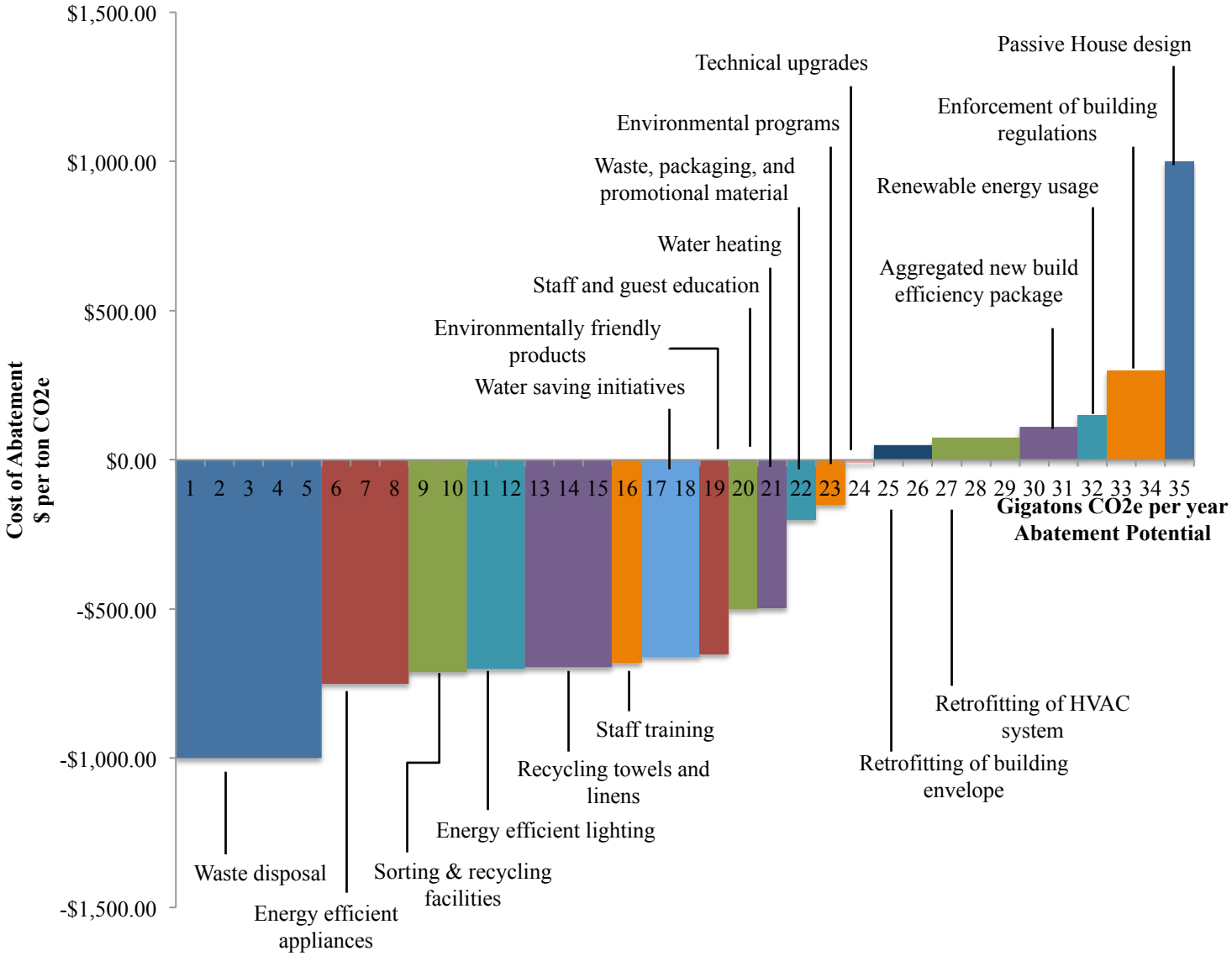
Research outcomes from this study will be of particular interest to academics and to hotel industry personnel who are interested in understanding which environmental initiatives would be feasible and suitable to adopt depending on the motivations of individual hotels. Different motivations would lead to hotels adopting different environmental initiatives. Environmental certification programs and financial outcomes are identified as motivators in adoption of environmental initiatives in hotels (Graci & Dobbs, 2008; Tzschentke et al, 2004). With the vast amount of environmental initiatives available to hotels, systems have been developed to assist hotels in deciding which environmental initiative to implement. Therefore, based on these findings in the past study, research outcomes will be twofold. First, this study will attempt to understand whether differences exist in hotels that are part of environmental certification programs and those that are not. Second, the research will introduce an environmental-financial decision support tool (MACC) that could assist in environmental initiatives selection and improve environmental decisions. Research outcomes will then be able to assist hotels in improving environmental initiatives adoption.

1.7 Goals and objectives of the research

The goal of the research is to examine environmental initiatives adoption rates to create industry-specific information to assist hotels in making decisions to adopt more environmental initiatives. To accomplish this goal, the objectives of the research are:

1. To identify environmental initiatives that are currently adopted by hotels;
2. To identify environmental certification programs that are available to hotels;
3. To review the business case and influence of environmental certification programs in hotels;
4. To measure whether hotels enrolled in environmental certification programs have different adoption rates than their counterparts; and
5. To understand the reception of the use of the MACC tool as an environmental-financial decision support tool to assist and increase adoption rates.

Figure 1: Mock Marginal Abatement Cost Curve demonstrating environmental initiatives and abatement costs



1.8 Thesis layout

Chapter two will review literature relevant to environmental initiatives in hotels, environmental certification programs, and use of the MACC. Chapter three will provide information on the methods used in the data collection and analysis processes. Chapter four will present the results and findings from data collected. Chapter five will then discuss the implications. Finally, chapter six will conclude the thesis by answering research questions, summarizing the research and its contributions (both practical and academic), and provide ideas for future research.

Chapter 2: Literature Review

With the increasing problem of climate change affecting all aspects of our lives, many industries around the world have become more environmentally conscious. The hotel industry has made several changes and adaptations to incorporate environmental initiatives throughout its operations. This includes the different environmental areas highlighting environmental champions. Sustainable tourism is an area explored by many hotels in becoming more environmental sustainable. Some hotels have adopted different systems that govern the certification of environmental initiatives while some have incorporated some types of initiatives while not adopting others. It is important to better understand how initiatives are chosen. Thus, the literature review will cover three themes: environmental initiatives that are currently implemented in hotels; types of environmental certification programs and motivations for enrolment in environmental certification programs; and the use of Marginal Abatement Cost Curve (MACC) as an environmental-financial support tool and other environmental communication tools. These themes will provide an understanding of sustainable tourism and the potential of the MACC to assist hotels in the levels of environmental initiatives adoption.

2.1 Types of environmental initiatives currently used by hotels

The intention of this first theme is to describe and determine the types of environmental initiatives currently implemented by hotels around the world. Similar environmental initiatives can be grouped together in terms of their function. Therefore the following theme will discuss environmental initiatives as placed in their groups. The groups include: energy environmental initiatives; waste environmental initiatives; water environmental initiatives; education environmental initiatives; purchasing environmental initiatives; program environmental initiatives; site environmental initiatives; and hotel environmental initiatives. Table 1 provides a summary of all environmental initiatives mentioned in the literature organized by location and environmental initiatives groupings. Table 1 also provides information regarding the literature's usefulness in the thesis.

2.1.1 Energy environmental initiatives

The Nicholls and Kang (2012a) study conducted in the Michigan lodging industry identified several energy related environmental initiatives. Energy Star-rated appliances were

used to some degree in 206 hotels. In another study, the Hilton Waterfront Beach Resort in Huntington Beach, CA implemented a "Green Room" where energy- and water-saving laundry equipment is available for guest use (Rahman, Reynolds & Svaren, 2012). In contrast, EnergyStar computer and other energy saving office equipment were found in other hotels (Trung & Kumar, 2005). Bohdanowicz (2006) also reported the use of energy efficient equipment in Sweden.

No general consensus of the preferred types of Energy-Star appliances was identified, nor where appliances were most frequently adopted. Further, it appears that the adoption of energy efficient appliances and electronics varies, however, it is more likely that hotels use some type of energy saving electronics or appliances as it is relatively easy to purchase. By switching out less energy efficient appliances and electronics, the hotel is essentially ensuring that all employees and guests are involved with energy reductions when using the appliance or equipment. However, guest behaviour can still influence the amount of energy savings as the guest may not turn off electronics and appliances when it is not in use, such as air conditioning and TV etc.

The use of energy efficient light bulbs was a popular energy related initiative identified in hotels, as shown in table 1. The replacement of less energy-efficient light bulbs with more energy-efficient light bulbs in guest rooms is frequently reported (Khemiri & Hassairi, 2005; Nicholls & Kang, 2012b; Rahman et al., 2012; Bohdanowicz, 2006). In some hotels in Vietnam, energy-saving lighting was only used in the entrance or lobby of the hotel, staircases and corridors, restaurants and guest rooms (Trung & Kumar, 2005). Replacing less energy efficient lighting with more energy efficient lighting in common areas is understandable as lighting in these areas are always turned on therefore energy savings in these areas may be the most beneficial. Cheung & Fan (2013) found that in the Langham Place Hotel Mong Kok Hong Kong (LPHKG) T8 lighting was replaced with T5 lighting both in the employee areas and common areas. The LPHKG also replaced their non-dimmable spotlights with LED spotlights to increase efficiency. Lights that were previously incandescent lamps were replaced with halogen lamps. Some lighting was retrofitted with compact fluorescent light (CFL) instead (Cheung & Fan, 2013). Motion sensors were also retrofitted, however, the location of these retrofits was not clear (Cheung & Fan, 2013).

Nicholls & Kang (2012b) reported that some hotels upgraded guest room power controls by the use of keycards. Similarly, Trung & Kumar (2005) found that a key-card or tag was used

to control the energy use in guest rooms. One issue with these electronic key-card control systems is the use of keycards or tags is not enforced and it is possible for guests to use similar cards instead of room cards to override this energy control. Another initiative was to upgrade motors to those with variable speed drives (Cheung & Fan, 2013). In addition, energy management was assigned to either the chief of engineering or vice director. Their duties included periodic (monthly or weekly) readings of energy consumption (Trung & Kumar, 2005).

2.1.2 Waste environmental initiatives

The Nicholls and Kang (2012b) study also found that hotels provided sorting and recycling facilities for waste in office spaces, kitchens, and guest rooms (Nicholls & Kang, 2012b); however, not all hotels provided all three sorting and recycling facilities (Nicholls & Kang, 2012b). In research by Rahman et al. (2012), recycling receptacles were also found in guest rooms at hotels from the American Hotel & Lodging Association. Bohdanowicz (2006) and Knowles, Macmillan, Palmer, Grabowski & Hashimoto (1999) also found the use of recycling or sorting facilities in hotels. Although sorting facilities may not be provided in all areas of the hotel, the hotel may still participate in recycling by either sending all waste to a sorting facility or by sorting through waste by staff. However, these studies do not mention these details.

In Rahman et al.'s (2012) study, regardless of hotels with more than or less than 100 rooms, some adoption of using reusable dishes, flatware, and napkins was found. It is not clear the proportions of reusable items used, however the study only found that this was done. Other reusable items were reported, however, it is unclear as to what these specific items were. In Poland and Sweden, hotels reused food and detergent packaging when possible (Bohdanowicz, 2006). Some hotels attempted to adopt proper disposal methods of waste, for example, oil, batteries, etc. (Nicholls & Kang, 2012b). The implementation of proper disposal methods may be governed by local laws and by-laws, making this initiative voluntary or mandatory.

With regards to reducing waste, packaging and promotional material, different environmental initiatives were implemented. Some hotels use green messaging in promotional literature (Nicholls & Kang, 2012b), whereas others would e-mail their promotional materials instead of sending paper material (Rahman et al., 2012). Some hotels tackled the issue of packaging by buying in bulk in hopes of reducing packaged material (Rahman et al., 2012).

Others have chosen to reduce packaging by returning dry cleaning without the plastic cover (Rahman et al., 2012). There was no general consensus on the approach to reduce packaging and promotional material. The mixed methods of approaches to reduction of promotional material or packaging could suggests that the knowledge base in this matter is not standardized, perhaps leaving room for development.

Another method of reducing waste was through donations. Some hotels donated good-quality leftover foods (Nicholls & Kang, 2012b), whereas others either donated leftover or used old furniture and old appliances or equipment (Rahman et al., 2012; Nicholls & Kang, 2012b; Bohdanowicz, 2006). The donation of various items around the hotel suggests that no general consensus is found.

By far, recycling seems to be the most popular waste environmental initiative. This is likely the case as it is relatively simple to implement and maintain. Other methods of waste reduction are potential environmental initiatives but are presented on a level that alters operations.

2.1.3 Water environmental initiatives

Water saving devices were a crucial part of the initiative in guest rooms (Trung & Kumar, 2005; Nicholls & Kang, 2012a; Cheung & Fan, 2013; Bohdanowicz, 2006). In particular, water saving sanitary equipment along with low flow toilets was used (Trung & Kumar, 2005). Guests would have no option but to use low flow toilets, making it mandatory for guests, increasing the effectiveness of the initiative. In addition, water-flow restricting valves were used on guest-floors to control water pressure (Trung & Kumar, 2005). The use of these initiatives would reduce water use due to the inability of guests to control these measures. Once the water-flow restricting valves is installed, the hotel ensures that once guests turn water devices on, water savings are automatic and does not rely on guests behaviours. However, the water savings associated with this environmental initiative is reliant on guest behaviours.

2.1.4 Education environmental initiatives

Education comes in many forms. One form of education is through educating guests on the different ways the hotels were being environmentally friendly (Bohdanowicz, 2006; Knowles et al., 1999). Another form of education is through staff education and training (Knowles et al.,

1999). Staff were trained to become more mindful of energy usage. When cleaning staff were in guest rooms, they were told to turn off lights, heaters, and air conditioners when rooms were unoccupied. Furthermore, they were trained to close all drapes in guest rooms during the summer months to prevent unnecessary heating (Rahman et al., 2012). Manually switching off lights, electronics, and appliances may be dependent on the individual staff. Staff could forget to perform this task during demanding times, lowering the effectiveness of the environmental initiative.

Education for staff or employees and guests were implemented in many different ways. In terms of staff or employee education, environmental training was provided to employees (Nicholls & Kang, 2012b). Other hotels targeted changes in employee behaviours (Khemiri & Hassairi, 2005). As environmental education was incorporated in employee training and became part of employees' jobs, environmental initiatives can be carried out routinely. In contrast, guest education was typically voluntary as guests were only provided with tips or suggestions to help the hotel increase its water and energy savings (Rahman et al., 2012). An issue with guest education would be the enforcement of these tips or suggestions, as they are voluntary and not mandatory. There is no way in which the hotel can oversee all guest action.

Furthermore, daily monitoring of water consumption (Khemiri & Hassairi, 2005) and controlling of temperature of water flowing to guest rooms was limited (Trung & Kumar, 2005). If leaks occurred, the Engineering Department of the hotel would be notified, which encouraged proper maintenance of the water system (Trung & Kumar, 2005). In addition, pipes, taps, showers, and water cisterns were checked on a monthly basis. Housekeeping staff were also told to pay attention to check for leaks and turn off taps when leaving guest rooms. Kitchen staff were told to turn the tap on only when needed (Trung & Kumar, 2005). Training staff to closely monitor water systems would reduce the unnecessary wastage of water, thereby positively affecting the environment. To reduce evaporation, gardens were watered in the early mornings or the late afternoons. Further, plants and flowers that were used for decoration were selected to be less water consuming (Trung & Kumar, 2005). Changing of watering patterns and adapting to daily weather cycles will be able to reduce the need of watering plants as much, in effect reducing the consumption of water.

2.1.5 Purchasing environmental initiatives

Purchasing is another grouping of environmental initiatives. Purchasing environmentally friendly products through environmental conscious vendors was one way to ensure environmental action (Nicholls & Kang, 2012b; Bohdanowicz, 2006; Knowles et al., 1999). In addition, hotels selected lower volatile organic compound (VOC) cleaning products to reduce their impacts to the environment and human health (Nicholls & Kang, 2012b). Before implementing the use of a specific kind of cleaner, an evaluation of the cleaners and chemicals, in terms of safety, was conducted (Rahman et al., 2012). Other hotels specifically purchased products that favoured the environment; for example, buying paper products that were either unbleached or bleached using a chlorine-free process (Rahman et al., 2012). Similarly, purchasing carpets or other furnishings made from recycled materials was found to be another way of purchasing environmentally friendly items (Nicholls & Kang, 2012b). Furthermore, hotels would buy recycled guest amenities in order to be environmentally friendly (Rahman et al., 2012).

Hotels who wish to contribute to the environment by sourcing from environmentally friendly companies will need to be wary of whether companies are truly environmentally friendly. This means that companies who simply state that they are environmentally friendly and provide no proof may contribute to the greenwashing problem. A good understanding of the sourcing company will avoid this issue.

2.1.6 Program environmental initiatives

Hotels often run programs that target different operational areas of the hotel. Recycling and reusing linens and towels program was presented as an environmental initiative (Nicholls & Kang, 2012b, Bohdanowicz, 2006; Knowles et al., 1999). In addition, organic linens and towels were purchased for hotel guest rooms (Nicholls & Kang, 2012b). These programs are usually simple to implement and monitor, however, difficult to make mandatory, which poses as a problem for hotels. Often, these reuse linens and towels programs signage are placed in the form of information leaflets or signs in guest rooms. Signs may be viewed as intrusive to guest privacy and comfort. Program signage does not oblige guests to follow directly; it is merely a suggestion of co-operation.

Similarly, the Hilton Waterfront Beach Resort in Huntington Beach, CA dealt with this issue in a slightly more proactive manner. They developed a recycling and reusing linens program (Rahman et al., 2012). Pillow cases were turned into dust rags, rejected linens became aprons, and the surplus of rejected linen and terry fabric were donated to homeless shelters (Rahman et al., 2012). This program ensures that the lifecycle of linens are extended. Furthermore, this program reduces the chance of human error where staff may forget to enforce certain environmental initiatives.

2.1.7 Site environmental initiatives

Environmental initiatives exists around and on the hotel grounds that help improve overall systems that are related to hotel operations. Hotels around the world have adopted renewable energy sources to help reduce the energy consumption from the country's energy source (Trung & Kumar, 2005; Cheung & Fan, 2013; Bohdanowicz, 2006; Dalton, Lockington & Baldock, 2008). In order to reduce the amount of electricity used for laundry, solar energy was adopted for drying cloth used in the hotel (Trung & Kumar, 2005). Further, a mixture of wind-based and solar-based energy was used to generate electricity. However, only heat energy generation used solar-based energy in Hong Kong (Cheung & Fan, 2013). Bohdanowicz (2006) found that hotels in Poland would change or modify building insulation to become more environmentally friendly. In London, the hotel's natural lighting was utilized (Knowles et al., 1999).

Environmental initiatives implemented related to the hotel grounds are not suitable to all locations as they are related to energy generation, which would mean these initiatives cannot be widely adopted by all hotels.

2.1.8 Hotel environmental initiative

Apart from site related environmental initiatives, environmental initiatives specifically related to the hotel building also provide environmental reductions. One program is the LEED certification (Nicholls & Kang, 2012b) that affected the hotel building. On the other hand, technical upgrades to hotel equipment were made in many hotels. However, not all hotels approached technical upgrades in the same manner. Khemiri & Hassairi (2005) found that hotels changed the transformer, installed daily energy consumption controls and combustion burners,

and installed a cooling system that used air instead of water-cooling towers. The initial cost of these environmental initiatives vary as well as the amount of environmental savings economically and reductions in terms of carbon dioxide. Therefore, the overall feasibility of environmental initiatives in different hotels may not be suitable. Different hotels operate differently and therefore technical upgrades will vary depending.

2.1.9 Others

Environmental programs or rating schemes were identified throughout the literature. These include external programs such as the Green Hotels Association (Nicholls & Kang, 2012b) and Energy 21 (Khemiri & Hassairi, 2005). External third party programs are available for hotels to participate in. As these programs are voluntary, not all hotels will participate based on this fact. Furthermore, as there are many environmental certification programs, it may be difficult for guests and hotels to fully understand which is truly environmental.

Environmental initiatives programs were implemented specific to hotels. These consisted of towel or linen reuse programs (Nicholls & Kang, 2012b), energy audits (Khemiri & Hassairi, 2005), water conservation campaigns (Khemiri & Hassairi, 2005), electricity tariff (Trung & Kumar, 2005), benchmarks (Trung & Kumar, 2005), and environmental certification programs (Nicholls & Kang, 2012a). The participation in these programs suggests that there are systems in place in hotels to help them determine which environmental initiatives or programs to implement. Since different hotels may require different standards, participation rates may not be reflective of the level of environmental friendliness of the hotel. In fact, it is possible that hotels may only be adopting standard environmental initiatives.

Table 1: Environmental initiatives identified in past studies, location, and usefulness of studies

Location of Study	Environmental Initiatives Groupings (Energy, waste, education, water, purchasing, program, site, hotel)	Usefulness in Relation to Current Study (Low, Medium, High)
American Hotel & Lodging Association, U.S. (Rahman, Reynolds & Svaren, 2012)	Energy = Energy efficient lighting, energy efficient appliances Waste = Sorting & recycling facilities, waste & packaging & promotional material Education = Staff training (energy savings), staff & guest education Purchasing = Environmentally friendly products Programs = Recycling towels & linens	High – sufficient number of environmental initiatives identified; location of study at close proximity
Poland (Bohdanowicz, 2006)	Programs = Towel reuse program Waste = Degreasing traps on kitchen discharge pipes, waste segregation and recycling, donation of hotel furniture and equipment, donation of leftover food, reusable food and detergent packaging Purchasing = Biodegradable detergents, purchasing in bulk, purchasing from local vendors Site = Change or modify heating system, change or modify fuel, change or modify building insulation Education = Guest education Water = Water efficient fixtures	High – sufficient number of environmental initiatives identified; location of study at close proximity
State of Michigan, U.S. (Nicholls & Kang, 2012a; Nicholls & Kang, 2012b)	Energy = Energy efficient appliances, energy efficient lighting Waste = Sorting & recycling facilities, waste & packaging & promotional material Purchasing = Environmentally friendly products Programs = Recycling towels & linens, environmental programs Education = Staff & guest education Site = Technical upgrades Water = Water saving initiatives	High – sufficient number of environmental initiatives identified; location of study at close proximity
Sweden (Bohdanowicz, 2006)	Energy = Energy efficient lighting, energy efficient equipment Waste = Sorting and recycling, reducing use of single packaging, getting rid of use of single packaging, donation of	High – sufficient number of environmental initiatives identified; location

	hotel furniture and equipment, donation of leftover food, reusable food and detergent packaging Programs = Responsible waste management campaigns, towel reuse program Purchasing = Environmentally friendly and biodegradable detergents and other chemicals, close cooperation with suppliers, purchasing in bulk, purchasing from local vendors Site = Incorporation of renewable energies Education = Guest education Water = Water efficient fixtures	of study at close proximity
Hong Kong (Cheung & Fan, 2013)	Energy = Energy efficient appliances Site = Renewable energy use, technical upgrades Water = Water saving initiatives	Medium – few environmental initiatives identified; location of study far from current study
Tunisia (Khemiri & Hassairi, 2005)	Energy = Energy efficient appliances Education = Staff & guest education Site = Technical upgrades Water = Water saving initiatives Programs = Environmental program	Medium – decent number of environmental initiatives identified; location of study far from current study
Vietnam (Trung & Kumar, 2005)	Energy = Energy efficient lighting Site = Renewable energy usage, technical upgrades Education = Staff & guest education Water = Water saving initiatives Programs = Environmental programs	Medium – decent number of environmental initiatives identified; location of study far from current study
Australia (Dalton, Lockington & Baldock, 2008)	Site = renewable energy supply	Low – article only covers one environmental initiative grouping
London, England (Knowles, Macmillan, Palmer, Grabowski & Hashimoto, 1999)	Energy = unidentified initiatives Hotel = Natural lighting Waste = Reduction in waste, recycling Education = Some staff education, some guest education Programs = Towel reuse program Hotel = Some in-house environmental audit Purchasing = Some purchasing from environmentally friendly vendors	Low – specific environmental initiatives are not identified, only the areas covered; article is relatively old therefore possibility that much has changed

Table 1 provides a summary of past studies that present information on environmental initiatives in the hotel industry around the world and their usefulness to this study. Based on the table above, environmental initiatives adopted by hotels are not necessarily dictated by the location. However, location may dictate the number of environmental initiatives adopted rather than the types of initiatives adopted.

It is clear that there is evidence of adoption of environmental initiatives in the hotel industry. These environmental initiatives can be placed into different groups, such as energy, waste, education, water, purchasing, program, site, and hotel. There is no restriction on which environmental initiatives hotels will implement. Within these groupings, environmental initiatives can also be looked at in terms of location. From the above, it is clear that environmental initiatives adopted in hotels are not determined by location, but the possibility of something governing the implementation selection. As mentioned previously, environmental certification programs act as a method to assist hotels in deciding which environmental initiatives to implement. Therefore the following theme will discuss environmental certification programs and motivations & barriers towards these programs.

2.2 Environmental Certification Programs

The use of environmental certification programs around the world has increased over time (Graci & Dodds, 2008). Different types of environmental certification programs exist; however, not all of these programs pertain to the hotel industry. Therefore, it is important to distinguish and discuss those that pertain specifically to hotels. Often, a third party organization provides these programs and certifications for hotels; however, government and individual hotel companies offer certification programs as well.

2.2.1 Third Party Certification

2.2.1.1 Green Keys Global Eco-Rating Program

The Green Keys Global Eco-Rating Program is a North American program that evaluates and certifies properties based on their level of environmental initiatives (Green Key Eco-Rating Program, 2015) in North America in more than 20 countries (Green Key Global FAQs, 2015). This program provides a self-assessment for hotels, motels or resorts based on their environmental performance. The self-assessment covers five operational areas and nine areas of

environmental practices. The five operational areas are: corporate environmental management, housekeeping, food & beverage operations, conference & meeting facilities, and engineering. The nine areas of environmental practices include energy conservation, water conservation, solid waste management, hazardous waste management, indoor air quality, community outreach, building infrastructure, land use, and environmental management (Green Key Eco-Rating Program, 2015).

The self-assessment consists of 160 questions, where each question is designed to carry a specific point value, which is assigned based on the potential environmental or social impact of the initiative. The number of environmental initiatives adopted will translate to a percentage, which will then award the hotel with 1 to 5 Green Keys. The awarding of 1 Green Key means that the hotel has adopted 1%-19.9% of environmental initiatives identified in the survey, 20%-39.9% adoption results in 2 Green Keys, 40%-59.9% equals 3 Green Keys, and 60%-79.9% 4 Green Keys. Hotels that have been awarded the highest number, 5 Green Keys, will have adopted 80%-100% of environmental initiatives in the survey (Green Key Global FAQs, 2015). As each question is weighted with a specific point value, different hotels may have adopted different environmental initiatives to achieve the same level of Green keys.

According to Green Keys Global, the 2015 listing includes 1,686 hotels participating in the Eco-Rating Program. Of these 1,686 hotels, 12 hotels have been awarded with 1 Green Key, 210 have been awarded with 2 Green Keys, 748 hotels have been awarded with 3 Green Keys, 669 hotels have been awarded with 4 Green Keys, and 47 hotels have been awarded with 5 Green Keys (Green Key Global FAQs, 2015).

2.2.1.2 GreenLeaders by TripAdvisor

Another third party organization that offers environmental certification is the GreenLeaders Program by TripAdvisor. This program provides a tool for hotels and B&B's to self-assess their properties based on their level of adoption of environmental initiatives (How are GreenLeaders Applications Scored, 2014). This program was developed with assistance from several industry experts providing information and expertise regarding environmental programs. GreenLeaders Program is currently eligible to hotels and B&B's from North America, Europe, Pacific, Central America, South America, and The Caribbean (How can I apply to be a GreenLeader, 2014). The areas of environmental focus are energy, water, purchasing, waste, site,

and education and innovation (GreenLeaders Survey, n.d.). These areas of focus appear to be similar to the Green Keys Eco-Rating Program.

Participating hotels are awarded one of five tiers based on their self-assessment survey. To be eligible for the first tier, hotels must satisfy a minimum set of requirements or GreenPartner. The minimum set of requirements include implementing a linen and towel re-use program, tracking energy usage on a regular basis, recycling practices, installing energy efficient light-bulbs, and educating both staff and guests on environmental practices (What are the levels of the GreenLeaders program, 2014). Once these minimum requirements are reached hotels will earn the GreenPartner tier. Hotels who wish to gain a higher tier can implement more environmental initiatives to improve environmental participation.

To attain a badge level of bronze, silver, gold, or platinum, hotels must meet minimum requirements and more (What are the Levels, 2014). To attain a bronze level hotels will have to meet the minimum requirements and also achieve a 30% score on the survey. To be a silver level GreenLeader, hotels will have to meet the minimum requirements and a 40% score on the survey. To be a gold level GreenLeader, hotels will be required to meet the minimum requirements and a 50% score on the survey. Finally, hotels that meet the minimum requirements and a score of 60% on the survey will attain a platinum level GreenLeader (What are the levels of the GreenLeaders program, 2014).

2.2.2 Hotel Programs

2.2.2.1 Planet 21

PLANET 21 is a certification by AccorHotels Group that assists hotels in becoming more environmentally friendly. This certification program is available to hotels that are part of the AccorHotels' chain. AccorHotels' PLANET 21 Program is developed around 7 pillars and 21 commitments. Each pillar involves three commitments that assist hotels in improving their social and environmental aspects. Furthermore, the AccorHotels Group has set quantifiable targets each year for all hotels to achieve. These targets are based on the commitments mentioned under each of the 7 pillars.

The 7 pillars are 'health', 'nature', 'carbon', 'innovation', 'local', 'employment', and 'dialogue' (The 7 pillars of PLANET 21, n.d.). Within the 'health' pillar, the three commitments are to ensure healthy interiors, promote responsible eating, and prevent diseases (Health, n.d.).

Inthe ‘nature’ pillar, the three commitments are to reduce water use, expand waste recycling, and protect biodiversity (Nature, n.d.). In the ‘carbon’ pillar, the three commitments made are to reduce energy use, reduce CO^2 emissions, and increase the use of renewable energy (Carbon, n.d.). In the ‘innovation’ pillar, the three commitments are to encourage eco-design, promote sustainable building, and introduce sustainable offers and technologies (Innovation, n.d.). In the ‘local’ pillar, the three commitments are to protect children from abuse, support responsible purchasing practices, and protect ecosystems (Local, n.d.). In the ‘employment’ pillar, the three commitments are to support employee growth and skills, make diversity an asset, and improve quality of worklife (Employment, n.d.). Finally, in the last pillar, the ‘dialogue’ pillar, the three commitments are to conduct business openly and transparently, engage franchised and managed hotels, and share commitments with suppliers (Dialogue, n.d.).

2.2.2.2 InterContinental Hotels Group (IHG) Green Engage System

The IHG Green Engage System is a system that engages hotels within the IHG chain and recognizes progression and performance of individual hotels (IHG Green Engage System, 2015). This system allows hotels to track their everyday practice, which tracks energy, carbon, and water (Designed for sustainability, 2015). Hotels enrolled in this system will be rated and given one of three levels. By 31st December 2015, all hotels in the IHG must be enrolled and reach Level 1 certification of this system (IHG Green Engage System, 2015). To reach Level 1 certification, hotels must satisfy 10 Green Solutions within the Green Engage System (O’Neill, 2014). However, it appears that there are no fixed 10 Green Solutions that are required from a list of solutions. Information is provided for hotels regarding each Green Solution, including a step-by-step implementation guide that provides financial information, case studies, and contexts of each Green Solution (Maloney, 2014). Information about the specifics of this program was difficult to locate through websites and direct areas that are targeted by hotels was not identified. However, the flexible nature of this system allows a variety of hotels to engage with simplicity.

2.2.3 Other Environmental Programs

2.2.3.1 Graduated grading system

Similarly, the Green Concierge Project provides hotels with the opportunity to participate in HospitalityGreen’s Eco-Business Certification. Hotels that participate will achieve one ofthree

tiers, bronze, silver, or gold. The program provides a tracking tool that quantifies resource savings or use for the hotel. The Eco-Business Certification audits performance improvements in the areas of resource use, conversation, and environmentally friendly practices (HospitalityGreen's Eco-Business Certification Program, 2011).

The Green Globe Certification is based out of the US, assessing industry sectors in more than 30 countries including North America (Green Globe contact in your region, 2015). This certification focuses on the sustainability performances of the travel and tourism industry. The Green Globe Standard covers 44 mandatory core criteria, which is supported by over 380 compliance indicators. Depending on the location of the applicant, the indicators will vary (Green Globe Certification, 2015). The four main criteria and indicators fall in the categories of 'sustainable management', 'social/economic', 'cultural heritage', and 'environmental' (Standard Criteria and Indicators, 2015).

The StayGreen Program is one that is offered by the Illinois Hotel & Lodging Association (IHLA) in 2008. In 2015, IHLA partnered with TripAdvisor GreenLeaders program in offering hotels the chance to earn double recognition if participating in the StayGreen Program. With this partnership, the StayGreen Program requires members to meet the minimum GreenLeaders bronze level badge to be considered part of the program. Those hotels that achieve a silver level GreenLeaders badge will be recognized as a StayGreen Elite member (StayGreen Hotel Recognition Program, 2012).

The Green Seal Standard for Lodging Properties determines requirements for hotels and other accommodations. The key areas of this Standard are waste reduction, energy conservation and management, fresh water resource management, wastewater management, prevention of pollution, and purchasing environmentally (GS-33 Hotels and Lodging Properties, 2015). Hotels will receive one of three certifications: bronze; silver; gold (GS-33, n.d.). This Standard appears to be more rigid than the Green Key Eco-Rating Program as only a specific list of environmental initiatives is considered.

2.2.3.2 Non-graduated grading system

Another certification program is the EcoRooms & EcoSuites Certification Program; a program recognized by the American Hotel and Lodging Association and the American Automobile Association (AAA). This program was designed around 8 criteria that would allow

for hotels to become certified. By only looking at 8 criteria, hotels must fulfill all 8 criteria in order to become certified; hotels that do not meet all 8 criteria will not be certified. Unlike other graduated rating systems, once hotels fulfil all 8 criteria, they gain membership and certification (EcoRooms & EcoSuites Certification Recognized by Industry Leaders, 2012).

In the US, the Environmental Protection Agency (EPA) has developed a voluntary program, ENERGY STAR. The ENERGY STAR program offers hotels free tools to assist in measuring energy performance, goal setting, tracking savings, and rewarding improvements. EPA provides a rating system that compares similar hotels in the area and rates these properties on a scale of 1-100. Hotels that achieve a score of 75 or higher will be eligible for the ENERGY STAR (Earn the ENERGY STAR for Your Hotel Properties, 2010). By collecting data based on the analysis of national survey data, a regression model is built and predicts energy use and thus develops a rating of 1-100 (Update to ENERGY STAR Ratings for Hotels, 2009). This type of certification is similar to EcoRooms & EcoSuites as there is only one level of award.

Audubon International provides a third-party green lodging program. The Audubon Green Leaf Eco-Rating Program highlights environmental excellence and awards those that have best environmental practices. Hotels conduct a self-evaluation assessment on environmental practices. Once this has been accomplished, Audubon International Green Lodging staff will conduct an on-site assessment along with verification on environmental initiatives (Green lodging program, n.d.). Once program staff have completed their assessment, lodging locations that show environmental excellence will be awarded.

2.2.3.3 Others

One program that aggregates all environmentally certified hotels is the Sabre Eco-Certified Hotel Program acting as a directory for eco-certified hotels (Sabre Eco-Certified Hotel Directory Questionnaire, n.d.). This program is aligned with the Global Sustainable Tourism Criteria (GSTC) whereby they perform audits on properties. The GSTC is an organization and one that also defines the minimum requirements for sustainable tourism. Criteria that the GSTC focuses on are environmental, social, and cultural impacts that follow the ISEAL Alliance guidelines (The Travelocity Green Guarantee, 2010). There are over 8,800 hotels that are part of the Sabre Eco-Certified Hotel Program (Eco-Certified Hotels, n.d.). Sabre Eco-Certified Hotel

Program also works with many other partners around the world including Green Key Eco-Rating Program (The Travelocity Green Guarantee, 2010).

2.2.4 Use of Environmental Classification Programs

Although many programs are offered, many of these programs are limited in some ways to specific hotels. Some possible limitations for hotel participation are cost, location, or program simplicity. Table 2 provides a summary table of information on each environmental program along with their location offered, size of program, cost, and key areas of focus of program. The following sections will discuss information provided in Table 2.

2.2.4.1 Location

Not all programs mentioned are available to all hotels around the world, which may limit the certification rate. As far as third party programs, Green Keys Eco-Rating Program, GreenLeaders, and Green Globe are offered to hotels situated in all geographical areas. Hotels that are part of a larger corporation, like InterContinental Group and AccorHotels, that have their own environmental program also certify around the world, such as Planet 21 and IHG Green Engage Program. However, Green Lodging Program, EcoRooms & EcoSuites Certification Program, Green Concierge Project, ENERGY STAR, and Green Seal Standard for Lodging Properties appear to only be offered to hotels and lodging properties in the US. In addition, the StayGreen Program offered in the US as well. As this program is specifically offered to those hotels in Illinois, this program cannot be compared to the other programs that are offered to a wider geographical area.

Looking only at programs offered to hotels in Canada, the list of certification programs appears to be limited. The Green Keys Eco-Rating Program, GreenLeaders, and Green Globe appear to be the only third-party certification programs available to hotels in Canada. In addition, as AccorHotels and InterContinental Group have properties in Canada, the two respective environmental programs are available to those specific hotels. Based on the geographical scope of the program, it is possible that this can affect the types of hotels that are certified under the programs.

2.2.4.2 Cost

The cost of hotels to become certified under these programs varies depending on the program itself, the location of the hotel, and the size of the hotel. Many of the environmental certification programs are available at a certain cost. The Green Keys Global Eco-Rating Program, Green Lodging Program, Green Concierge Project, Green Globe Certification, and Green Seal Standard for Lodging Properties require hotels to pay an annual fee to become certified. The fee varies depending on the size of the hotel in terms of number of rooms either determines or partly determines the cost. The cost associated with programs may be a possible deterrent for smaller hotels, however, for larger hotels it may be a motivator. Economically, smaller hotels may not have the capital to participate in such programs compared to larger hotels. However, as some programs offer different costs for different hotel sizes, smaller hotels will not be charged as high a cost as larger hotels, making this attractive for smaller hotels. However, some other programs administer annual fees based on the location of the hotels. Green Keys Global Eco-Rating Program, Green Globes Certification, and Green Seal Standard for Lodging Properties are programs that require hotels to pay a fee dependent on the location of the hotel. With the differences in criteria in annual fees, it is interesting that it appears that the cost of the programs do not appear to affect the size of the program. As not all of the costs of the programs are made public, it is difficult to definitively say that this is the case.

2.2.4.3 Size of Programs

The size of the programs varies. Those that are offered in a smaller geographical area would mean that there are fewer hotels that are eligible, thus possibly explaining the reason behind the smaller number of hotels in certain programs. The Green Lodging Program, Green Concierge Project, and StayGreen Program are all programs that are limited to either the US or parts of the US. In addition, the Programs offered in the US are much smaller in size than programs offered internationally, which is calculated based on the number of hotels participating in each program. The Green Keys Eco-Rating Program, ENERGY STAR, Green Globe Certification, and Sabre Eco-Certified Hotel Program appear to all have significantly more members than those only in the US. The large number of hotels in the Sabre Eco-Certified Hotel Program is due to the aggregation of other certification programs, acting as a directory. In

comparison of the two sizes of programs, areas being covered by the programs differ between programs.

2.2.4.4 Program Minimum Requirements

Different programs require different minimum requirements and certification processes. Although the presentation of minimum requirements differs, many of these programs are focused on similar criteria or requirements. Comparing all the programs with respect to environmental areas based on a similar theme, areas appear to be reoccurring. Many of the programs include energy, water, and waste as an area of focus (Green Key Eco-Rating Program, 2015; GreenLeaders Survey, n.d.; The 7 pillars of PLANET 21,n.d.; Designed for sustainability, 2015; Green Lodging Program, n.d.; EcoRooms & EcoSuites certification recognized by industry leaders, 2012; GS-33 Hotels and Lodging Properties, 2015). Although many programs involve the three areas of focus, it is interesting that not all programs do.

Another common area covered by some programs (Carbon, n.d.; Designed for sustainability, 2015; Getting started with the benchmarking starter kit, n.d.) includes management or reduction of carbon. As carbon dioxide is widely known as a greenhouse gas, it is interesting that not all environmental certification programs explicitly require the management or reduction of carbon. Some mention of education or community outreach or similar ideas is present in environmental areas of focus in programs (Green Key Eco-Rating Program, 2015; GreenLeaders Survey, n.d.; The 7 pillars of PLANET 21, n.d.), but do not appear to be a focus area in other programs.

With the plethora of programs available to hotels, it is possible that hotels may be able to apply for more than one certification program. Therefore, it is imperative to evaluate the programs to further understand the differences between the programs as well as whether hotels that apply for these certification programs adopt more environmental initiatives than those that do not apply. Based on this information, a better understanding of where environmental improvements can be accomplished most effectively.

Table 2: Summary of environmental certification programs offered, location, size of program, environmental key areas, and cost

Environmental Program		Location Offered		Other Parts of the World	Cost/Fee	Environmental Areas/Focuses	Size of Program
		Canada	U.S.				
Third Party Certification	Green Keys Global Eco-Rating Program (Green Keys)	✓	✓	✓	U.S: USD $600 per year Canada: CAD $400 + tax per year International: USD $800 per year (Green Key Global FAQ, 2015)	Energy Conservation; Water Conservation; Solid Waste Management; Hazardous Waste Management; Indoor Air Quality; Community Outreach; Building Infrastructure; Land Use; Environmental Management (Green Key Eco-Rating Program, 2015)	1,686 members (Green Key Eco-Rating Program, 2015)
	GreenLeaders (TripAdvisor)	✓	✓	✓	Free	Energy; Water; Purchasing; Waste; Site; Education and Innovation (GreenLeaders Survey, n.d.)	Unable to locate[3]

Hotel Programs	Planet 21 (Novotel)	✓	✓	✓	N/A[2]	Health; Nature; Carbon; Innovation; Local; Employment; Dialogue (The PLANET 21 program, n.d.)	Suspect all hotels are part of the program. Reports 92 countries involved. (AccorHotels: Our Planet 21, 2015)
	IHG Green Engage System (InterContinental Group)	✓	✓	✓	N/A[2]	Energy; Carbon; Water; Waste (IHG Green Engage System, 2015)	All hotels part of IHG
Graduated Rating Systems	Green Concierge Project		✓		Annual fee, however, unable to locate the cost (HospitalityGreen's Eco-Business Certification Program, 2011)	Pollution Prevention; Resource Conservation; Recycling and Toxic Chemical Reduction (Hasek, 2011)	More than 60 (Santa Fe's Green Lodging Initiative Celebration, 2014)
	Green Globe Certification (Green Globe)	✓	✓	✓	Dependent on the size and location of hotel Canada: USD $750-$5000 per year (Green Globe contact in your region, 2015)	Sustainable Management; Social Economic; Cultural Heritage; Environmental (Green Globe Certification, 2015)	More than 500 members by 1998 (About Green Globe, 2015)

	StayGreen Program (IHLA)		✓		Unable to locate[3]	Energy; Waste & Recycling (Illinois Hotel and Lodging Association StayGreen Hotel Program, n.d.)	Green Energy & Green Recycling: 21 hotels Green Energy: 32 hotels Green Recycling: 37 hotels (Find Hotels, Inns and Accommodations with the Illinois Hotel and Lodging Association, n.d.)
	Green Seal Standard for Lodging Properties		✓		Varies depending level applying for, size of hotel, evaluation fees, compliance meeting fees, and reduced evaluation fees. (Fees for Green Seal Certification under GS-33 Standard for Lodging Properties, n.d.)	Waste Minimization; Energy Conservation and Management; Management of Fresh Water Resources; Waste Water Management; Pollution Prevention; Environmentally Sensitive Purchasing (GS-33 Hotels and Lodging Properties, 2015)	Unable to locate[3]
Non-Graduated Rating Systems	EcoRooms & EcoSuites Certification Program		✓		Unable to locate[3]	Energy Management; Reduced Pollution; Waste; Water (EcoRooms & EcoSuites Certification Recognized by Industry Leaders, 2012)	Unable to locate[3]

	ENERGY STAR (EPA)		✓		Unable to locate[3]	Energy Performance; Water Efficiency; Carbon Emissions (Get started with the benchmarking starter kit, n.d.)	Over 5,000 as of April 2010 benchmarked Over 415 as of April 2010 achieved ENERGY STAR (achieved 75 or higher on benchmark) (Earn the ENERGY STAR for your hotel properties, 2010)
	Green Lodging Program (Audubon International)		✓		1st Year: $350-$1500 2nd – 3rd Year: $175-$750 (Green Lodging Program, n.d.)	Water Quality; Water Conservation; Waste Minimization; Resource Conservation; Energy Efficiency (Green Lodging Program, n.d.)	63 (Certified Green Lodging Properties, n.d.)
Others	Sabre Eco-Certified Hotel Program	✓	✓	✓	Suspect hotels pays cost of third party certification or third party absorbs cost	Topics covered by third party certification program	8,800 facilities (Eco-Certified Hotels, n.d.)

[2] N/A refers to cost information that cannot be located through the PLANET 21 and IHG Green Engage website. As these environmental certification programs are hotel specific, it is suspected that there is no cost for individual hotels.

[3] Unable to locate refers to information that cannot be located through environmental certification program websites, however, is suspected that information is available internally and not published information.

The environmental certification program that is available to a hotel can dictate the adoption of environmental initiatives to attain certification. Depending on where the hotel is situated, the programs offered vary. Minimum requirements governing environmental certification program can further dictate the adoption rate of environmental initiatives.

2.2.5 Views, Motivations, and Issues on Environmental Certification

The term "green" has been used frequently and made its mark in popular culture in the past several years. With the broad use of "green", organizations and certifications associated with "going green" have been affected. Environmental certification programs in the hotel industry have not been exempted. As the number of environmental certification in hotels has grown over the years and has been more popular within these few years, hotels may find it difficult to distinguish programs that are effective, legitimate, and suitable specifically to their hotel (Brunet, n.d.).

However, advocates of environmental certification programs consider the many benefits that come with certification. One of the main arguments for certification is the cost reduction associated (Graci & Dodds, 2008). In addition, hotels recognize that being environmentally friendly is good for the planet, further advocating for environmental certification programs (Brunet, n.d.). Essentially, according to Andrea Myers, the director-program development at Green Key Global, the leading motivation to environmental certification appears to be economical. Once hotels participate in these programs for economic reasons, participants then continue for the right reasons, relating to the feel-good reasoning (Brunet, n.d.).

Some others, such as Rami Belson (the CEO of Energex Inc), believe that there is a shift amongst hotels. At the beginning of the "green" movement, hoteliers were actively seeking out hotels that are environmentally friendly. However, since then, the market for environmentally friendly hotels has passed (Brunet, n.d.). Thereby changing the motivations of environmental certification amongst hotels.

Hotels may also view environmental certification positively as it is a way to assure guests of environmental practices that are implemented. According to a research authority in the U.S., guests consider environmental protection as the hotel's responsibility. Furthermore, the implementation of environmental initiatives in hotels is starting to be viewed as a basic feature (Baylor, n.d.). Due to the expectations from guests, it is highly likely that hotels will be

motivated by this reason to implement more environmental initiatives. However, some hotels may be motivated in simply implementing several simple environmental initiatives and proclaiming themselves as a "green" hotel (Pizam, 2009), as this is what they expect guests want (Baylor, n.d.).

Pizam (2009) insinuates one view on whether some hotels are engaged in environmental certification programs for the image or as a marketing strategy, suggesting that environmental certification is a marketing ploy; however, Pizam (2009) later states that other hotels are genuine in participating in environmental certification programs. This phenomenon is better known as 'greenwashing'. Baylor (n.d.) also provides one view that one in three travellers are concerned with 'greenwashing'. Travellers feel that participating in environmental certification programs and implementing environmental initiatives is purely for public relations (Baylor, n.d.).

On the contrary, Baylor (n.d.) later states that environmental certification programs are beneficial in the sense that programs provide positive marketing for hotels. She continues to argue that hotels that participate in environmental certification programs are part of an elite group and are much more likely to be recognized in the media compared to hotels that are not certified. Furthermore, successful hotels, or as Halbe (2013) states, champion hotels may become case studies for certifying organizations demonstrating the success of their program (Baylor, n.d.).

In some hotels, due to the high capital investment or a lack of access to finance, hotels are unable to take on higher cost environmental initiatives (Low carbon green growth road map for Asia and the Pacific, n.d.; Jhawar, Kohli, Li, Modiri, Mota, Nagy, Poon & Shum, 2012). This high capital investment can also extend to issues with participating in environmental certification programs. The cost of participation could potentially be too costly for smaller hotels, which may offset the financial benefits of certification (Fiorino, 2006).

One noticeable study showed that hotels that participate in environmental certification programs are in fact able to maintain higher operational efficiency along with better customer-driven resource efficiency. Furthermore, this study demonstrates that environmental certification programs have the ability to influence the resource consumption behaviour of both hotels and guests (Zhang, Joglekar, Heineke & Verma, 2014).

On the other hand, the uncertainty of financial benefits from adopting environmental initiatives and participating in environmental certification programs coupled with consumers that

are unfamiliar with environmental certification programs poses an issue (Jhawar et al., 2012). A study found that Costa Rican hotels that participated in an environmental certification program passed their financial costs onto their customers in the form of increased room costs (Chafe, 2005). A higher room cost may mean that customers may not be willing to stay at hotels that have participated in environmental certification programs (Brunet, n.d.). In addition, some environmental certification programs are not as legitimate as others (Jhawar et al., 2012), which can be confusing for consumers or guests (Poser, 2009).

Although not all governments have regulated hotels' resource usage, some governments do play roles in regulating the hotel industry (Graci & Dodds, 2008). In some countries, the government subsidizes hotels that have obtained certain environmental certifications (Jhawar et al., 2012). Hotels in countries that are not regulated anticipate that regulations will be imposed on them in the near or distant future; therefore they believe that early action will provide them with good practice (Graci & Dodds, 2008).

Current literature presents clear motivations and issues related to the participation in environmental certification programs. Environmental certification programs provide cost reduction opportunities, higher operational efficiency, and recognition of achievements for hotels. Further, the changing expectations of guests are placing expectations of environmental sustainability on hotels. With government regulations constantly changing, hotels are also participating in environmental certification programs to get ahead of these regulations. However, environmental certification programs are viewed as a phenomena that is short lived or that it is a form of "greenwashing". The financial uncertainty and high capital investments may deter hotels. Further, as there are many environmental certification programs to choose from, hotels and guests may be unfamiliar with which programs are suitable for their hotel.

By far, economic benefits associated with implementing environmental initiatives and participating in environmental certification programs appear to be the strongest motivator in hotels (Graci & Dodds, 2008; Brebbia & Pineda, 2004). Due to the many reasons associated with participating in environmental certification programs, hotels may want to only implement environmental initiatives that will provide them with financial gains.

The choice of adoption of specific environmental initiatives could be affected by economic costs as well. Therefore providing an economic and environmental tool to disseminate this information would be beneficial to hotels. Baylor (n.d.) may be amongst others in thinking

that it is difficult to calculate the return on investment on environmental certification programs. As the MACC presents environmental initiatives and associated costs, an opportunity exists for hotels to calculate and understand the economic and environmental benefits simultaneously.

2.3 Environmental Knowledge

2.3.1 Marginal Abatement Cost Curve

A GHG MACC is able to link companies' marginal emission levels with the cost of additional units of pollution reduction. Potential initiatives identified on the curve can be identified as abatement measures (McKitrick, 1999). These abatement measures can be adopted to reduce carbon dioxide emissions in certain areas of which can be discussed in several ways.

MACC has been and is currently mostly used at the national level and some use at the sectorial level to inform policy formation and to influence program designs in various countries. MACC abatement measures have been identified in the following sectors by looking at each national level MACC report: transportation, industrial, agricultural, buildings, and energy. However, not all of these sectors are directly relevant to this research. Therefore an overview of the transportation, industrial, and agricultural sectors will be provided and sectors that are directly related will be discussed in length. The two sectors that will be discussed in depth are the energy and building sectors. Although buildings are not usually considered to be a sector, for the purpose of this thesis, buildings will be treated as a sector. This decision was made to allow for comparison amongst sectors. Furthermore, as energy consumption by buildings can be high (Harvey, 2014), the energy efficiency of buildings can affect the environment drastically.

2.3.1.1 Abatement measures in the transportation, industrial, and agricultural sectors

Within the transportation, industrial, and agricultural sectors, abatement measures exist that help reduce carbon dioxide emissions. This is the overarching theme in these sectors. The most common abatement measure in the transportation sector appears to be the implementation of hybrid vehicles (McKinsey & Company, n.d.a; McKinsey & Company, 2007a; McKinsey & Company, 2007b; McKinsey & Company, 2009a; McKinsey & Company, 2009b; McKinsey & Company, 2009d) and electric cars (McKinsey & Company, n.d.a; McKinsey & Company, 2007b; McKinsey & Company, 2009b; McKinsey & Company, 2009c; Bloomberg, 2011).

Whereas the most common abatement measure in the industrial graphs varies drastically as there are different ways to achieve abatement depending on the sub-sector. Even though this is the case, general abatement measures include the improvements to make mechanical systems more efficient and optimal (McKinsey & Company, n.d.b; McKinsey & Company, 2009b; McKinsey & Company, 2007a). The overall abatement idea in the industrial sector appears to be increasing efficiency (McKinsey & Company, n.d.a; McKinsey & Company, 2007a; McKinsey & Company, 2009a; McKinsey & Company, 2009d). However, another general abatement theme appears to be switching to alternative measures (McKinsey & Company, n.d.a; McKinsey & Company, 2007a; McKinsey & Company, 2009c; McKinsey & Company, 2009d; Hasanbeigi et al., 2010). There was no mention of which alternative measures would be implemented. The variability in abatement measures could be attributed geographically and industry specific.

Within the agricultural sector, there does not appear to be any common abatement measures associated. However, measures were directed more towards flora management rather than fauna management (McKinsey & Company, n.d.a; McKinsey & Company, 2009c; McKinsey & Company, 2009d; Bloomberg, 2011). Again, the abatement measures could be associated geographically; therefore no commonalities could be expected.

It is interesting that although the three sectors appear to be very different, similar abatement measures are designed to reduce the impact on the environment. Therefore suggesting that options are available to a variety of companies towards one general abatement measure. Furthermore, some of the abatement measures are not directly actionable; for example, the conservation of tillage in the agricultural sector (McKinsey & Company, 2009c). However, others such as the composting of new solid waste and using landfill gas for electricity generation (McKinsey & Company, n.d.a) appears to be much more actionable, therefore providing more valuable information for users.

2.3.1.2 Abatement measures in the energy sector

Table 3 provides a summary table of positive and negative abatement measures covered in the energy sector. Like the MACC, negative abatement measures identified means that abatement measures will not cost over the period of the environmental initiative. Similarly, positive abatement measures would mean that abatement measures will cost to implement the environmental initiative over the period of the environmental initiative.

Within the energy sector, it is difficult to provide comparisons due to the geographic variations across countries. However, it is possible to point out that the most common abatement measure appears to be the alteration of energy mix to incorporate and make a shift to more efficient energy sources (McKinsey & Company, 2007a; McKinsey & Company, 2009a; McKinsey & Company, 2009b; McKinsey & Company, 2009c; McKinsey & Company, 2009d). More efficient energy sources vary from country to country, as there is no one efficient energy source that fits all countries. Not all of these changes fall underneath the MACC, which suggests that positive abatement costs are associated with the change in energy mix. In some countries, changing energy mix is more complicated than others, making this abatement measure potentially harder to implement.

In Germany, energy generation is forecasted to reduce usage from nuclear power (McKinsey & Company, 2007a). Improving power plant efficiency along with the usage of wind and biomass as abatement measures is included on Germany's MACC. Solar panels are also included as a potential abatement measure, however, due to a small net benefit; it is not as efficient as wind and biomass (McKinsey & Company, 2007a). On the contrary, in the US, although carbon capture and storage, wind, nuclear, solar PV, geothermal power, and hydroelectric power are seen as abatement measures, these are all associated with positive abatement costs. One abatement measure, conversion efficiency, which was to improve heat rates of base-load pulverized coal power plants, was the only measure associated with a negative abatement cost available (McKinsey & Company, 2007b). In Switzerland, a reduction of nuclear power stations is favoured, therefore is suggested as an abatement measure to incorporate hydroelectric and renewable-energy power plants. Shift from the energy mix to incorporate other forms of renewable energy include increasing the height of existing dams and storage for hydropower (McKinsey & Company, 2009b). In China, identified abatement measures include the replacement of coal with cleaner energies along with energy efficiency improvements in other sectors. Cleaner sources could include small hydropower and geothermal with negative abatement costs (McKinsey & Company, 2009c). If the enhanced policy scenario is in place in Kazakhstan, which requires more ambitious low-carbon investments, abatement measures include solar PV, gas turbine, wind (high- and medium-quality), CCGT, power T&D, and small hydroelectric (Bloomberg, 2011). These are all seen as having net negative abatement cost measures.

Coal carbon capture and storage (CCS) new built with enhanced oil recovery (EOR) appear to be a potential abatement measure (McKinsey & Company, 2009c). Similarly, in Russia, gas CCS new built with EOR was found to be a possible abatement measure (McKinsey & Company, 2009d). In Russia, two abatement measures were associated with negative abatement costs. These two measures are increased share of combined heat and power (CHP) and improved insulation on heating grids. Other measures were identified with a positive abatement cost including renewable energies, and grid losses reduction (McKinsey & Company, 2009d).

Table 3: Positive and negative abatement measures in the energy sector by country

Location	**Environmental Initiatives in the Energy Sector**	
	Positive Abatement Measures	**Negative Abatement Measures**
China (McKinsey & Company, 2009c)	Renewables Carbon capture and storage (CCS) Others: technical, operational	Renewables CCS + enhanced oil recovery (EOR)
Germany (McKinsey & Company, 2007a)	Alteration of energy mix CCS Renewables Other: technical, operational	Renewables Others: technical, operational
Kazakhstan (Bloomberg, 2011)	Renewables Others: technical, operational	Gas turbine Power transmission & distribution
Poland (McKinsey & Company, 2009a)	Renewables CCS	Others: technical, operational
Russia (McKinsey & Company, 2009d)	Alteration of energy mix Renewables CCS + EOR Others: technical, operational	Others: technical, operational
Switzerland (McKinsey & Company, 2009b)	Alteration of energy mix Renewables Others: technical, operational	Renewables Others: technical, operational
UK (McKinsey & Company, 2007c)	Renewables CCS	
US (McKinsey & Company, 2007b)	Renewables Conversion efficiency CCS Alteration to energy mix	Conversion efficiency

2.3.1.3 Abatement measures in the building sector

The building sector refers to residential and commercial buildings. As hotels are often included in commercial buildings, abatement measures mentioned in this section can also apply to hotels. Therefore a list of abatement measures will be examined in detail (table 4). Many different measures related to residential or commercial buildings are prominent as abatement measures in national reports. The countries that have not directly mentioned abatement measures related to buildings include Kazakhstan (Bloomberg, 2011), UK (McKinsey & Company, 2007c), and Sweden (McKinsey & Company, 2008b). It is interesting that commonalities between the countries are not apparent in explaining why there is no direct mention of abatement measures associated with buildings.

The most prominent measure is switching less efficient lighting to more energy efficient lighting in buildings (McKinsey & Company, n.d.a; McKinsey & Company, n.d.b; McKinsey & Company, 2007a; McKinsey & Company, 2007b; McKinsey & Company, 2009a; McKinsey & Company, 2009b; McKinsey & Company, 2009c; McKinsey & Company, 2009d). This is the switching from incandescent lighting to LED lighting or other more efficient lighting. In Germany, lighting in the tertiary sector and street lights are also included in lighting abatement measures (McKinsey & Company, 2007a). The presence of energy efficient lighting in the tertiary sector and street lights as a possible abatement measure may be present in Germany due to government policies or the environmental conscious living by Germans that allow for this potential abatement.

In all of these countries but one, Belgium, lighting appears to have a positive abatement cost associated with the measure (McKinsey & Company, n.d.a). It is interesting that lighting is a positive abatement cost in Belgium as this type of measurement generally has a short pay back time (McKinsey & Company, 2009b). It is possible that the positive abatement cost could be attributed to the cost of nuclear power, which produces 57% of the country's electricity. In addition, Belgium is beginning to phase out nuclear power, 2015 to 2025, and that would affect this environmental initiative (Deloitte, 2015).

Retrofitting of building envelopes has also been a common abatement measure. This measure is commonly known as retrofitting insulation between the buildings inner walls and the outer wall (McKinsey & Company, n.d.b; McKinsey & Company, 2007a; McKinsey & Company, 2007b; McKinsey & Company, 2009a; McKinsey & Company, 2009c; McKinsey &

Company, 2009d). It could be that these countries would benefit more due to the built up urban environments increasing the abatement potential compared to other countries. Both of these cases involve residential buildings and commercial buildings. One other measure that would require retrofitting included the HVAC system (heating and air conditioning) in buildings. Maintenance and controls related to this system were also noted as an abatement measure (McKinsey & Company, n.d.a; McKinsey & Company, n.d.b; McKinsey & Company, 2007a; McKinsey & Company, 2007b; McKinsey & Company, 2009a; McKinsey & Company, 2009b; Bloomberg, 2011).

Electronics and appliances in residential buildings and commercial buildings were another possible abatement measure (McKinsey & Company, n.d.a; McKinsey & Company, n.d.b; McKinsey & Company, 2009a; McKinsey & Company, 2009c; McKinsey & Company, 2009d). In commercial buildings, appliances were singled out to refrigerators and electronics were referring to office electronics (McKinsey & Company, n.d.a; McKinsey & Company, 2009a). Although this may not contribute to a large amount of abatement potential, it is nevertheless an abatement measure. In the case of the US, abatement potential lies in increasing performance standards for certain devices and providing information to consumers at the time of purchase along with other energy saving measures (McKinsey & Company, 2007b). Other measures were not mentioned and therefore the abatement potential is unknown.

One other abatement measure that is presented in more than one country is an aggregated new build efficiency package seen in either residential or commercial buildings or in both depending on the country (McKinsey & Company, n.d.a; McKinsey & Company, 2009a). Furthermore, the passive house strategy was presented as an abatement measure (McKinsey & Company, n.d.b; McKinsey & Company, 2009c). It is possible that in China, there is room for new building developments and therefore passive house designs for new buildings are a viable option. A similar case may be argued for Belgium (McKinsey & Company, n.d.b). Other countries may not have directly mentioned the passive house design for new builds, but the idea of stricter norms for new buildings was suggested (McKinsey & Company, 2009c; McKinsey & Company, 2009d). Similarly, the enforcement of building regulations is another abatement measure (Bloomberg, 2011).

Methods of water heating in either residential or commercial or both was another abatement measure that was found in several MACC's (McKinsey & Company, n.d.a; McKinsey

& Company, 2009c). In both residential and commercial buildings, solar water heaters were recommended as economically beneficial to the owner. Possible reasons to implement solar water heaters could include landscape suitability, southern exposure to sunlight and proven technology. Pumps were another measure that was found commonly in China (McKinsey & Company, 2009c) and Russia (McKinsey & Company, 2009d).

Very little variation in abatement measures is present on MACCs from different countries suggesting that in order to become more energy efficient in this sector, a comprehensive list is available. Generally, many of these abatement measures have a negative abatement cost, however, there are cases where positive abatement measures exist. Government intervention along with policies that are currently in place may affect the suitability of particular types of abatement measures.

Table 4: Summary table showing the positive and negative abatement measures mentioned at each location in the building sector

Location	Environmental initiatives in the Building Sector	
	Positive Abatement Measures	**Negative Abatement Measures**
Belgium (McKinsey & Company, n.d.b)	Lighting Electronics & Appliances Building Systems Building Envelope	
Brazil (McKinsey & Company, n.d.a)		Lighting Electronics & Appliances Building Systems Building Envelope
China (McKinsey & Company, 2009c)	Lighting Building Systems Building Envelope	Lighting Electronics & Appliances Building Systems Building Envelope
Germany (McKinsey & Company, 2007a)	Building Systems Building Envelope	Lighting Electronics & Appliances Building Systems Building Envelope
Kazakhstan (Bloomberg, 2011)	Building Systems Building Envelope	Building Systems
Poland (McKinsey & Company, 2009a)	Lighting Building Systems	Lighting Electronics & Appliances Building Systems Building Envelope
Russia (McKinsey & Company, 2009d)	Building Envelope Building Systems	Lighting Electronics & Appliances Building Systems Building Envelope
Sweden (McKinsey & Company, 2008b)		Retrofit heating -50% (commercial)
Switzerland (McKinsey & Company, 2009b)	Building Systems	Lighting Building Systems
UK (McKinsey & Company, 2007c)	Building Systems Building Envelope	Lighting Electronics & Appliances Building Systems Building Envelope
US (McKinsey & Company, 2007b)	Building Systems Building Envelope	Lighting Electronics & Appliances Building Systems Building Envelope

2.3.2 Transfer of environmental knowledge

An abundance of environmental knowledge exists in literature. However, translating this knowledge into industry practice is an issue that requires attention. Managers and decision-makers are faced with multiple choices in implementing environmental initiatives or other business related issues. It is more likely that a business would take on environmental initiatives if it were in line with its core business or financial benefits (Sharma, 2009). In response, environmental tools have been developed to facilitate knowledge transfer where necessary.

2.3.2.1 Tools of knowledge transfer

There exist many methods or tools of knowledge transfer. However, there is no one way in which businesses transfer knowledge internally and externally. Furthermore, the limited knowledge of business sustainability poses a problem inhibiting the successful usage of these existing knowledge transfer tools, particularly the transfer of environmental knowledge (Ayuso, 2006). Therefore a review of the existing environmental knowledge transfer tools is necessary to understand the need of the introduction of the MACC as an environmental-financial decision support tool in the hotel industry.

Ivankovic & Jerman (2010) have suggested that management accounting system (MAS) is an appropriate tool that could provide useful information for decision-making. The MAS should provide timely information that caters to the different levels of management. However, the information provided may not be deemed useful if management is unsatisfied with it (Ivankovic & Jerman, 2010). The lack of timely and suitable information could inhibit decision-making.

The use of information technologies, in the form of Decision Support Systems (DSS), in environmental business decision-making is a tool that provides managers with information (Pilepic & Simunic, 2009). In some situations, hotels are able to benefit from these information technologies, as they are a component of management and support business decisions. Generally, DSS are able to influence those in the upper management levels or strategic levels of management more so than lower management levels (Pilepic & Simunic, 2009).

A fuzzy decision-making tool was developed to assess environmental sustainable buildings, in particular residential buildings (Seo, Aramaki, Hwang & Hanaki, 2004). This tool

consists of multiple criteria including factors that may have conflicting relationships such as economics and the environment. Furthermore, the tool is able to take into account many criteria and sustainable alternatives to produce an outcome that would assist decision-makers in deciding which sustainable measures best fit the building (Seo, Aramaki, Hwang & Hanaki, 2004).

An Informed Decisions Toolbox (IDT) can be used to allow decision-makers more control over the decision-making process in the healthcare field (Rundall, Martelli, Arroyo, McCurdy, Graetz, Neuwirth, Curtis, Schmittdiel, Gibson & Hsu, 2007). The toolbox was designed with four A's in mind: accessibility, accuracy, applicability, and actionability (Rundall et al., 2007). There are six steps that form the (IDT). In particular, the IDT assists decision-makers in incorporating research evidence on top of colloquial sources, such as experiences from colleagues (Rundall et al., 2007). Furthermore, information used in decision-making must meet the organization's standards, be suitable to the situation, and executable in reality (Rundall et al., 2007). In addition, the toolbox hopes to enable managers to be able to use all types of evidence to make effective decisions (Rundall et al., 2007). Although the IDT was designed with the healthcare field in mind, the toolbox appears to be applicable to many other situations, such as making sound decisions about environmental initiatives. Furthermore, through the comparison of tools, the IDT seems to have wider applications than the MAS and DSS.

Another tool, in some ways similar to the IDT, is the environmental management accounting (EMA) tool (Burritt, Hahn & Schaltegger, 2002). Two components make up this tool: the monetary environmental management accounting (MEMA) and the physical environmental management accounting (PEMA). These components are used in different levels of management and departments within an organization. For example, top management will use MEMA within the EMA instead of the PEMA whereas divisional management will use both MEMA and PEMA (Bruitt et al., 2002). The EMA tool can also be applied to different organizations that want to quantify environmental information in decision-making.

An alternative tool related to environmental decision-making is the multiple criteria analysis tool (MCAT) (Marinoni, Higgins, Hajikowicz & Collins, 2009). This tool consists of software that supports decision-makers in making environmental investment decisions. Although EMA provides decision-makers with useful monetary and physical environmental accounting information, the MCAT also has the ability to quantify intangibles (Marinoni et al., 2009). MCAT is used to provide additional information when making environmental decisions;

therefore the MCAT software program appears to be applicable to other fields or disciplines (Marinioni et al., 2009) such as tourism.

Additionally, environmental systems analysis (ESA) tools can evaluate man-made systems using a systems perspective (Moberg, 2006). The information presented in these tools can be used for learning or communication. ESA tools can also assist decision-makers to make more informed decisions. Examples of ESA tools can be divided into procedural and analytical tools (Wrisberg et al., 2002 as cited in Moberg, 2006). Procedural tools describe those that improve procedures that assist in decision-making. Analytical tools describe tools that provide information for communication, optimization, and comparing alternatives, as examples (Moberg, 2006). The ESA tools look at both the decision-making process in terms of improving decision-making and not only at environmental information available. This could potentially provide a useful tool in other industries that require environmental decision-making.

The environmental tools reviewed above demonstrate that there are many different ways in which environmental knowledge can be transferred in businesses. However, these tools have not demonstrated the usefulness and applicability in the hotel industry. As a result, managers in the hotel industry may have limited understanding of the environmental possibilities in their hotel. Therefore it is essential to introduce the MACC as an environmental-financial decision support tool in the hotel industry to assist hotels to implement environmental initiatives.

Abatement measures identified on MACCs at the national level provide an example of how to show the available financial and environmental information to decision-makers. This suggests that the MACC is a viable tool that enables countries to identify the best abatement measures that can assist them in reducing GHG emissions. Furthermore, as the MACC incorporates cost and payback time for each abatement measure, it is desirable to develop customized MACCs for hotels, to be able to disseminate environmental information and assist in the implementation of environmental initiatives.

With the vast types of environmental initiatives available to hotels, the question of whether a difference exists between hotels or whether all hotels adopt the same environmental initiatives arises, in particular hotels that are environmentally certified and those that are not environmentally certified. Some hotels have selected to adopt some environmental initiatives, yet others adopt other environmental initiatives. Environmental initiatives that hotels implement can

be defined by several groupings: energy, waste, water, education, purchasing, program, site, and hotel.

Environmental certification programs could be appealing to hotels that are motivated financially but also want to improve brand image. However, other hotels that are not environmentally certified may still adopt environmental initiatives. The introduction of the MACC tool can act as a decision support tool assisting in environmental and financial information dissemination to assist hotels in selecting environmental initiatives.

Chapter 3: Methods

3.1 Methods

From the previous chapter, it is clear that the focus of this thesis is twofold; to determine environmental differences between environmentally certified hotels and hotels not environmentally certified, and to introduce an environmental-economic tool to the hotel industry to assist in implementation of environmental initiatives and to improve the environmental communication of hotels. The following chapter will present details of the methods used to achieve the research objectives.

3.2 Location & Population

The data collected for this research were from hotels in Canada, specifically in Toronto, Ontario. This includes hotels that are situated in the Downtown Toronto area and the Greater Toronto Area that are also part of the Greater Toronto Hotel Association (GTHA). The Greater Toronto Area includes Peel Region, Durham Region, Halton Region, and York Region (Figure 2). Hotels that were considered in this research were determined through the GTHA, which totals 168 hotels. The hotels that were part of this hotel association include chain, independent, and boutique hotels throughout the Greater Toronto Area and Downtown Toronto area. Only hotels that were located within this geographical region and part of the GTHA were included in the study.

Location is an important aspect of this research as it provides a broad range of hotels within a small area, allowing for the sampling size to increase. Furthermore, the location allows for easy access to the researcher, as she was located in Toronto, making in person semi-structured interviews a possibility.

Figure 2: Map showing the four Regions and associated municipalities in the Greater Toronto Area

Source: Adapted from the City of Mississauga's 'Mississauga's location in the Greater Toronto Area (GTA)' map (http://www.mississauga.ca/file/COM/MAP_gtamap2_new03.pdf)

3.3 Primary Research Approaches

3.3.1 Mixed Methods Research

A mixed methods approach to research was used to collect primary data as this type of research allows for the use of both quantitative and qualitative research methods (Creswell, 2014). In particular, an exploratory mixed methods approach was used to explore adoption rates of environmental initiatives and to understand the reception of an environmental-financial tool for environmental initiatives, specifically a MACC developed for the hotel industry. This exploratory mixed methods approach included two phases.

In the quantitative phase, or the first phase of the mixed methods approach, questionnaires were used to determine views regarding the usefulness of the MACC in particular

hotels. Hotels that show interest in the MACC, or find that the MACC is useful, was contacted and invited to participate in a semi-structured interview, or telephone interview, at the convenience of the hotel manager. The second phase or qualitative phase was conducted for hotels that are interested in the MACC as an environmental-financial decision support tool. This phase was to gather information for each hotel to develop a tailored MACC specific to the individual hotel, which was constructed by the researcher.

The first phase of the data collection process was carried out between October and December 2014. The decision for this timeline was due to the availability of the researcher and hotel representatives, avoiding the busy peak winter season. These questionnaires were distributed in two waves, first wave in October 2014 and the second wave in mid-November 2014. Hotels were given a time frame of one month to respond to the questionnaire. The second phase, the semi-structured interviews, was scheduled at the convenience of the hotel manager between the months of December 2014 and February 2015 for hotels that find the MACC useful. The construction of the MACCs will take place immediately after semi-structured interviews have taken place (see 3.3.4 Construction of MACC).

Data analysis will be conducted in a sequential manner. The first phase of analysis was conducted once questionnaires were returned from hotel. The analysis of this first phase dictated information included in the second phase of analysis, which was conducted once information required becomes available.

3.3.2 Semi-structured questionnaires

Semi-structured questionnaires are a specific type of questionnaire that is cheaper, quicker, and more convenient to administer than other research instruments (Bryman, Teevan & Bell, 2009). It also allows for the researcher to cover a wider range of participants. The semi-structured questionnaire allows for the collection of information through pre-set questions that provide some guidelines to the questionnaire. Structure is present in this type of questionnaire to allow for the direction of research to be guided. It also allows for some open-ended elaboration to specific questions. For the purpose of this thesis, semi-structured questionnaires will be used to assess the reception of the MACC as an environmental-financial decision support tool for hotels. Questions were developed to obtain information on the suitability of the MACC in terms of operational usage, whether information present is useful in making environmental decisions,

and the interest in the MACC for their specific hotel. The semi-structured questionnaire can be found in Appendix 1.

3.3.2.1 Sampling

The sampling design was random sampling from a list of pre-defined hotels. Hotels were chosen from an alphabetical list from the GTHA and then randomly sampled. The sample size for structured-questionnaires amounts to 62 hotels. With technology becoming more integrated into our daily lives, hotel managers were e-mailed the questionnaire and asked to fill out at their own pace and availability, which would reduce the risk of unwilling hotel managers' participating in the study. Follow up telephone calls were made a week after the questionnaires are sent. Once the time period of completing questionnaires ended, all the responses were saved on the researcher's personal computer.

To inform hotel managers of the possible decision-making MACC tool, a short explanation was provided of how the MACC would be applicable to hotels and how to read the curve. An example curve was also included in the questionnaire to help illustrate the proposed decision-making MACC tool.

3.3.2.2 Data Analysis

The analysis process of the semi-structured questionnaires took place offline. Data collected included both quantitative questions and qualitative questions. Both types of questions were analyzed manually to identify the usefulness of the MACC within the hotel industry. This was accomplished by looking at commonalities between the responses.

3.3.3 Semi-structured interviews

Semi-structured interviews are a common and suitable way of conducting qualitative research, especially when more detailed information and hard to get information is required. For the purpose of this research, semi-structured interviews were planned due to the sensitive nature of the information required; for example, cost of environmental initiatives, types of environmental initiatives adopted, etc. Semi-structured interviews were chosen as opposed to structured or unstructured interviews as semi-structured interviews allow for information to become expanded upon when needed. A planned structure, guided by questions, is used to obtain

the required information. The interview was developed in two parts. The first part was developed to obtain information about the interest in the MACC and current environmental initiatives implemented. The second part was developed to gather information required to construct a tailored MACC for the hotel. A copy of these guiding questions can be found in Appendix 2.

Interviews were recorded with a tape recorder to allow for transcription later. The researcher also took notes to assist throughout the interview. All recorded interviews was be kept offline on the researcher's personal computer and transcribed directly after the semi-structured interviews. The researcher carried out the process of transcribing interviews manually. A form was used in order to record information transcribed from the interviews. This allows for quick and accurate information presented and used to construct the MACC once the transcribing process is completed.

3.3.3.1 Sampling

The researcher knew the number of semi-structured interviews that took place once the questionnaires were completed and returned. Hotel managers who identify that the MACC tool may be useful or who are interested in understanding more about this tool were contacted and interviewed. The interviews were used to gather data on specific information required to construct the MACC for the hotel. Questions pertaining to their reasoning of the usefulness of the MACC were included. This helped understand why specific hotels found the MACC useful.

3.3.3.2 Data Analysis

Semi-structured interviews were transcribed manually. The first run through was to transcribe the interview verbatim. This was followed by a second run through to eliminate any mistakes. Data analysis was conducted manually by identifying specific information that was required to produce a tailored MACC for the specific hotel. Information identified in the interview that pertains to the usefulness of the MACC was also analyzed manually as this would allow for the interpretation of the target meaning and reduced mistakes and misunderstandings.

3.3.4 Construction of MACC

The data obtained from interviews were used in the construction of customized MACCs with the use of a program developed for this purpose. This program was built by Sustain Success

Limited in the United Kingdom and utilizes Microsoft Office Excel as a means to deliver this program. Information that is required for the construction of a MACC is as follows: capital cost of the abatement measure, annual saving (or cost) of the abatement measure, annual abatement potential (CO^2e), life time of abatement measure (years), and discount rate. The payment for the use of this program is £85. The number of MACCs developed was reflected in the number of useful responses identified from the semi-structured interviews conducted.

3.3.5 Initial Results

After carrying out the initial research approach, the approach yielded a low participation rate. In total, questionnaires were sent to 62 random hotels from the GTHA list. Out of the 62 hotels, only 4 hotels responded with completed questionnaires, a 6% participation rate. The low participation rate is a concern as the results yielded would not be representative of the larger population of hotels in Toronto. Therefore, a secondary research approach was formulated to obtain data despite the low participation rate for primary data collection.

3.4 Secondary Research Approach

3.4.1 Quantitative Research

A quantitative research approach was used to collect secondary data on environmental adoption rates in hotels in the Greater Toronto Hotel Association. In order to collect data on environmental initiatives adopted in hotels, hotel websites, other websites, guest reviews and management responses, and guest and management photos were examined to identify environmental initiatives adopted by hotels. Information gathered provided insight into the types of environmental initiatives that have been adopted in hotels.

Following the completion of the initial research approach, the second research approach commenced in March 2015. Data collection of environmental initiatives took place between March 2015 and May 2015.

Data analysis took place based on environmental initiatives present from triangulation of source information after all necessary information was gathered. Information from this phase provided data for more advanced statistical analysis. Statistical analysis included t-test, which also utilized the Levene's test, using IBM SPSS software.

3.4.2 Website Analysis and Triangulation

Information regarding environmental initiatives from all hotels in the GTHA was gathered and triangulated based on the source. Each hotel was first looked at on their hotel website and other websites, followed by guest reviews and management responses. 'Other websites' included any other websites that include information about environmental initiatives in hotels that is not the hotel website. The search engine, Google, was utilized to locate other websites that provided environmental information on hotels. The terms that were inputted into Google included 'sustainability', 'green', 'environment', and 'environmental'. This was followed by the word 'initiative' and the hotel name. All photos, guest and management, posted on the TripAdvisor site was also looked at and noted if environmental initiatives are present in the photo. TripAdvisor was chosen as a suitable source due to the richness of information available. All information collected was used to explore the number of environmental initiatives adopted in hotels.

3.4.2.1 List of Environmental Initiatives

Multiple sources of existing data were used to identify and verify the list of environmental initiatives adopted by the population hotels (Appendix 3). By accessing information using the triangulation approach, environmental initiatives were extracted from the three sources thus building a comprehensive list of population environmental initiatives. The environmental initiatives were then sorted into nine different categories or groups based on the intended purpose of the initiative itself. The allocation decision to place specific initiatives in groups was at the discretion of the researcher. The groups were determined by categories used in previous research (Rahman, Reynolds & Svaren, n.d.) and other certification programs present. These certifications include Green Keys Global Eco-Rating Program endorsed by the Hotel Association Canada, GreenLeaders by TripAdvisors, and PLANET 21 by AccorHotels.

3.4.2.2 Hotel Categories

Hotels from the population were placed into three exclusive categories based on whether or not the hotel participated in any formal environmental certification program, which is illustrated in table 5. By looking at the hotel, Green Keys Global Eco-Rating Program, and TripAdvisors website, the researcher then decided where each hotel should be placed. Formal

environmental certification programs include any types of programs that are accredited or other third party accreditation programs. If any discrepancies occurred regarding where the hotel should be placed, the researcher contacted the hotel to verify and resolve the discrepancies.

3.4.2.3 Environmental Certification Programs

The environmental certification programs chosen for this research were selected based on the location, size, and cost of certification. The Green Keys Eco-Rating Program was chosen due to the high volume of hotels certified under this program in Toronto. This Program is also known internationally and in Canada within the hotel community. Furthermore, there is a cost for certification of hotels. The second program that is selected is the GreenLeaders Program. This program is also an internationally recognized program. However, this program does not require hotels or other accommodations to pay an annual fee to become certified. The two programs provided a wide coverage of hotels that may wish to become certified.

In addition, two other programs were selected. These two programs provided more in depth information regarding environmental initiatives in hotels, the PLANET 21 program by AccorHotels and the IHG Green Engage Program by the InterContinental Hotels Group. These two programs provided additional information about environmental initiatives used in the respective hotels. As these two programs were not considered part of any environmental certification programs, hotels that were only part of this program were placed in category 2.

Table 5: Table identifying criteria, environmental programs, and environmental certification programs associated with hotel categories

Hotel Categories	Criteria	Programs Involved
Category 1	Part of environmental certification program(s); implements environmental initiatives	Green Key Eco-Rating Program GreenLeaders Program
Category 2	Do not participate in environmental certification program(s); implements environmental initiatives	PLANET 21 IHG Green Engage Program
Category 3	Do not participate in environmental certification program(s) and does not implement environmental initiatives	N/A

3.4.2.4 Triangulation

The use of triangulation allows for different data access points or sources to be explored in relation to one particular aspect to ensure accurate data (Bryman et al., 2009). This approach assisted in deciding which source would be best suited for data collection as it allows for a comparison of several different sources, which assisted in exploring the number of environmental initiatives present in hotels. As triangulation allows the comparison of multiple data sources, if multiple data sources reported similar information the data collected can be considered reliable. Triangulation was an important method for this research, as the verification of multiple sources provided clarity on environmental initiatives.

For the purpose of this research, the sources included hotel websites, other websites, guest reviews and management responses, and guest and management photos. With regards of guest reviews and management responses, the TripAdvisor website was used as it is popular amongst travellers, enabling a plethora of information to be explored. Similarly, guest and management photos were explored through reviewing the TripAdvisor website as there were many photos that are aggregated in one location. Both guests and management were given the opportunity to post photos, making the TripAdvisor website ideal for the purpose of this research.

TripAdvisor is a suitable website to use for the purpose of this research as the site operates in 45 countries, including China (under a different domain) (TripAdvisor, 2015). According to TripAdvisor (2015), there are more than 190 million reviews and opinions from travellers and guests around the world and more than 26 million traveller photos posted on their site. As TripAdvisor is not only a website for hotels, not all the reviews, opinions, and photos will be related to hotels. However, out of the 4.4 million business and properties on TripAdvisor, there are more than 890,000 hotels, B&Bs, and specialty lodgings included on the website, which is 20% of businesses and properties. Due to these figures, TripAdvisor was a suitable website to use.

By providing a table with multiple data sources, it was possible to compare and identify whether multiple types of sources mentioned the same environmental initiatives or whether some initiatives were identified more frequently through one particular type of source.

Table 6 and table 8 show the number of environmental initiatives present in each environmental initiative grouping combining all sources. These two tables do not identify which

sources were responsible for identifying environmental initiatives in each environmental initiatives grouping. Table 7 and table 9 provide greater detail of environmental initiatives groupings broken down by sources. The following section will discuss the insights from comparing these sources with the environmental initiatives groupings identified from 144 hotels and their suitability.

Information presented in table 6, table 7, table 8, and table 9, were developed by checking all six sources for environmental initiatives that fall into each environmental initiatives groupings. In table 6 and table 8, the first column, 'individual environmental initiatives present at source' aggregates the presences of environmental initiatives at all sources. The second column, 'environmental initiatives present at individual sources' aggregates the presence of environmental initiatives at individual sources.

3.4.2.5 Suitability of Sources Chosen

Each of the three sources was examined to identify environmental initiatives to compile a comprehensive list of environmental initiatives. The percentage of source types where the environmental initiatives was found is given in table 6, table 7, table 8, and table 9.

Table 6 and table 8 show the frequency of environmental initiatives that can be found at the five or six sources. In category 1 hotels (table 6), the range of environmental initiatives found at all sources was 82% to 100%. For example, in the 'Education' grouping, 5 out of 5 environmental initiatives were found at each source equating to 100%. These same environmental initiatives were also found at all 6 sources equating to 100%. Based on this understanding, these results explain that there was a high frequency of environmental initiatives that can be found at all six sources together. It is highly likely that any environmental initiatives identified can be captured by these environmental initiatives groupings and sources.

Table 6 demonstrates that the range of environmental initiatives at the six sources was from 83% to 100% in category 1 hotels. In category 2 hotels (table 8), a range of 30% to 83% is reported at the five sources. The high ranges across sources, either 5 sources or 6 sources reported in table 6, is promising in presenting environmental initiatives information. This therefore suggests that sources were not biased on the category of environmental initiative presented. Similarly, the range of the use of 2 to 4 sources reported in table 8 demonstrates the validity of the sources. These results further argue that the sources are suitable in capturing a

variety of environmental initiatives in all environmental initiative groupings. To further provide evidence in arguing the suitability, it is important to look into each specific source and whether the suitability is consistent.

Variability is observed in table 7 and table 9. For example, fewer environmental initiatives were identified from photographs in all environmental initiative groupings in table 7. Websites are the leading method of dissemination of environmental initiatives, specifically hotel websites and GreenLeaders website. Overall, at least one source reported on all aspects of environmental initiative groupings. This therefore suggests that the sources are consistent in reporting all groupings of environmental initiatives.

Similarly, the greater detail in table 9 shows more variability than table 8. The range of coverage for categories of individual environmental initiatives when sources are combined ranges from 30%-82%. This wide range suggests that some sources examined may not be suitable to identify all the environmental initiatives reported. Although the range of environmental initiatives present at one specific source does not vary drastically, comparing this range to that in table 9, the range is relatively large. The range difference in category 2 (table 8) is 40% where as in category 1 (table 6) it is 17%. Due to this variability, it is important to take a closer look at the possible consequences of the range.

Table 9 provides information that enables the evaluation of individual sources according to environmental initiatives groupings. By looking at this breakdown, it appears that variability of all groupings with each source appears across all sources and is not subjected to only one particular source. However, it appears that environmental initiatives that are more noticeable by guests are reported more by the reviews source, such as in the ‘Energy – Overall’ grouping. More ‘Site’ environmental initiatives were reported through websites, which is not surprising as these environmental initiatives are usually ‘behind-the-scenes’ or operational initiatives. This therefore suggests that variability is consistent throughout and is not due to one particular source providing information that may be of concern.

Table 6: Summary table showing category 1 environmental initiatives with sources (n = 101)

Environmental initiatives (groupings)	Presence of environmental initiatives taking into account all sources		Environmental initiatives present at individual sources (out of 6 sources)	
	# Present at source	Percentage	# Of environmental initiatives	Percentage
Energy – operational	9	82%	6	100%
Energy – equipment	9	90%		
Energy – overall	18	86%		
Waste	10	100%	5	83%
Education	5	100%	6	100%
Water	10	100%	6	100%
Purchasing	9	100%	5	83%
Program	6	100%	6	100%
Site	14	100%	5	83%
Hotel	10	91%	5	83%

Table 7: Summary table showing presence of environmental initiatives for particular sources in category 1 (n = 101)

Environmental initiatives (groupings)	Website						Reviews				Photos	
	Hotel		Other		GreenLeaders		Guest		Management			
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Energy – operational	8	73	3	27	9	82	6	55	4	36	4	36
Energy – equipment	6	60	1	10	5	50	2	20	1	10	1	10
Energy – overall	14	67	4	19	14	67	8	38	5	24	5	24
Waste	8	80	0	0	8	80	5	50	6	60	3	30
Education	4	80	1	20	4	80	3	60	2	40	1	20
Water	7	70	1	10	5	50	3	30	2	20	1	10
Purchasing	7	78	0	0	6	67	4	44	3	33	2	22
Program	6	100	1	17	4	67	4	67	3	50	2	33
Site	11	79	0	0	9	64	3	21	4	29	5	36
Hotel	8	73	0	0	2	18	3	27	2	18	2	18

Table 8: Summary table showing category 2 environmental initiatives with sources (n = 43)

Environmental initiatives (groupings)	Presence of environmental initiatives taking into account all sources		Environmental initiatives present at individual sources (out of 5 sources)	
	# Present at source	Percentage	# Of environmental initiatives	Percentage
Energy – operational	7	64%	4	80%
Energy – equipment	3	30%		
Energy – overall	10	48%		
Waste	6	60%	4	80%
Education	4	80%	3	60%
Water	3	30%	3	60%
Purchasing	4	44%	3	60%
Program	5	83%	4	80%
Site	8	57%	2	40%
Hotel	5	45%	2	40%

Table 9: Summary table showing presence of environmental initiatives for particular sources in category 2 (n = 43)

Environmental initiatives (groupings)	Website				Reviews				Photos	
	Hotel		Other		Guest		Management			
	Count	%	Count	%	Count	%	Count	%	Count	%
Energy – operational	2	18	0	0	9	82	5	45	4	36
Energy – equipment	3	30	0	0	2	20	0	0	0	0
Energy – overall	5	24	0	0	11	52	5	24	4	19
Waste	5	50	0	0	4	40	2	20	3	30
Education	3	60	0	0	2	40	0	0	1	20
Water	1	10	0	0	2	20	0	0	3	30
Purchasing	4	44	0	0	3	33	0	0	1	11
Program	5	83	0	0	3	50	2	33	2	33
Site	8	57	0	0	4	29	0	0	0	0
Hotel	3	27	0	0	0	0	0	0	2	18

Based on the findings of table 6, table 7, table 8, and table 9, the sources chosen appear to be suitable and suggest that all the sources chosen were utilized. The variability of sources is telling as results can suggest the reception of environmental initiatives by guests. Variability can also show what hotels want to communicate with guests. The variability between category 1 and category 2 may appear to be quite different, however, the range of environmental initiatives found within the categories appear to be consistent throughout the groupings and sources.

The use of the three types of sources and their sub-sources increased the replicability of the results, thereby increasing the validity. In some cases, sources allowed for the verification of environmental initiatives presented, whereas in other situations, sources provided new information of environmental initiatives.

3.5 Ethical Considerations

The research proposal was reviewed by the Office of Research Ethics, University of Waterloo. Following the approval of the ethics review, recruitment letters and consent forms were sent out via e-mail to connect with potential participants, aka hotel managers. These participants were identified through a previous contacts list put together by the researcher consisting of contact information.

All information provided by specific hotels will be kept anonymous and any specific identifying factors linking information used in this research to hotels will be made anonymous to ensure for participant privacy. Hotels that do not wish to be anonymous will be mentioned in the research.

Information that has been gathered through websites will include hotel names and will not be of any ethical concerns as access to this information is open to the public and does not require any special log in or password.

Overall, as the initial research method yielded low response rates, the research study was carried out using triangulation of websites, reviews, and photos to gather environmental initiatives implemented in hotels. These three sources were appropriate as they demonstrated many environmental initiatives implemented by hotels. The total number of sample of hotels was 144 and gathered from the GTHA. Hotels were categorized into three groups based on environmental certification programs and environmental initiatives implemented.

Chapter 4: Results and Findings

The intention of this chapter is to present results, findings, and analysis of the data gathered. The chapter will first present results from the questionnaires collected regarding the MACC. Next, results regarding environmental initiatives identified in hotels will be discussed along with the statistical analysis. The next section will discuss the new environmental initiative groupings that were developed and the associated statistical analysis. Finally, the last section will tie all the results and findings together providing a summary of this chapter.

4.1 MACC as a tool in the hotel industry

The use of the MACC tool is demonstrated at the national level and at the sectorial level. At the national level, the MACC shares information that covers all sectors within the country. At the sectorial level, environmental initiatives are shared specific to industries. However, the hotel industry does not appear to have adopted the MACC as a tool.

4.1.1 Readiness of the MACC tool

The intention of the questionnaire was to gage the perceived usefulness of the MACC tool to the hotel industry. However, 62 questionnaires sent out to hotels yielded a low response rate, as seen in table 10. Only four hotels responded to the questionnaires. The low response rate meant that statistical analysis was not possible, however, even this lack of response provided an interesting insight into the readiness of the MACC tool for use in the hotel industry. It can be speculated that hotels are not interested in the MACC tool. The four hotels that responded to the questionnaire demonstrated a slight interest in the MACC as a tool for environmental-financial decision-making.

Looking at the questionnaire responses, each hotel told a different story in terms of their readiness. The individual hotels were able to provide a partial window into the types of hotels and their readiness. Based on the categories laid out for the purpose of this thesis, the four hotels represented category 1 and category 3. Table 10 provides information from hotels that responded and the category each hotel falls into.

Table 10: Hotel responses and the category each hotel falls into (n = 4)

Hotel	Characteristic of Hotel	Category
Hotel A	Boutique hotel situated in Downtown Toronto.	Category 3
Hotel B	Chain hotel situated in Downtown Toronto.	Category 1
Hotel C	Boutique hotel situated in the GTA.	Category 1
Hotel D	Chain hotel situated in the GTA.	Category 1

The overall idea of the usefulness of the MACC as a tool seemed to vary. Hotel A and Hotel D did not view the MACC as a useful tool to provide environmental information for their hotel, whereas Hotel B and Hotel C showed more interest in the MACC tool. It is possible that the perceptions of the tool may be caused by the lack of environmental knowledge or understanding of the MACC. As stated by Hotel A respondent "I am unsure what a MACC is. [I] am also unsure of what the gigatons of CO_2e means to a small hotel. We are simple folk[s]". When Hotel D was presented with the same opportunity to suggest additional information that could be included, no response was provided.

Individually, Hotel A and Hotel D thought that the MACC would not be useful in their hotels. It is unknown as to whether this is due to a lack of information regarding the MACC tool or whether they truly do not think that the MACC is useful, as the hotels did not elaborate. The opinion that the MACC was not a useful tool in their hotel was reflected by the overall responses to each question.

Hotel A, although part of category 3, showed more interest than Hotel D, which is part of category 1. Hotel D's response showed no interest in the MACC tool for their hotel and did not think that there is additional information shown on the tool that is not already known by the hotel. This is interesting as Hotel D is part of category 1. Hotel A seemed to be undecided in terms of the usefulness, due to the lack of information.

In contrast, Hotel B and C overall thought that the idea of a MACC was beneficial and showed interest in responses to the questions. Of particular interest is Hotel C. Hotel B was satisfied with the tool as it is and did not have any suggestions, however, Hotel C was able to provide suggestions for improvement like budget analysis. The proactive answers from Hotel C suggests that this particular hotel appears to be more involved with environmental sustainability, as they provided positive responses, all indicating interest in the MACC.

4.1.2 Usefulness of MACC: environmental initiatives

The three hotels of interest are Hotel B, C, and D. Hotel A falls into category 3; no environmental initiatives are identified for the hotel.

Table 11: Four hotels and the number of environmental initiatives implemented by each hotel broken down into environmental initiatives groupings

Hotel (Category 1 = C1; Category 3 = C3)	Total (Max = 84)	Energy - Operational	Energy - Equipment	Waste	Education	Water	Purchasing	Program	Site	Hotel
Hotel A (C3)	0	0	0	0	0	0	0	0	0	0
Hotel B (C1)	4	0	0	2	0	0	0	1	0	1
Hotel C (C1)	31	3	4	6	3	1	4	5	5	0
Hotel D (C1)	22	3	0	5	0	1	3	6	2	2

Similar to findings from above, the level of environmental initiatives implementation varied greatly. Within the three category 1 hotels, the range of the total number of environmental initiatives implemented is 27. This compliments previous findings that hotels within the same category do vary (Halbe, 2013), as the large range shows champions and laggers.

The hotel with the highest number of environmental initiatives and greatest interest in the MACC tool is Hotel C. This hotel implemented 37% of environmental initiatives. Although this is not considered a high percentage, it is the highest number of environmental initiatives adopted among the four hotels. The only area where no environmental initiatives were identified was the 'Hotel' environmental initiative grouping. This finding is not surprising as this environmental initiative group consists of initiatives that are typically more difficult to implement, as it requires changes to the hotel infrastructure.

Hotel D implemented the second highest number of environmental initiatives among the four hotels. The distribution of environmental initiatives is somewhat similar. The environmental initiative groups that differ greatly are 'Energy – Equipment' and 'Education'. This is interesting, as environmental initiatives in these two groupings are considered relatively easy to implement.

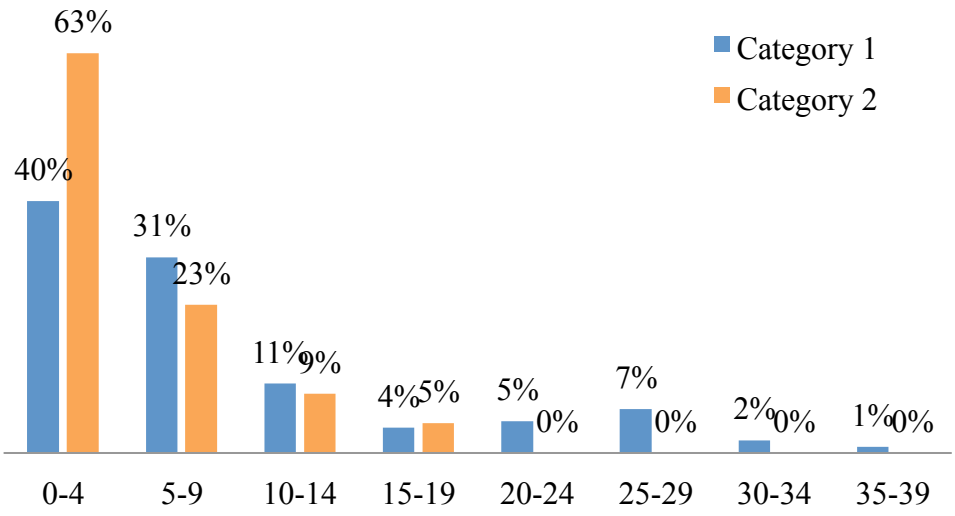
Overall, even within category 1, hotels vary in level of interest and environmental initiatives implemented. The more interested hotels are Hotel B and Hotel C, although Hotel D had undertaken more environmental initiatives than Hotel B. The category 3 hotel, Hotel A, suggested that hotels may not know enough information with regards environmental initiatives to be interested in the MACC tool. The limitation of only four hotels providing questionnaire responses requires different approaches to examining environmental initiatives in the hotel industry. Furthermore, there were no hotels from category 2 that responded to the questionnaire; no conclusion can be reached regarding them. Therefore analysis of environmental initiatives from hotels in category 1 and category 2 is required.

4.3 Environmental initiatives reported by hotels

The distribution of environmental initiatives implemented in category 1 and category 2 hotels can be understood in terms of the total number of initiatives implemented. Figure 3 presents the distribution of the number of environmental initiatives implemented when grouped into ranges as a percentage.

The overall pattern shows that category 1 hotels were distributed more widely than category 2 hotels. Furthermore, the distribution pattern of category 1 (86%) and category 2 (100%) hotels is similar where the majority of hotels implemented zero to nineteen environmental initiatives. This distribution suggests that all hotels, regardless of the hotel category, implemented similar numbers of environmental initiatives. This further suggests that from this sample of hotels that environmental certification does not entirely dictate the number of environmental initiatives implemented.

Figure 3: Total percentage of environmental initiatives implemented in category 1 (n = 101) and category 2 (n = 43) hotels



Note: Numbers along the x-axis represent the total number of environmental initiatives hotels has implemented. The percentage represents the number of hotels that implemented the total number of environmental initiatives in that range.

From findings discovered above, further analysis is required to help determine whether category 1 and category 2 hotels are different in terms of the number of environmental initiatives implemented. The unequal variances t-test in conjunction with the Levene's test was used to test the difference between category 1 and category 2 hotels. This test was used three times to provide more information regarding the differences and to confidently answer the research objectives. The first test, table 12, examines the difference of overall environmental initiatives implemented in category 1 and category 2 hotels. The second test, table 13, examines the difference of environmental initiatives implemented when placed in nine environmental initiative groupings and one overall grouping. The third test, table 23, examines the difference of environmental initiatives implemented when placed in four environmental initiative groupings.

By using the t-test, certain assumptions were made regarding the variances, distribution, and sample sizes. Based on evidence by de Winter & Dodou (2010) where the t-test showed minor power differences from the Mann-Whitney-Wilcoxon (MWW) test, the t-test together with the Levene's test was utilized to test the significance between the two hotel categories.

Furthermore, the t-test was superior to the MWW test when severe violations were made to the test assumptions (de Winter & Dodou, 2010).

Table 12: Differences in hotel categories by environmental initiatives

Hotel Category	n	Mean	Standard Deviation	t	p
Category 1	101	8.7	8.7	3.480	< .000
Category 2	43	4.9	4.0		

Overall, hotels averaged more environmental initiatives in category 1 (M=8.7) than in category 2 (M=4.9) hotels. In addition, variation within category 1 (SD=8.7) appears to be aligned to the mean when compared to category 2 (SD=4.0) even though category 1 (n=101) had more than twice the number of hotels in category 2 (n=43). A statistical difference does exist between the two hotel categories (t=3.480, p<.000). Although there is a statistical difference between the two categories of hotels, it is possible that not all groupings are significantly different.

The following t-test examines the difference between category 1 and category 2 hotels in terms of the nine environmental initiative groups and one overall group independently. This t-test will provide more detailed information and understanding of where the difference may lay. However, it will not compare category 1 and category 2 hotels in terms of the nine environmental initiative groups and one overall group together. The reason the t-test was chosen was due to its simplicity for comparison. The important question at hand is whether a difference exists between the two categories in terms of the number of environmental initiatives implemented. The following t-test is equally as important as it will identify the areas of particular interest; namely the areas that show significance.

4.3.1 Distribution of environmental initiatives reported by category 1 and category 2 hotels

Looking at the distribution of environmental initiatives across the nine environmental initiative groups and one overall group will provide in depth insight into the areas that are lacking or less implemented by hotels. Important differences may exist in the nine environmental initiative grouping and one overall group. Table 13 provides information of hotels in category 1 and category 2 in terms of the distribution of environmental initiatives.

Table 13: Hotel category differences in environmental initiatives in nine environmental initiatives groupings and one overall environmental initiative grouping

Environmental Initiative Grouping	Number of Environmental Initiatives Implemented				
Hotel Category	n	Mean	SD	t	p
Energy – Operational					
Category 1	101	1.04	1.25	1.381	<.085
Category 2	43	.74	.98		
Energy – Equipment					
Category 1	101	.59	.91	2.585	<.011
Category 2	43	.26	.62		
Energy – Overall					
Category 1	101	1.63	1.94	2.160	<.017
Category 2	43	1.00	1.45		
Waste					
Category 1	101	1.83	1.86	3.201	<.002
Category 2	43	1.07	.99		
Education					
Category 1	101	.96	1.11	4.968	<.000
Category 2	43	.26	.58		
Water					
Category 1	101	.58	.83	2.598	<.011
Category 2	43	.28	.55		
Purchasing					
Category 1	101	.66	1.09	2.252	<.013
Category 2	43	.33	.68		
Program					
Category 1	101	1.65	1.69	2.183	<.031
Category 2	43	1.12	1.18		
Site					
Category 1	101	.81	1.44	2.035	<.022
Category 2	43	.44	.73		
Hotel					
Category 1	101	.63	1.11	0.922	<.179
Category 2	43	.49	.74		

The above table provides information of the two categories broken down into nine environmental initiative groups and one overall group. Overall, consistent differences do exist across all groups between category 1 and category 2 hotels.

An environmental initiatives group of interest is the 'Site' grouping. The mean of category 1 hotels (M=0.81) is almost double that of category 2 hotels (M=0.44). This shows that on average, category 1 hotels implemented twice as many environmental initiatives than

category 2 hotels. The difference in mean is reflected in the variation of environmental initiatives implemented in category 1 (SD=1.44) and category 2 (SD=0.73) hotels.

Similarly, the mean of category 1 (M=0.96) in the 'Education' grouping compared to category 2 (M=0.26) grouping is almost four times, whereas the variation between category 1 (SD=1.11) and category 2 (SD=0.58) is only double. Although the difference between the mean is four times, in terms of actual environmental initiatives, it comes down to less than one environmental initiatives difference.

In the 'Waste' grouping, category 1 (M=1.83) hotels on average implemented more environmental initiatives than category 2 (M=1.07) hotels. However, the variation of category 1 (SD=1.86) hotels was much more than category 2 (SD=0.99) hotels. The difference between the average number of environmental initiatives implemented by category 1 and category 2 hotels is much smaller than the difference in variation.

All of the variations fall within 2 standard deviations for both categories. Although variations exist, variations within the categories and groups individually are not extreme. This also suggests that although many hotels in each category are close to the mean, there are also quite a few hotels that are different than the other hotels in the same category. To break it down, the standard deviations of all groups in category 1 hotels variations are higher than category 2 hotels. In addition, the range of standard deviations of all groups in category 1 hotels is slightly more than category 2 hotels. This suggests that, in category 1, the range of variation in number of environmental initiatives implemented by each hotel in each group is similar to category 2. This does not mean that the number of environmental initiatives implemented is similar; it merely shows that their variation is similar.

The largest variation between category 1 (SD=1.94) and category 2 (SD=1.45) is in the 'Energy-Overall' group, with the average number of environmental initiatives implemented varying greatly between category 1 (M=1.63) and category 2 (M=1.00) hotels. As the 'Energy – Overall' group combines the 'Energy – Operational' and 'Energy – Equipment' group, it is expected that the variation within this group of category 1 and category 2 hotels is large. Simply put, overall energy environmental initiatives implemented by each hotel in the category 1 hotels appear to vary much more than category 2 hotels. Overall, it is not surprising that there is a significant difference between category 1 and category 2 hotels in the 'Energy-Overall' grouping ($t=2.160$, $p<.017$).

Three other environmental initiative groups that were significantly different between category 1 and category 2 hotels were found. Differences in category 1 and category 2 hotels were demonstrated in the 'Education' group ($t=4.968$, $p<.000$). In the 'Waste' group, a significant difference was also discovered between category 1 and category 2 hotels ($t=3.201$, $p<.002$).

Other environmental initiative groups were found to have significant differences, although, 'Education', 'Energy – Overall', and 'Waste' was more significant. For 'Site', there is indeed a difference between category 1 and category 2 hotels ($t=2.035$, $p<.022$). However, this is only a small difference.

This is a similar situation for the 'Program' group ($t=2.183$, $p<.031$), where category 1 hotels ($M=1.65$, $SD=1.69$) implemented more environmental initiatives than category 2 ($M=1.12$, $SD=1.18$) hotels. Another grouping that was found to be significant in categories is the 'Water' group ($t=2.598$, $p<.011$), again where category 1 ($M=0.58$, $SD=0.83$) hotels implemented more environmental initiatives than category 2 ($M=0.28$, $SD=0.55$) hotels. Comparably, the 'Energy – Equipment' group was found to be significantly different between the two categories ($t=2.585$, $p<.011$). Like above, the category 1 ($M=0.59$, $SD=0.91$) hotels implemented more environmental initiatives than category 2 hotels ($M=0.26$, $SD=0.62$). The environmental initiative grouping 'Purchasing' ($t=2.252$, $p<.013$) presented similar significant differences between category 1 ($M=0.66$, $SD=1.09$) and category 2 ($M=0.33$, $SD=0.68$). In all three instances, category 1 hotels are indeed different than category 2 hotels in terms of the number of environmental initiatives implemented, however, there is only a small significant difference between the two categories of hotels.

On the other hand, hotels in category 1 and category 2 in the 'Energy – Operational' ($t=1.381$, $p<.085$) and 'Hotel'($t=0.922$, $p<.179$) groups are not different from each other. This means that although the variations between category 1 hotels and category 2 hotels exists, the number of environmental initiatives implemented appear to be a normal occurrence in environmental initiatives. Overall, all groups have relatively small mean values; therefore these groups may represent areas in which both categories of hotels can improve.

It is obvious that the significant difference in eight out of ten groups affected the overall difference between the two categories of hotels. As two out of the ten groups were not

significantly different from each other, this presents an opportunity for hotels in the two categories to improve environmentally.

4.3.2 Adoption rates of environmental initiatives

In addition to looking at the differences between the average number of environmental initiatives implemented in each environmental initiative grouping, it is interesting to look at the adoption rates within each environmental initiative grouping as well. The following tables will provide information regarding the adoption rates of individual environmental initiatives in the nine environmental initiatives groupings.

Table 14: Adoption rates in Energy - Operational grouping

	Environmental Initiative	Number and percentage of hotels that have implemented environmental initiative			
		Category 1		Category 2	
Energy - Operational	Energy Efficient Lighting	53	52%	12	28%
	Dimmable Lighting Controls	6	6%	6	14%
	Lighting Control	2	2%	5	12%
	Lighting Sensors	11	11%	1	2%
	Temperature Sensors	7	7%	1	2%
	Electronic Sensors	1	1%	0	0%
	Blinds Sensors	1	1%	0	0%
	Climate Control by Management	21	21%	6	14%
	Energy Savings during "Slow Times"	4	4%	1	2%
	Energy Assessment of Building	5	5%	0	0%

Although no significant difference was found, based on the distribution of adoption rates in 'Energy – Operational', there is reason to believe that the two hotel categories are quite different. Category 2 efforts in environmental initiatives were focused more on lighting related energy environmental initiatives, while category 1 was well rounded in terms of implementation (table 14).

In 'Energy – Operational' environmental initiatives, both category 1 and category 2 hotels appear to have varied adoption rates (table 14). In category 1 hotels, the adoption rate of 'Energy Efficient Lighting' was over fifty percent. In comparison, category 2 hotels only had an

adoption rate of twenty eight percent. This is the most implemented environmental initiative that is related to lighting. Although category 1 hotels had a higher adoption rate in 'Energy Efficient Lighting', category 2 hotels had a higher adoption rate in the other two lighting environmental initiatives. These findings suggest differences in environmentally certified hotels and not environmentally certified hotels.

In terms of sensors energy environmental initiatives, sensors that affect the lighting efficiency appear to be adopted the most in both categories. Category 1 hotels adopted other sensor environmental initiatives, but not all were implemented by category 2 hotels. However, in building related energy environmental initiatives, 'Climate Control by Management' had the highest adoption rate of the two environmental initiatives.

Table 15: Adoption rates in Energy - Equipment grouping

	Environmental Initiative	Number and percentage of hotels that have implemented environmental initiative			
		Category 1		Category 2	
Energy - Equipment	Energy Efficient Appliances/Equipment	25	27%	6	14%
	Tracks Energy Use	21	21%	0	0%
	Ceiling Fan	2	2%	0	0%
	Kitchen Retrofit Efficiency	2	2%	0	0%
	Energy Recovery Unit	2	2%	3	7%
	Tree Shading	1	1%	0	0%
	Instantaneous Water Heater	1	1%	0	0%
	Energy Recycler Dehumidifier	1	1%	0	0%
	Alternate Water Heating Method	0	0%	2	5%

Adoption rates in the 'Energy – Equipment' grouping varied in both categories (table 15). In both categories, adoption rates were much less than fifty percent. In comparing the two most adopted environmental initiatives in category 1, 'Tracks Energy Use' and 'Energy Efficient Appliances/Equipment', category 1 hotels had higher adoption rates than category 2 in two environmental initiatives. The highest adoption rate in category 2 was the 'Energy Efficient Appliances/Equipment'. Interestingly, the only environmental initiative that was not implemented at all in category 1 hotels was the 'Alternate Water Heating Method'; yet this environmental initiative was implemented in category 2. Furthermore, comparing category 1 and

category 2 hotels in terms of 'Tracks Energy Use', category 1 hotels implemented twenty one percent more than category 2 hotels, which did not track energy use at all.

Table 16: Adoption rates in Waste grouping

	Environmental Initiative	Number and percentage of hotels that have implemented environmental initiative			
		Category 1		Category 2	
Waste	Recycling Practices	74	73%	28	65%
	Reusable Dinnerware	33	33%	5	12%
	Recyclable/Reused/Donated Food Waste	20	20%	1	2%
	Reducing in-room waste	20	20%	9	21%
	Recyclable/Reused/Donated Furniture or Materials	10	10%	0	0%
	Safe Disposal of Hazardous Materials	9	9%	1	2%
	Paperless Check-in & Check-out	8	8%	2	5%
	Waste Assessment of Building	8	8%	0	0%
	Recycling Sorting Process	3	3%	0	0%
	Recycling Electronics	1	1%	0	0%

Adoption rates in the 'Waste' grouping also varied (table 16). The highest level of adoption rate in both categories is 'Recycling Practices'. Areas of highest adoption levels were similar in both categories as well. This includes 'Recyclable/Reused/Donated Food Waste', 'Reusable Dinnerware', and 'Reducing in-room waste'. However, findings show that in general, category 1 hotels focused on a variety of recycling or reusing methods, where as category 2 hotels only focused on selective environmental initiatives.

Table 17: Adoption rates in Education grouping

	Environmental Initiative	Number and percentage of hotels that have implemented environmental initiative			
		Category 1		Category 2	
Education	Guest Education	42	42%	5	12%
	Staff Training	34	34%	5	12%
	Guest Feedback and Comments	17	17%	1	2%
	Staff Feedback and Comments	2	2%	0	0%
	Vendor Education	2	2%	0	0%

In terms of 'Education', the same environmental initiatives had the highest adoption rates in both categories (table 17), 'Guest Education' and 'Staff Training'. However, category 1 hotels also showed relatively high adoption rates in the 'Guest Feedback and Comments' environmental initiative as well. These adoption rates suggest that environmentally certified and not environmentally certified hotels selected similar environmental initiatives.

Table 18: Adoption rates in Water grouping

	Environmental Initiative	Number and percentage of hotels that have implemented environmental initiative			
		Category 1		Category 2	
Water	Water Efficient Fixtures	41	41%	8	19%
	Smart Irrigation System	6	6%	0	0%
	Water Use in A/C System	2	2%	0	0%
	Landscaping Irrigation Controlled	2	2%	0	0%
	Water Saving Program	2	2%	2	5%
	Water Filtration System	2	2%	2	5%
	Alternative Water Source	1	1%	0	0%
	Laundry Efficiency	1	1%	0	0%
	Rainwater Conservation Program	1	1%	0	0%
	Water Assessment of Building	1	1%	0	0%

Adoption rates for water related environmental initiatives were concentrated in the 'Water Efficient Fixtures' environmental initiative (table 18). Close to half of hotels in category 1 implemented this environmental initiative and just fewer than twenty percent of hotels in category 2 implemented this environmental initiative. Although only eight category 2 hotels implemented the 'Water Efficient Fixtures' environmental initiative, concentration in this environmental initiative demonstrated the popularity and focus of the initiative.

Table 19: Adoption rates in Purchasing grouping

	Environmental Initiative	Number and percentage of hotels that have implemented environmental initiative			
		Category 1		Category 2	
Purchasing	Environmentally Conscious Toiletry Brands	21	21%	4	9%
	Sustainable Foods & Drinks	18	18%	2	5%
	"Green" Cleaning Products and/or Practices	13	13%	4	9%
	Sourcing from Environmental Suppliers/Products	6	6%	4	9%
	"Green" Dry Cleaning	3	3%	0	0%
	Locally Produced/Sourced Toiletries	2	3%	0	0%
	Purchasing in Bulk	2	2%	0	0%
	Refillable Food Dispensers	1	1%	0	0%
	"Green" Furniture	1	1%	0	0%

Adoption rates in both category 1 and category 2 hotels varied (table 19) in 'Purchasing' environmental initiative grouping. In addition, the 'Environmentally Conscious Toiletry Brands' and 'Green Cleaning Products and/of Practices' were most adopted in both categories. The noticeable difference in adoption rates was between the 'Sustainable Foods & Drinks' environmental initiatives in category 1 and 'Sourcing from Environmental Suppliers/Products' environmental initiatives in category 2. These two environmental initiatives had the third highest adoption rates in their respective categories.

Table 20: Adoption rates in Program grouping

	Environmental Initiative	Number and percentage of hotels that have implemented environmental initiative			
		Category 1		Category 2	
Program	Towel Reuse Program	62	61%	17	40%
	Linen Reuse Program	52	51%	17	40%
	Maintenance Plan (Preventative and/or Post)	23	23%	0	0%
	Volunteer Housekeeping	13	13%	3	7%
	Raising Awareness	10	10%	8	19%
	Green Team	8	8%	3	7%

Adoption rates in program related environmental initiatives showed a concentration of hotels that implemented the same environmental initiatives between the two hotel categories (table 20), 'Linen Reuse Program' and 'Towel Reuse Program'. In comparison, category 1 hotels had a higher adoption rate in the 'Maintenance Plan (Preventative and/or Post)' environmental initiative compared to category 2. However, category 2 had a higher adoption rate than category 1 in 'Raising Awareness'.

Category 1 hotels adopted a variety of program environmental initiatives, however, it is more evident that category 2 hotels have focused on two environmental initiatives rather than other program environmental initiatives.

Table 21: Adoption rates in Site grouping

	Environmental Initiative	Number and percentage of hotels that have implemented environmental initiative			
		Category 1		Category 2	
Site	"Green" Meetings & Business Centres	18	18%	1	2%
	Natural Lighting	14	14%	3	7%
	Paints - low VOC paints, water-based paints	10	10%	0	0%
	Electronic Car Charging Station	10	10%	3	7%
	Local Plants	7	7%	0	0%
	Low Chemical Gardening or Minimal Use of Gardening Chemicals	6	6%	0	0%
	Alternative Form of Transportation	5	5%	2	5%
	Rooftop Garden/Green Roofs	3	3%	4	9%
	Minimum Water Plants	2	2%	0	0%
	Pavement	2	2%	0	0%
	Building Envelope	2	2%	4	9%
	Alternate Energy	1	1%	1	2%
	Energy Levy	1	1%	0	0%
	Living Wall	1	1%	1	2%

Adoption rates of environmental initiatives in the site environmental initiative grouping varied in both category 1 and category 2 hotels (table 21). The highest two environmental initiatives adoption rates were 'Natural Lighting' and 'Green Meetings & Business Centres' in category 1 hotels. However, in category 2 hotels, the highest two adoption rates were 'Rooftop

Garden/Green Roofs' and 'Building Envelope' environmental initiative. This suggests that category 1 hotels, which are environmentally certified, selected different environmental initiatives than category 2 hotels, which are not environmentally certified.

Table 22: Adoption rates in Hotel grouping

	Environmental Initiative	Number and percentage of hotels that have implemented environmental initiative			
		Category 1		Category 2	
Hotel	Double Door Entry Way	24	24%	12	28%
	Recycling or Donating of Recyclable Materials	12	12%	4	9%
	Use of Recycled/Sustainable Paper	9	9%	2	5%
	Carbon Tracking, Reporting, and/or Auditing	5	5%	0	0%
	Electronic in Place of Paper	5	5%	1	2%
	Use of Recycled Room Material	4	4%	0	0%
	Paperless Payroll	1	1%	0	0%
	Designated "Green" Rooms	1	1%	0	0%
	Carbon Offset Program	1	1%	0	0%
	LEED Certified	2	2%	0	0%
	Building Design	0	0%	2	5%

In both hotel categories, the highest two adoption rates in the hotel environmental initiative grouping appeared to be the same environmental initiative (table 22). The highest was the 'Double Door Entry Way' environmental initiative and the second highest was the 'Recycling or Donating of Recyclable Materials', suggesting that category 1 and category 2 hotels selected the same environmental initiative to implement. Of interest is the 'Double Door Entry Way' environmental initiative, where category 2 had a higher adoption rate than category 1, however category 1 had a higher frequency of hotels that implemented this environmental initiative. Similar to 'Energy – Operational', category 2 hotels focused on a select few environmental initiatives to implement, which offsets the significant differences between the two category of hotels.

One interesting comparison can be made between 'Building Design' and 'LEED Certified'. Category 2 did not appear to be 'LEED Certified' yet appeared to implement

'Building Design' environmental initiative. This adoption difference, suggesting issues relating to environmental certification.

Overall, the majority of adoption rates of individual environmental initiatives in all nine environmental initiative groupings did not exceed fifty percent. Where the adoption rate of environmental initiatives exceed fifty percent of hotels occurred four times in total in category 1 hotels, once in 'Energy – Operational', once in 'Waste', and twice in 'Program' grouping and only once in the category 2 hotels in the 'Waste' grouping. It is clear that based on the above tables, adoption rates in category 1 hotels were overall higher than category 2 hotels. These findings reflect the overall significant differences between the two categories of hotels. However, in groupings where no significant differences were found, the focus of environmental initiatives in category 2 may have masked the overall differences in groupings.

4.4 Classification of environmental initiatives

4.4.1 Regrouping environmental initiatives

After looking at the data and conducting the initial analysis, there was an opportunity to regroup into new categories rather than the nine categories that have been looked at in past studies (Ayuso, 2007). Environmental initiatives can be grouped in another way to focus on improving specific areas of the hotel, instead of the general type of the environmental initiatives. By regrouping the environmental initiatives in this new way, the information becomes similar to that found on the MACC.

The new groupings are 'behavioural', 'operational – equipment', 'operational – programs', and 'infrastructure'. These groupings are based on an examination of the function of the collective environmental initiatives.

The 'behavioural' grouping describes environmental initiatives that alter or require the change in behaviour either from staff or guests. The 'operational' grouping can be divided into two other groupings, 'operational – equipment' and 'operational – programs'. Environmental initiatives in both groups are considered initiatives that affect the operations of the hotels. The group 'operational – equipment' describes environmental initiatives that are considered equipment that affects the operations of the hotel. The other group is the 'operational – programs' that describes environmental initiatives that are programs or activities that affect the operations as well. Finally, the fourth grouping is 'infrastructure'. This group describes

environmental initiatives that change the infrastructure of the hotel and improve environmental sustainability in that way. The new groups can be seen in Appendix 4.

The t-test was used to test the difference between category 1 and category 2 hotels in the new groupings. Whether a difference exists is important, as the results will provide greater insight into whether differences exist only when grouped in one way and not other ways. In another words, whether differences that occurred in the previous groups was due to the structure of the groupings or whether there is indeed a difference. Furthermore, to better answer the objectives laid out in chapter 1, the regrouping will assist in understanding environmental initiatives in terms similar to what is presented on the MACC.

4.4.1.1 Environmental initiatives between category 1 and category 2 hotels in new groupings

Table 23 presents the new groupings when comparing category 1 and category 2 hotels.

Table 23: Hotel category differences in environmental initiatives in new environmental initiatives groupings

Environmental Initiative Grouping	**Number of Environmental Initiatives Implemented**				
Hotel Category	**n**	**Mean**	**SD**	**t**	**p**
Behavioural					
Category 1	101	4.62	4.11	3.936	<.000
Category 2	43	2.65	1.90		
Operational – Equipment					
Category 1	101	1.88	2.38	2.185	<.031
Category 2	43	1.09	1.78		
Operational – Programs					
Category 1	101	1.32	1.94	3.615	<.000
Category 2	43	.47	.88		
Infrastructure					
Category 1	101	1.00	1.34	1.013	<.313
Category 2	43	.77	1.04		

Unlike the previous groups, the averages in all environmental initiatives groups follow the same pattern; category 2 hotels on average implemented fewer environmental initiatives compared to category 1 hotels. Based on the averages, it is possible to speculate that there is a difference between category 1 and category 2 hotels in terms of the environmental initiatives.

Further, the variation in category 1 hotels of the four groupings is greater than that of category 2 hotels. One possibility is due to the larger sample size in category 1.

In the 'Operational – Programs' group, the mean of category 1 (M=1.32) is quite large compared to the mean of category 2 (M=.47). In the 'Behavioural' group, the variation of category 1 (SD=4.11) hotels in this grouping is much larger than that of category 2 (SD=1.90) hotels. In fact, the variation of category 1 is just over two times the variation of category 2. Furthermore, within this grouping, category 1 (M=4.62) hotels appear to implement more environmental initiatives than that of category 2 (M=2.65). This equates to category 1 hotels implementing almost twice as many environmental initiatives than category 2 hotels.

Comparably, in the 'Operational – Equipment' group, category 1 (M=1.88) hotels implemented almost two times more environmental initiatives than category 2 (M=1.09) hotels. In terms of the variation, category 1 hotels (SD=2.38) varied more than category 2 (SD=1.78) hotels.

On the other hand, the 'Infrastructure' group showed no significant differences between category 1 and category 2 hotels. Category 1 (M=1, SD=1.34) hotels on average implemented more environmental initiatives and varied more than category 2 (M=0.77, SD=1.04) hotels.

Out of the four environmental initiatives groupings, three groupings showed a significant difference between category 1 and category 2 hotels and only one grouping did not find any significant difference. The three environmental initiatives groupings are 'Behavioural', 'Operational – Equipment', and 'Operational – Programs'. The environmental initiatives grouping that showed no difference between category 1 and category 2 hotels was 'Infrastructure'.

Category 1 hotels in 'Behavioural' group ($t=3.936$, $p<.000$) and 'Operations – Programs' group ($t=3.615$, $p<.000$) appear to be much more significantly different from category 2 hotels in their respective groups. These two groupings are made up of observable environmental initiatives, which may attribute to a higher number of environmental initiatives implemented. However, the category 1 hotels in 'Operational – Equipment' group ($t=2.185$, $p<.031$) also appears to be significant from category 2 hotels in the same groups, but does not appear to be as significantly different as the 'Behavioural' group and 'Operational – Programs' group.

It is interesting that the only group that does not appear to be significantly different between category 1 hotels and category 2 hotels is the 'Infrastructure' ($t = 1.013$, $p < 0.313$)

group. As this environmental initiatives group is made up of initiatives that are related to the building infrastructure, environmental initiatives are much more noticeable. On the other hand, it is possible that all hotels have implemented similar environmental initiatives and that improvements can be made across category 1 and category 2 hotels. Environmental initiatives implemented in the two categories may vary, where category 1 hotels may implement environmental initiatives that require a higher capital cost and category 2 hotels may implement more simplistic environmental initiatives. From these results, it is possible to observe that both categories of hotel are not implementing a high number of these environmental initiatives.

From both the environmental initiatives groupings, it is clear that in some areas, category 1 and category 2 hotels are not different than each other, in terms of their distribution. Even though environmental initiatives are grouped differently, there is overwhelming evidence in demonstrating the differences between the categories. From this evidence alone, it is plausible that category 1 hotels are indeed significantly different than category 2 hotels. Although within these categories, there are hotels that perform below average and above average. This supports the hypothesis proposed by Halbe (2013) of champions and laggers within the hotel industry.

Knowing that a strong difference exists between the two categories of hotels is important to be able to provide tailored information for hotels. This information can be translated in a presentable method to assist hotels in understanding environmental initiatives to implement. As the new groupings presented is similar to types of information presented on the MACC and that differences were discovered between categories. Although hotels show little interest in the MACC, the regroupings of environmental initiatives can provide information that can be related in a language that hotels will understand. This may help bridge the information gap that addresses environmental communication in the hotel industry.

4.5 Types of environmental initiatives implemented

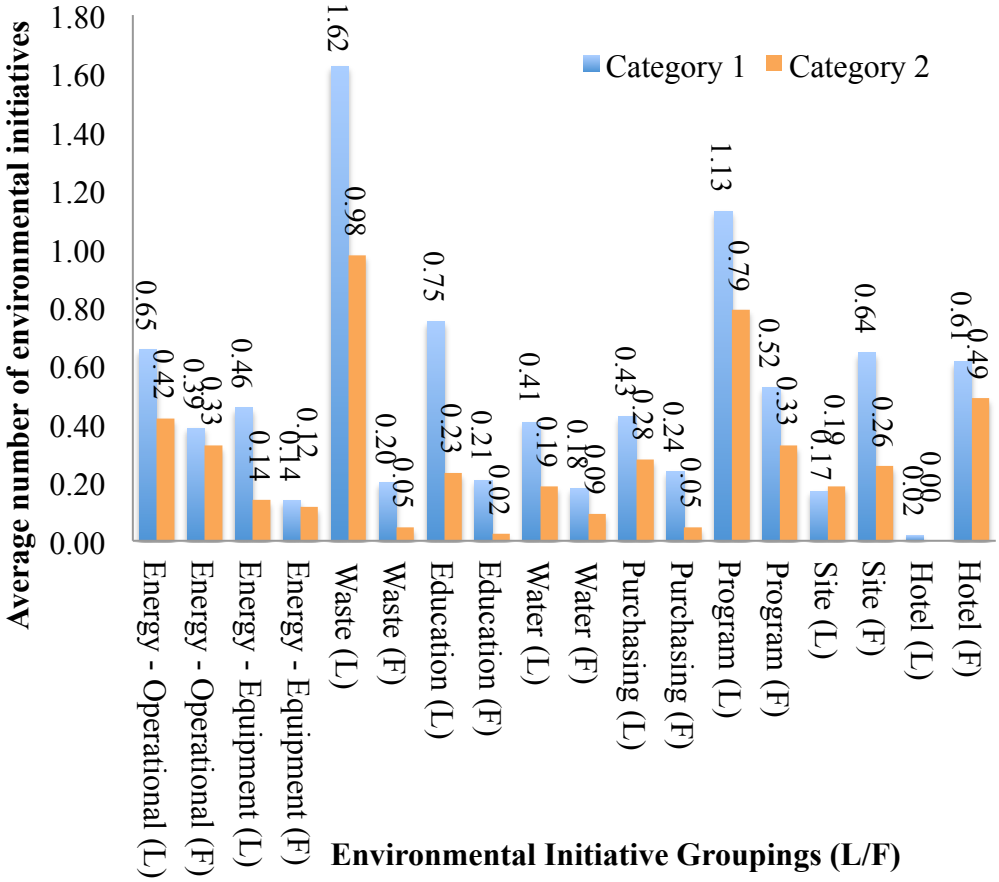
To better understand knowledge penetration from academic literature to current environmental initiatives, a comparison of past literature and findings based on the average number of environmental initiatives implemented were made on category 1 and category 2 hotels (figure 4).

More noticeably, where category 1 exceeds category 2, the ‘Waste (L)’ environmental initiative grouping differed the greatest. Category 1 implemented more waste environmental

initiatives that were mentioned in past literature than category 2 hotels, on average 0.67 more environmental initiatives. Other environmental initiative groupings where category 1 greatly exceeded category 2 include ‘Education (L)’, ‘Water (L)’, ‘Program (L)’, and ‘Site (F)’. Out of the four environmental initiative groupings, only one of the groupings was from research findings, ‘Site (F)’. The other three groupings showed greatest differences between the two categories from past literature, ‘Education (L)’, ‘Water (L)’, and ‘Program (L)’.

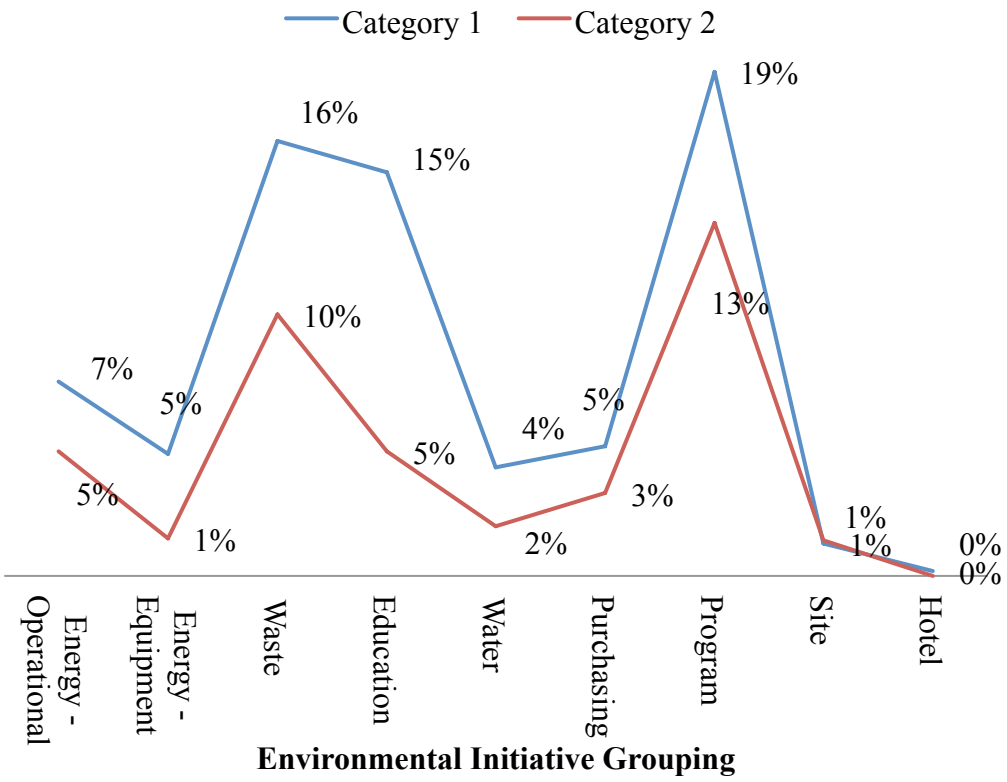
Percentages of the total number of environmental initiatives implemented from research findings compared to environmental initiatives in the past literature were examined as well (Figure 5). Overall, category 1 hotels implemented a higher percentage of environmental initiatives from past literature than category 2 hotels. However, the trend of category 1 and category 2 hotels appeared to be the same. The only noticeable difference is in the ‘Waste’, ‘Education’, ‘Water’, and ‘Program’ environmental initiative grouping. The largest difference was in the ‘Education’ group, where there was a ten percent gap. These noticeable differences were expected in the four environmental initiative groupings.

Figure 4: Average number of environmental initiatives implemented by environmental initiative groupings based on past literature and research findings



Note: (L) refers to environmental initiatives referenced in 'Literature' and (F) refers to environmental initiatives discovered in 'Findings'

Figure 5: Percentage of environmental initiatives implemented from findings compared to environmental initiatives in past literature



4.6 Summary of differences in category 1 and category 2 hotels

4.6.1 Interest in the MACC

Overall, the MACC appears to be an unfamiliar tool in the hotel industry. Hotels that took part in the questionnaire showed limited interest in the MACC as an environmental-financial tool. As the sample size was small, it is not possible to conclude that all hotels share the same views regarding the MACC. However, the two hotels that showed an interest in the MACC demonstrate that this tool has potential to provide valuable information to assist hotels in implementing environmental initiatives suitable for their hotel. Therefore, based on the findings in this study, it is possible to conclude that more information regarding the MACC and the potential benefits is required.

4.6.2 Differences between category 1 and category 2 hotels in both environmental initiatives groupings

Findings demonstrated that 86% of hotels in category 1 and 100% of hotels in category 2 implemented between zero and nineteen environmental initiatives. Both categories of hotels share similar distributions in the total number of environmental initiatives implemented. However, it is not possible to conclude that category 1 and category 2 hotels are different just by looking at the percentage of environmental initiatives implemented. Therefore the t-test was used to test whether a significant difference exist the between the two categories of hotels.

The t-test in conjunction with the Levene's test was used to test the significant differences between the category 1 and category 2 hotels in both environmental initiative groupings. The overall t-test showed significant difference between the two categories of hotels. Furthermore, significant differences between category 1 and category 2 hotels were found in both methods of environmental initiative classification of environmental initiative groupings. In the first method of environmental initiative groupings, twenty two percent of groups were not significantly different. In the second method of environmental initiative groupings, twenty-five percent of groups were not significantly different. These significantly different groups in effect influenced the overall significance between the two categories of hotels. The distribution and focus of environmental initiatives in category 1 and category 2 hotels is interesting.

Environmental initiatives implemented found in research findings and past literature varied from environmental initiative groupings in category 1 and category 2 hotels. However, both categories of hotel followed the same general pattern in implementation, with category 1 hotels implementing a higher percentage of environmental initiatives than were found in past literature.

From statistical testing, there was an overall significant difference between category 1 and category 2 hotels. Results demonstrated that category 1 hotels implemented on average close to two times more environmental initiatives than category 2 hotels. Looking closely at the nine environmental initiative groupings and adoption rates of environmental initiatives showed that differences do exist within the two categories of hotels. Therefore, a suitable conclusion can be made stating that overall category 1 and category 2 hotels appear to be different by the total number of environmental initiatives implemented and are quite different when taking a closer look.

4.6.3 Third category of hotels

Although research focused on category 1 and category 2 hotels, a third category of hotels was included in the study. These hotels do not appear to implement any environmental initiatives. This category is different than category 1 and category 2. As these hotels do not appear to implement environmental initiatives, they were not included in the analysis of initiatives undertaken. However, this does not mean that the hotels as a group do not provide interesting insight.

First, the existence of a third category is interesting. Although small in size, this category shows that there are still hotels that do not appear to be environmentally friendly. Second, a nuance is discovered. What was discovered hints at an issue in dissemination of environmental information, particularly environmental initiatives. The methods used and the sources used to identify environmental initiatives implemented by hotels are shown as a suitable method to identify and verify actions taken. If hotels did implement environmental initiatives, the sources used would be able to provide this information, as seen for category 1 and category 2 hotels. However, as environmental initiatives were not identified in these hotels, it is probable that this is due to the hotels not implementing environmental initiatives.

Chapter 5: Discussion

In the previous chapter, information regarding environmental certification programs and environmental initiatives adoption was analyzed in a sample of Canadian hotels in the GTA. The purpose of this chapter is to discuss the implications directly gained from the analysis of hotels that are environmentally certified and hotels that are not. This chapter will first compare and contrast findings related to environmentally certified hotels with the existing literature. The second section of this chapter will discuss the introduction of the MACC as an environmental-financial decision support tool in the hotel industry. This will then lead to identifying research opportunities from research findings and to address the remaining gap in the literature.

5.1 Implementation of environmental initiatives in the hotel industry

The intention of this research is to address the knowledge gaps identified in the literature to examine the implementation of environmental initiatives in environmentally and not environmentally certified hotels in order to assist environmental initiatives adoption. Furthermore, the intent is to understand the reception of hotels in selecting environmental initiatives by introducing an environmental-financial decision support tool to hotels. Information provided by this tool will demonstrate and disseminate information that would guide implementation.

Findings suggested that hotels that are environmentally certified implemented more environmental initiatives than hotels that are not environmentally certified. Evidence also demonstrated higher overall adoption rates by environmentally certified hotels than not environmentally certified hotels. The varied levels of environmental initiatives adoption presented an opportunity to assist hotels in adopting more environmental initiatives. One system that was examined was the MACC as an environmental-financial decision support tool in the hotel industry and the other system was environmental certification programs.

5.2 Environmental certification in hotels

When observing whether significant differences exist between environmentally certified and not environmentally certified hotels, adoption rates suggested that environmental initiatives implemented varied in groupings. Environmentally certified hotels on average implemented double the number of environmental initiatives than not environmentally certified hotels.

5.2.1 Environmental initiatives implemented

As a category, hotels that are environmentally certified implemented more environmental initiatives than hotels that are not environmentally certified in all groups. Both hotel categories implemented environmental initiatives found in literature, however, hotels that were environmentally certified implemented more environmental initiatives than not environmentally certified hotels. Environmentally certified hotels, as a category, implemented more environmental initiatives found at either five or six sources (table 6) than not environmentally certified hotels (table 8). Furthermore, the hotels also implemented different environmental initiatives. Although this difference is the general case, the implementation of environmental initiatives across hotels that are environmentally certified and hotels that are not environmentally certified varied from hotel to hotel within each category. The variation could be reflected in the environmental initiative groupings. Evidence of energy, waste, education, purchasing, program, site, and hotel environmental initiatives existed in both environmentally certified hotels and not environmentally certified hotels.

5.2.1.1 Energy

Evidence of energy efficient appliances, electronics & light bulbs were discovered in both categories of hotel. Much of this information was identified using all six sources in environmentally certified hotels (refer to table 6) and four sources in not environmentally certified hotels (refer to table 8) suggesting the prominence of energy related environmental initiatives. However, more hotels that were not environmentally certified had evidence of keycard lighting control of room electricity. Nicholls & Kang (2012b) and Trung & Kumar (2005) revealed the same energy related initiatives in hotels. Environmental certification programs may not include this environmental initiative as a requirement, which may reduce the adoption rate. Further, the cost associated with environmental initiative could potentially inhibit the adoption rate compared to other less costly options, such as energy efficient lighting.

Other energy initiatives were present in hotels, however, not as common as the ones mentioned above. Adoption rates of this environmental initiative were lower in not environmentally certified hotels than environmentally certified hotels (refer to table 14). Replacing less efficient appliances, electronics & light bulbs with more efficient ones can be

considered relatively simple and easy to implement, making this energy initiative commonly implemented (refer to figure 4). Lighting related environmental initiatives appeared to be central to energy related environmental initiatives (refer to table 14). Similarly, energy efficient appliances and electronics appeared to be common amongst energy equipment related environmental initiatives (refer to table 15). This environmental initiative could also be considered a norm when hotels choose to become environmentally friendly (Baylor, n.d.), which may explain the popularity of this environmental initiative.

In this type of environmental initiatives, hotels primarily implement a select number of environmental initiatives, like the ones mentioned above. However, research shows that there are many other environmental initiatives that can assist hotels in reducing energy intensity (refer to figure 4). Depending on the hotels' interest, they are able to implement energy environmental initiatives that are operational or equipment related. Past literature does not provide evidence of other types of energy related environmental initiatives implemented in hotels regardless of whether they are environmentally certified or not (refer to figure 5).

Energy related environmental initiatives in both environmentally certified and not environmentally certified hotels were relatively low, suggesting that the past literature presents a list that covers a small portion of actual energy related environmental initiatives, however, more environmental initiatives are being implemented currently (refer to figure 5). This was the case with both 'Energy – Operational' and 'Energy – Equipment' environmental initiatives.

5.2.1.2 Waste

In general, waste related environmental initiatives were reported in a high number of sources in both environmentally certified hotels (out of five sources, see table 6) and not environmentally certified hotels (out of four sources, see table 8). The evidence of such initiatives in the majority of sources also suggests the validity as well as frequency of waste initiatives. Of these initiatives, recycling bins and sorting facilities were observed in both environmentally certified and not environmentally certified hotels. By far, recycling practices dominated waste related environmental initiatives in both categories of hotels (refer to table 16). Not all hotels were observed to implement this environmental initiative, however, most hotels had some form of recycling available to guests, whether this was in guest rooms or in public areas. These findings aligned with that of Nicholls & Kang (2012b) and Rahman et al. (2012),

where recycling receptacles were found in office space, kitchens, and guest rooms. In the context of Toronto, recycling is intuitive and adopted by all outside of hotels within homes and other businesses. As recycling systems are in place through government programs, this environmental initiative is particularly easy to implement, which is a possible explanation of the high levels of implementation in both hotel categories.

Research findings also found that hotels implemented waste related environmental initiatives that were outside of recycling. These include reducing promotional material, reusing dinnerware when possible, and donating certain lightly used items, which had relatively high levels of adoption. Evidence of these environmental initiatives was found in literature as well (Rahman et al., 2012; Nicholls & Kang, 2012b). Although evidence of these environmental initiatives exists, not all hotels implement these initiatives. Clearly this type of environmental initiative requires more effort and change in company culture. For example, reducing promotional packaging requires hotel management to alter current practices of producing promotional material in print and instead sending information electronically. Environmentally certified hotels implemented more environmental initiatives than hotels that were not environmentally certified in past literature and findings (refer to figure 4), suggesting that environmentally certified hotels are indeed more environmentally friendly.

Opportunity existed for hotels to implement waste related environmental initiatives. Like energy environmental initiatives, there is one predominant waste related environmental initiative, recycling bins and sorting facilities in hotels. Both environmentally certified and not environmentally certified hotels may be inclined to place recycling bins in guest rooms and/or public areas as many other hotels are doing so, creating guest expectations and norms (Baylor, n.d.). Furthermore, the percentage of environmental initiatives implemented/adopted recognized in the past literature was considerably high in both environmentally certified and not environmentally certified hotels (refer to figure 5), which could indicate that hotels have not implemented more innovative environmental initiatives.

5.2.1.3 Water

Evidence of water related environmental initiatives discovered from literature was more common in environmentally certified hotels in terms of the sources used and the variation in

sources (refer to table 6 & table 7). However, some not environmentally certified hotels also had these initiatives according to three sources (refer to table 8).

To overcome water issues, hotels have implemented environmental initiatives that improve water efficiency to reduce the water usage in everyday operations. The most common water environmental initiative, in both environmentally certified and not environmentally certified hotels, is the use of water efficient fixtures, reflected in the adoption rates (refer to table 18). Water efficient fixtures involved the use of water saving showerheads, facets that reduced water usages, and dual flush toilets that allowed for different water usages as needed. This was found in public areas as well as guest rooms in hotels that implemented these initiatives. These findings were similar to the literature (Trung & Kumar, 2005; Nicholls & Kang, 2012a; Cheung & Fan, 2013). The use of these initiatives would help reduce the water flow rates in guest rooms so that water reduction is guaranteed (Trung & Kumar, 2005). Environmentally certified hotels implemented more environmental initiatives than not environmentally certified hotels in both past literature and in research findings in terms of water related environmental initiatives (refer to figure 4). However, the overall percentage of environmental initiatives implemented that is identified in literature is relatively low in both environmentally certified and not environmentally certified hotels, suggesting that other environmental initiatives were available currently to hotels (refer to figure 5).

Although not as common as water efficient fixtures, opportunity existed for hotels to implement other environmental initiatives. Water environmental initiatives extended to the reduction of water in other areas of the hotel. These environmental initiatives were targeted more towards behind-the-scene operational areas as opposed to environmental initiatives that guests would be able to notice, such as laundry efficiency, rainwater conservation, water filtration system to name a few (refer to table 18). Therefore it is possible that guests would not be aware of these water environmental initiatives in place.

5.2.1.4 Education

These environmental initiatives were commonly mentioned in all six sources in environmentally certified hotels (refer to table 6) and three sources in not environmentally certified hotels (refer to table 8). The dispersion of education environmental initiatives varied between the sources in environmentally certified (refer to table 7) and not environmentally

certified hotels (refer to table 9). This hints at the level of prominence that education related environmental initiatives hold in current practice.

In particular, guest and staff education were observed as environmental education initiatives, with high levels of adoption rate (refer to table 17). For example, guest education involved the hotel informing guests through signs, instructions, green initiatives, and the environment to name a few. Staff education involved training employees to become more environmentally friendly through turning off lights after cleaning rooms, turning off electronics that may be left on, and reporting issues that would affect environmental operations. These practices were also discovered in the literature Rahman et al., 2012). Both categories of hotels were engaged in these two educational environmental initiatives activities.

Staff education and training was more directed towards regulating and operational issues, whereas guest education was seen as voluntary. Staff education extended, not only to front line staff, but also to kitchen employees and landscaping employees. This was also discovered in the literature by Trung & Kumar (2005).

Other environmental initiatives were implemented in research findings that did not appear to be identified in the literature (refer to figure 5). These include educating vendors and guest & staff feedback and comments. These systems were found in several hotels, but not all. One attributing factor could be related to corporate culture. However, it is possible that hotels simply do not have the human resources to carry out these environmental initiatives, for example in not environmentally certified hotels (refer to figure 4).

5.2.1.5 Purchasing

Hotels that were not environmentally certified appeared to report less (refer to table 8) and through fewer sources (refer to table 9) on this type of environmental initiative than hotels that were environmentally certified (refer to table 6). The differences been the two categories of hotels in terms of sources used and the environmental initiatives reported by source is reflected in further analysis of findings.

From further analysis, information gathered from hotel websites, reviews, and photos indicated that numerous hotels purchased from local and/or environmentally conscious companies or brands whenever possible. Research by Nicholls & Kang (2012b) in addition discovered that there was evidence of hotels purchasing organic linens and towel for guest

rooms. Hotels also purchased in bulk to reduce the need for unnecessary transportation costs. These hotel brands would provide environmentally friendly toiletries to hotels, whether they were environmentally certified or not (refer to table 19), which was found in research (Rahman et al., 2012). As not all hotels that are part of the same chain are environmentally certified, those that are not environmentally certified may still source or purchase through the same vendors; therefore, it is possible that this environmental initiative appears to have been implemented more than others.

Hotels also purchased "green" cleaning products that were environmentally friendly, which had relatively high levels of adoption rates in environmentally certified and not environmentally certified hotels (refer to table 19). This finding was in line with Nicholls & Kang (2012b), where hotels specifically selected lower VOC cleaning products in order to reduce environmental and human health impacts.

Evidence of environmentally friendly furniture was used in one hotel, which was environmentally certified (refer to table 19). This environmental purchasing initiative is reported in the literature by Nicholls & Kang (2012b), Bohdanowicz (2006), and Knowles et al. (1999). Overall, a low percentage of the purchasing environmental initiatives were implemented by both categories of hotels (refer to figure 5). In addition, environmentally certified hotels implemented more environmental initiatives identified in past literature than not environmentally certified hotels (refer to figure 4).

5.2.1.6 Program

Program related environmental initiatives were mentioned frequently by all six sources of environmentally certified hotels (refer to table 6). Of these sources, the mention of these environmental initiatives was spread out amongst all six sources (refer to table 7). However, in not environmentally certified hotels, the prominence of program related environmental initiatives decreased (refer to table 8) and sources used varied much more (refer to table 9). The differences in sources used is aligned with the literature and findings, where environmentally certified hotels implemented more environmental initiatives than not environmentally certified hotels. The variation in the sources used was also reflected in the adoption rates and dispersions of program environmental initiatives between the two categories of hotel suggesting the selection criteria and decisions of environmental initiatives adoption.

In both the literature and research findings, the most widely implemented program related environmental initiative was the towel and linen reuse program, reflected in the adoption rates (refer to table 20). This particular environmental initiative was implemented by most of the hotels regardless of their participation in environmental certification. Towel and linen reuse is a requirement for some environmental certification programs, which may explain the high implementation rate of this environmental initiative (refer to figure 4). However, this does not explain the actual motivations of hotels that are not environmentally certified. It is possible that hotels and guests now view this environmental initiative as part of the norm (Baylor, n.d.); therefore hotels implement this initiative regardless of certification. It is also possible to speculate that cost savings is a motivation (Graci & Dodds, 2008).

Other programs included voluntarily forgoing daily housekeeping for a cash or coupon incentive, maintenance plan, dedicated green team, and raising awareness amongst employees (refer to table 20). For example, hotels would participate in Earth Day that involved turning lights off for an hour on Earth Day. A mixture of hotels participated in these additional programs; however, it was more evident in hotels that were environmentally certified. This was the overall trend for environmentally certified hotels both in literature and findings (refer to figure 4). This suggests that hotels involved in these events have integrated environmental practices within the hotel culture rather than simply implementing environmental initiatives in isolation. Similarly, the high percentage of environmental initiatives implemented by hotels of both categories indicates that most hotels are implementing common environmental initiatives such as towel and linen reuse (refer to figure 5).

5.2.1.7 Site

Evidence of site related environmental initiatives were more prominent in research findings from this study than in literature. Site environmental initiatives in environmentally certified hotels (refer to table 6) used five sources in identifying environmentally initiatives as opposed to two sources in not environmentally certified hotels (refer to table 8). Of these sources, the variety of sources used was spread out across all sources in environmentally certified hotels (refer to table 7). In comparison, hotels that were not environmentally certified did not utilize as many sources (refer to table 9). The variation between number and types of

sources used is reflective of the overall differences and focus of hotels in selecting certain environmental initiatives to implement.

Past literature focused on energy generation at individual hotels (Trung & Kumar, 2005; Cheung & Fan, 2013) such as solar energy for laundry, natural lighting (Knowles et al., 1999), and building insulation (Bohdanowicz, 2006). The three environmental initiatives were evident in research however a small number of hotels implemented this initiative (refer to table 21). Interestingly, out of three environmental initiatives, the majority of hotels were were not environmentally certified. Both environmentally certified hotels and not environmentally certified hotels, on average did not implement many site environmental initiatives mentioned in the literature (refer to figure 5), however they implemented more other environmental initiatives (refer to figure 4). An explanatory factor could be that some environmental certification does not recognize this environmental initiative, which could potentially deter hotels from implementing such initiative.

Site related environmental initiatives varied from hotel to hotel (refer to table 21). In addition, environmental initiatives related to the hotel site were not common in both environmentally certified and not environmentally certified hotels found in past literature (refer to figure 4). Environmental initiatives ranged from the design of the pavement and building to allow for natural light to utilizing plants that required minimal water for survival and indoor living wall. In addition, one hotel that was not environmentally certified chose to incorporate an alternative renewable energy source. Literature by Trung & Kumar (2005), Cheung & Fan (2013), Bohdanowicz (2006), and Dalton et al. (2008) discovered that some hotels decided to use alternative forms of energy. In addition, some hotels provided electric car charging stations to attract more environmentally conscious guests that drove electric cars. This environmental initiative may be difficult to implement due to overall cost and the need for these stations.

5.2.1.8 Hotel

In terms of sources of environmental initiatives, hotels that are environmentally certified reported environmental initiatives throughout all six sources (refer to table 6), however, not environmentally certified hotels only utilized two sources (refer to table 8). The lack of use of different sources could indicate the differences in the two categories of hotels (refer to table 8 & table 9). The two sources used by not environmentally certified hotels suggests that hotels would

notify guests of hotel related environmental initiatives and information is further received through guest reviews (refer to table 9); whereas hotels that are environmentally certified would disseminate information through all sources (refer to table 6). These findings suggest that even though environmentally certified hotels utilized a variety of sources, these hotels are not environmentally different in terms of adoption levels.

Further analysis shows that environmental initiatives observed in sample hotels were related to the operations of the hotel rather than technical operations that were discovered by Khemiri & Hassairi (2005), whether in environmentally certified or not environmentally certified hotels. In sample hotels, there were some environmental initiatives that were targeted to the building itself. For example, some hotels had two layers of doors in the lobby, which was adopted by a relatively high number of hotels (refer to 22). This way, when doors were to open and close, hot or cool air would not leave the hotel thereby reducing the need for excessive heating or cooling the area. In terms of building design, some hotels also used a white roof or implemented a reflective system on the roof to reduce unwanted heating from the sun. Other environmental initiatives were targeted at internal operations, such as paperless payroll, carbon tracking or reporting, and using recycled/sustainable paper in day-to-day operations.

Noticeably, two environmentally certified hotels were certified under Leadership in Energy and Environmental Design (LEED). This was also found in past literature (Nicholls & Kang, 2012b). Not only do these two hotels implement environmental initiatives, but also LEED indicates that the hotel was built with the environment in mind. However, two not environmentally certified hotels have implemented environmental initiatives that affect the building design, which is similar to LEED certification. These research findings are interesting as environmental building design is one of the main components of LEED certification (Going green with LEED, n.d.). The only environmental initiative identified in the literature and found in research findings was LEED certification. The low levels of adoption suggest that there is much room for improvement in this area (refer to figure 5).

Not all environmental initiatives required drastic changes in hotel operations, however, hotels that were observed to implement this type of environmental initiative were mostly environmentally certified hotels in the research findings (refer to figure 4). It is possible that hotels that implemented these environmental initiatives are considered more proactive and are environmental leaders.

5.2.2 Minimum requirements of environmental certification programs

When hotels apply for environmental certification, they are required to meet minimum requirements. These minimum requirements differ depending on the environmental certification program selected, which could potentially affect environmental initiatives selection. As all environmental certification programs have placed importance on the environment, therefore it is not surprising that the total adoption rates of environmentally certified hotels are higher than hotels that are not environmentally certified. These differences in environmental initiatives selection are discovered in the nine environmental initiative groupings and one overall grouping showing significant differences in eight out of ten groupings. Minimum requirements of environmental initiatives could also account for the differences seen, where the focus is on certain environmental initiatives varying from program to program.

The lower adoption rates of certain environmental initiatives could be attributed to environmental certification programs. For hotels that are not environmentally certified, possible explanations include the cost (Chafe, 2005; Brunet, n.d.) and lack of information/unfamiliarity of the environmental certification program (Jhawar et al., 2012). Hotels may consider and implement environmental initiatives for cost saving reasons, promotional reasons, or motivations other than environmental certification programs.

5.2.3 Imbalance of environmental initiatives implemented

In the two hotel categories, there are hotels that lag behind the average hotel. As lagging hotels exist in environmentally certified and not environmentally certified categories, the possibility of improvement exists to implement more or a different selection of environmental initiatives. There is no doubt that when hotels implement certain environmental initiatives, a certain amount of consideration is required. One common consideration is the capital cost of environmental initiatives (Low carbon green growth road map for Asia and the Pacific, n.d.; Jhawar, Kohli, Li, Modiri, Mota, Nagy, Poon & Shum, 2012). Noticeably, the lagging hotels implement common and simple environmental initiatives rather than more innovative ones. To choose certain environmental initiatives, hotels should understand the costs and benefits both financially and environmentally. However, barriers exist that prevent knowledge transfer (Halbe, 2013).

5.2.4 Likelihood of environmental initiatives implementation

The level and likelihood of implementation of environmental initiatives could be attributed to the nature of specific initiatives, such as 'Behavioural', 'Operational – Equipment', 'Operational – Programs', and 'Infrastructure' (refer to table 23). For example, behavioural environmental initiatives would be implemented more often than infrastructure related environmental initiatives, as behavioural environmental initiatives are inherently simpler to implement. However, whether actual behavioural changes take place is another question. Therefore the nature of environmental initiatives influenced the areas of focus that hotels in both hotel categories would likely implement. In the four areas, environmentally certified hotels implemented more environmental initiatives than not environmentally certified hotels (refer to table 23), suggesting that environmental initiatives that are perceived as more difficult or required more capital investment would not be implemented, instead focus was directed towards simple environmental initiatives.

5.3 Reception of the MACC

The filling of the information gap within hotels is crucial to transform the hotel industry into one that is more environmental. Therefore in order to achieve this, the issue of industry specific environmental knowledge must be addressed. There exists a problem of lack of knowledge transfer between different sectors and within sectors, inhibiting the potential knowledge transfer of innovative environmental sustainable initiatives (Halbe, 2013). The manufacturing, transportation, agricultural, building, and energy sectors have each developed a MACC to assist with knowledge transfer. These MACCs provide knowledge that can be shared with other sectors. For example, the building and energy sectors can share results from environmental initiatives that would benefit the hotel industry. However, developing a MACC specifically for the hotel industry will be most beneficial to communicate environmental and financial information. As a specific MACC has not been developed for the hotel industry, this study uncovers interesting opinions and interests regarding the opportunity for this development in the hotel industry.

In the already developed MACCs, the building sector becomes the most applicable MACC to hotels. For example, all MACCs mentioned improving lighting energy efficiency,

however, Belgium (n.d.b) was the only country where within the building sector lighting or switching to energy efficient lighting was considered a positive abatement. The variation of what is considered positive and negative abatement measures indicates that there is no fixed set of environmental initiatives suitable for all buildings. Similarly, each hotel is situated in different locations, which may allow for some environmental initiatives to benefit in different environmental areas.

From the sample hotels involved in this study, it is clear that hotels do not implement the same number of environmental initiatives. Even when the same third party program environmentally certified hotels, the number and type of environmental initiatives implemented vary. Within the hotels that responded to the MACC, the number of environmental initiatives implemented varied. This can be attributed to individual hotels utilizing different methods in making decisions as to which environmental initiative to implement.

Hotels that responded to the questionnaire showed some interest in the MACC; however, the overall interest level regarding the MACC was low, similar to the overall usage of the MACC at the industry level. The varied responses also provided information along with suggestions that suggests that the MACC could be beneficial. Based on the research findings and comparative analysis, there is an opportunity for the hotel industry to utilize a MACC as an environmental-financial decision support tool to increase adoption rates of many environmental initiatives.

Overall, the level of interest in the MACC varied. Although the MACC could be a potential environmental-financial decision support tool that could be used in the hotel industry, this tool may require more development before it can present its full potential. As the level of interest and exposure of the MACC to the hotel industry is low, it may be more feasible and suitable to further develop environmental certification programs to better assist the implementation of environmental initiatives.

5.4 Areas that need to be addressed going forward

5.4.1 Improving environmental knowledge transfer

Within the category of environmentally certified hotels, the number of environmental initiatives varied. Similar findings were discovered for hotels that were not environmentally certified. Likewise, the number of environmental initiatives implemented in different groups of

environmental initiatives also varied indicating that hotels have a process in deciding which environmental initiatives to implement. The selection of environmental initiatives also varied in some areas but remained the same in others. Unfortunately, the processes are unknown and vary from hotel to hotel, making environmental knowledge transfer rather difficult. Environmentally speaking, environmentally certified hotels implemented more environmental initiatives than not environmentally certified hotels, results being significantly different. Improvements can be made in both hotel categories, as environmentally certifying does not guarantee that the hotel is more environmentally different than hotels that have not environmentally certified, which can be seen in the distribution of total number of environmental initiatives implemented.

Areas of focus of environmental initiatives in hotels are in generic areas, for example energy efficient lighting or water efficient fixtures, however, as demonstrated in other MACCs, there are positive and negative abatement measures that vary from MACC to MACC. If a hotel were only to implement the generic ones, they may not reap maximum environmental and financial benefits.

Introducing an environmental-financial decision support tool, the MACC, to the hotel industry could be beneficial. The respondent hotels participating in this study provided insight into the current knowledge of this tool in the hotel industry. The MACC is unfamiliar therefore more research is required to develop a customized MACC for the hotel industry, cost structure, and carbon intensity of the local jurisdiction.

Instead of the MACC as a possible tool, the current practice in hotels is environmental certification. Therefore environmental certification programs could also be considered as a tool that will assist hotels in selecting environmental initiatives to improve adoption rates. An opportunity may be created to improve environmental certification programs to facilitate the certification process.

5.4.2 Views and motivations guiding environmental certification

Within the sample hotels, differences were discovered between hotels that have certified and hotels that have not been certified in terms of the number of environmental initiatives implemented by each hotel. Besides noting that a difference exists, environmentally certified hotels may be characterized differently than not environmentally certified hotels.

The commonalties of environmental initiatives that hotels have implemented appear to be initiatives that would be expected by guests (Baylor, n.d.), altering the image of the hotel (Pizam, 2009), and influencing resource consumption of employees and guests (Zhang et al., 2014). Although hotels may be motivated in similar ways, they may decide and select different environmental initiatives to fulfil the motivators. These motivations can be said to include both environmentally certified hotels and not environmentally certified hotels.

The motivations and views that drove hotels to environmentally certify or hotels that chose to not environmentally certify are unclear in this study. Hotels may decide to environmentally certify due to environmental reasons (Brunet, n.d.), or due to cost reduction reasons (Graci & Dodds, 2008). Within sample hotels, one thing is certain; the majority of hotels have been observed to implement some environmental initiatives. The few that have not been observed to implement environmental initiatives could be due to the lack of access to finance (Low carbon green growth road map for Asia and the Pacific, n.d.; Jhawar, Kohli, Li, Modiri, Mota, Nagy, Poon & Shum, 2012), because of 'greenwashing' (Baylor, n.d.), or other unknown reasons.

Overall, significant differences were discovered in terms of the total number of environmental initiatives implemented between environmentally certified and not environmentally certified hotels. When taking a closer look at the adoption rates in the nine environmental initiative groupings, differences existed in terms of total number and selection of environmental initiatives. In some cases, some individual hotels that have not been environmentally certified implemented more environmental initiatives than some individual hotels that have been environmentally certified through looking at adoption rates. This indicates that although hotels are environmentally certified, there is always an opportunity to improve by implementing more suitable environmental initiatives. Nevertheless, opportunity exists for improvement within both categories of hotels as not all hotels within the same category implement the same number of environmental initiatives or the same combination of environmental initiatives. Therefore, a customized MACC could be used as an environmental-financial decision support tool, to enable hotels to gain a better understanding of beneficial environmental initiatives for their hotel.

Chapter 6: Conclusion

The purpose of this study was to examine environmental initiatives adoption rates to create industry-specific information to assist hotels in making decisions to adopt more environmental initiatives. By understanding the difference between environmentally certified hotels and not environmentally certified hotels, the discussion in the previous chapters assisted in providing a better understanding of the hotel industry. In addition, the introduction of the MACC to the hotel industry was also discussed. These two systems create potential to be able to assist environmental initiatives adoption. Therefore, this chapter will summarize research findings, outline areas for future research, provide contributions to research, and include limitations of the research study.

6.1 Future research

6.1.1 Environmental systems in the hotel industry

The two systems presented in this research provided some insight into current environmental knowledge transfer methods, which influenced the selection and combination of environmental initiatives implemented.

The first system, environmental certification programs, guide hotels in implementing certain environmental initiatives to meet minimum requirements, whereas other hotels not environmentally certified are guided by other motivations. Depending on the motivations, hotels are governed in different ways that enable the implementation of different environmental initiatives. The different selections of environmental initiatives from both hotel categories demonstrate the necessity in environmental knowledge transfer. Nevertheless, environmental certification programs influence and thereby provide assistance in environmental initiatives adoption in hotels.

The introduction of the MACC, the second system, as an environmental-financial decision support tool showed some positive reception in the hotel industry from questionnaires. However, results were inconclusive in determining the usefulness of this tool. To better understand environmental initiatives implemented by hotels, more detailed environmental knowledge would be beneficial. More detailed environmental knowledge that would be interesting includes financial costs of environmental initiatives, specific environmental initiatives implemented, and guiding motivations in environmental decision-making of environmental

initiatives implementation. This information would be used to create an industry specific MACC and thus industry specific environmental knowledge.

Multiple ways to facilitate environmental initiatives adoption are presented. However, from the research findings, it appears that the hotel industry would benefit more from improvements made to environmental certification programs. The use of the MACC is unfamiliar and new within this industry requiring more research and information. Therefore, out of the two systems, environmental certification programs appear to be the most suitable way to increase environmental initiatives adoption.

6.1.2 Environmental certification programs: Practicality of new classification system

As environmental certification programs are a familiar tool or system within the hotel industry, further developing environmental certification programs maybe the more feasible option. Many environmental certification programs are available to the hotel industry. As long as hotels meet certain minimum requirements, they are certified under the program. This also means that hotels are required to implement a certain set of environmental initiatives, even though there are many alternatives. The underlying factors of why some hotels in the Canadian context decide to environmentally certify was not identified in this study. To better understand, more research is required to definitively understand factors behind environmental certification in a similar context.

Environmental certification programs played a large role in this research study; in determining whether environmentally certified hotels differ from hotels that have not environmentally certified. As environmental certification programs appear to be better understood by hotels, it is desirable to improve sustainable tourism in this way. Past literature presents view and motivations as to why some hotels environmentally certify and why others do not. One argument against environmental certification is that hotels are concerned with the legitimacy of environmental certification programs. All environmental certification programs focus on rewarding actions that are positive for the environment; however, none of these programs sanction actions that are negative. This new system will be a relative rating program that will allow hotels to compare themselves against other hotels with a score that is meaningful. That way, hotels will know specifically the areas in which they are lagging and exceling in comparison to other hotels.

An opportunity exists for future research studies in determining the potential of developing a new environmental certification program that reward positive actions, but also take into account negative actions. Certification under this new environmental certification program will provide a better environmental picture of hotels, combating the legitimacy issue.

6.2 Limitations of this study

This research study focused on two third party certification programs, GreenLeaders by TripAdvisor and Green Key Eco-Rating Program, and two internal chain specific programs, PLANET 21 by AccorHotels and IHG Green Engage by InterContinental Hotels Group. The sample only included hotels that were from these programs and part of the GTHA, totalling 144 hotels. Furthermore, environmental information used in the research study was limited to what was available online (websites, photos, and reviews). Views regarding the MACC were collected from just four hotels. This research study is a starting point for the comparison of environmentally certified hotels with not environmentally certified hotels and the environmental differences that exists between the two categories. This study also considered introducing an alternative environmental-financial decision support tool to the hotel industry. Further research that involves other environmental certification programs, more hotels, more views on the MACC, and environmental information required to develop a industry specific MACC would be beneficial in strengthening research findings. Results from further research would provide a better representation of environmental certification programs in the hotel industry.

6.3 Contributions of this research study

Contributions of this research study included a better understanding of environmental certification programs along with the differences between environmentally certified and not environmentally certified hotels. It also provided insight into the usefulness of the MACC in the hotel industry as an environmental-financial decision support tool. Furthermore, environmental certification programs demonstrated the possibility to assist hotels in environmental initiatives implementation.

In terms of academic literature, this research contributed to knowledge on the implementation of environmental initiatives, discovered the reception of the MACC in the hotel industry as an environmental-financial decision support tool, and illustrated the success of

environmental certification programs in environmental initiatives adoption. Although the MACC received mixed reviews, the research contributed to the knowledge base on other possible systems that can be applied in the hotel industry.

In practical terms, the research study looked at the issues of environmental certification in the view of hotels and therefore introduced a new environmental-financial decision support tool to the hotel industry to improve environmental knowledge. Individual hotels and the hotel industry will benefit from the knowledge gained from this research, allowing hotels to become more environmental friendly whether this is as individual hotels, chain hotels, or the industry as a whole. Furthermore, environmental initiatives identified in this research study can provide hotels, particularly Canadian hotels, with an industry specific list of environmental initiatives and encourage the implementation of innovative environmental initiatives.

In conclusion, the issue of climate change is relevant in all industries and sectors. Each of these industries and sectors has developed mitigation efforts to overcome this issue. In tourism, sustainable tourism is a prevalent movement that has directed environmental focus on day-to-day operations. Many of these mitigation efforts involve incorporating greener day-to-day operations that focus on certain aspects such as energy, waste, and water.

The hotel industry is not exempt from this and has joined the climate change fight by implementing environmental initiatives. As hotels are resource intensive, it is necessary for them to reduce their negative impacts on the environment. Examples of environmental initiatives include energy efficient lighting, energy efficient appliances/equipment, guest and staff education, recycling practices, water efficient fixtures, and towel & linen reuse programs. As an effort, some have environmentally certified their hotels while others have not. Similarly, some hotels implement common environmental initiatives while others implement more of a variety of environmental initiatives. As hotels differ from one another, the implementation of environmental initiatives differs as well, which affect the overall effectiveness. Therefore, it is imperative for hotels and hotel industries around the world to improve environmental communication thus proactively engage in and increase environmental initiatives to be able to make the most positive impact on the environment.

Appendix

Appendix 1

Structured-questionnaire Questions

1. If this tool were available with information for your local hotel industry, would your hotel or hotels view this tool as beneficial?
2. If this tool were tailored specifically to your hotel or hotels, would your hotel view this tool as beneficial? If yes, would your hotel or hotels incorporate this tool in decision-making when considering environmental initiatives? Would it be used when making operational decisions? Would it be used when making capital investment decisions?

   Would it be used in other ways? If yes, what other ways?
3. Would this tool provide knowledge not previously known to the hotel or hotels?
4. Does this tool provide you with enough information to make informed decisions on which environmental initiative is most beneficial to your hotel or hotels? If not, what additional information is required?
5. Would this tool help or influence your hotel or hotels in making decisions about which environmental initiative to consider?

Appendix 2

Interview Questions

1. What information do you currently use in your hotel to make environmental decisions? Would there be a difference in making capital investments compared to operational investments? For example, capital investments refer to the investment of a sum of money in a particular environmental decision, like changing all windows to more energy efficient windows. Operational investments would be altering the way the hotel operates and becoming more environmentally friendly, like reducing the number of towels to be washed.
2. How would you rank initiatives that are capital investments or operational investments? Would you more likely adopt initiatives that are operational investments or capital investments?
3. What information, besides those used currently and those shown on the MACC, would be useful to help with environmental decision-making?

4. Do you think that the MACC would be useful, in terms of information presented to help with environmental decision-making, in your hotel? If yes, what are the reasons that have lead you to make this decision. If no, why do you think that the MACC is not useful to your hotel?
5. Are you interested in developing a MACC for your hotel? If yes, why? If no, what are the reasons that lead to your disinterest in a MACC for your hotel?
6. What environmental initiatives are currently in use in your hotel/hotels?
7. Of these initiatives, please provide the following information: capital cost (dollars), annual saving (dollars), GHG abatement (per annum or energy savings), and project life (years).
8. Are there any initiatives that are planned implemented in the next 2 years/3-5 years/6-10 years?

Appendix 3

	Environmental Initiative	Detail
Energy - Operational	Lighting Control	Key card control of lighting in guest rooms
	Climate Control by Management	Management control of heater and/or air conditioning
	Energy Efficient Lighting	Use of energy efficient lighting in guest rooms and/or public areas
	Lighting Sensors	Sensors in public, guest rooms, interior, and exterior areas that control whether the light is turned on or off
	Temperature Sensors	Sensors in public and guest rooms areas that control whether the temperature is at its pre-set setting
	Electronic Sensors	Sensors in public and guest rooms areas that control whether electronics are turned on or off
	Blinds Sensors	Sensors areas that control whether the blinds are lowered or up
	Dimmable Lighting Controls	Lighting controls in guest rooms and public areas that can be set at different brightness's as needed
	Energy Savings during "Slow Times"	Closing off floors when occupancy is lower, shutting down elevators or escalators when occupancy is lower to reduce energy
Energy - Equipment	Energy Assessment of Building	Assess amount of energy hotel consumes to evaluate measures to make the hotel more energy efficient
	Tracks Energy Use	Tracking the use of energy in the building
	Energy Efficient Appliances/Equipment	Equipment or appliances that include ENERGY STAR, solar heated pool, heating-cooling system, PTAC heater, HVAC
	Tree Shading	Shade created by trees around the building area
	Kitchen Retrofit Efficiency	Retrofits that include turning off the gas and exhaust management
	Instantaneous Water Heater	Water heater that heats water when needed
	Energy Recovery Unit	Units that captures and utilizes exhaust air
	Energy Recycler Dehumidifier	Lowers amount of energy consumed
	Alternate Water Heating Method	Method alternative from local energy source (e.g. geothermal)
	Ceiling Fan	Use of ceiling fans in guest rooms
Waste	Recycling Practices	Recycling bins in guest rooms and/or public areas
	Recyclable/Reused/Donated Food Waste	Recycling, reusing, or donating cooking oil
	Recyclable/Reused/Donated Furniture or Materials	Recycling, reusing, or donating used mattresses, toiletries, electronics, flooring, and cutlery
	Reusable Dinnerware	Reusing glassware, recyclable disposable, refillable containers

	Recycling Electronics	Recycling electronics used in the hotel
	Reducing in-room waste	Reducing toiletry bottles and using soap dispensers instead in guest rooms
	Waste Assessment of Building	Assess amount of waste hotel produces to evaluate measures to reduce waste production
	Safe Disposal of Hazardous Materials	Safe disposal of hazardous materials such as batteries
	Paperless Check-in & Check-out	Emailing or providing an e-receipt etc.
	Recycling Sorting Process	Sorting in house (at hotel) or third party sorting (outsourcing)
Education	Guest Education	Signs, information, instructions providing information about the environment, sustainability, green initiatives, and local environment
	Staff Training	Training on energy saving measures such as turning off lights after cleaning, turning off electronics (radios and TV), and reporting issues that would affect operations
	Vendor Education	Environmental information in the form of brochures and guides for hotel vendors
	Guest Feedback and Comments	Allowing guests to provide input in how to improve environmental sustainability in hotel
	Staff Feedback and Comments	Allowing staff to provide input in how to improve environmental sustainability in hotel
Water	Water Efficient Fixtures	Use of water saving showerheads and facets & dual-flush toilets in guest rooms and/or public areas
	Alternative Water Source	Alternate water source for toilets in guest rooms and/or public areas
	Smart Irrigation System	Used to water garden areas of the hotel grounds
	Water Use in A/C System	Alternate water use in air conditioning system
	Laundry Efficiency	Use of cold water in laundry facilities in hotel
	Rainwater Conservation Program	Capturing rainwater and using it in hotel operations
	Water Assessment of Building	Assess amount of water hotel consumes to evaluate measures to make the hotel more water efficient
	Landscaping Irrigation Controlled	Timer controlling water system
	Water Saving Program	Reduces water consumption through voluntary controlled water usage by guests
	Water Filtration System	System filtering taps in guest rooms to allow for drinkable water through taps
Purchasing	Environmentally Conscious Toiletry Brands	Use of toiletries that are biodegradable or organic brands that are environmentally conscious
	Locally Produced/Sourced Toiletries	Purchasing from toiletries from local sources

	"Green" Dry Cleaning	Use of “green” chemical and processes in dry cleaning
	"Green" Cleaning Products and/or Practices	Use of environmental conscious cleaning products and practices
	Refillable Food Dispensers	Purchasing food dispensers that reduces waste packaging (e.g. butter, jam, creamers etc.)
	"Green" Furniture	Furniture that is environmentally conscious
	Sustainable Foods & Drinks	Purchasing organic, fair trade, and/or locally sourced foods and drinks when possible
	Purchasing in Bulk	From perishables to non-perishables
	Sourcing from Environmental Suppliers/Products	Purchasing locally whenever possible
Program	Linen Reuse Program	Reuse of linens for the entire stay or replacing linens on request
	Towel Reuse Program	Reuse of towels for the entire stay or replacing towels on request
	Volunteer Housekeeping	Forgoing daily housekeeping for cash incentive/coupons
	Maintenance Plan (Preventative and/or Post)	Including air filters, air ducts, fans, burners, freezers/refrigerator motors, thermostats, and dishwashers
	Green Team	A group of staff dedicated to environmental issues in the hotel
	Raising Awareness	Staff volunteer and/or events that raises environmental awareness (e.g. Earth Day)
Site	Paints	Use of low VOC paints or water-based paints
	Electronic Car Charging Station	For guest use
	Local Plants	Use of local plants in gardens
	Minimum Water Plants	Use of plants that require minimum water for survival
	Alternate Energy	Use of alternative energy source for hotel
	Energy Levy	Energy levy placed on guest bills
	Living Wall	Plants growing indoor on a wall improving air quality
	Low Chemical Gardening or Minimal Use of Gardening Chemicals	Use of gardening chemicals that are less harmful to the environment
	Natural Lighting	Allowing natural lighting in guest rooms and public areas
	Pavement	Material and design of pavements to reduce surface runoff
	Alternative Form of Transportation	Hotel provides bicycle rentals for guest use
	"Green" Meetings & Business Centres	Meeting space and business centres is equipped with recycling bins, energy efficient equipment, and other environmental friendly necessities
	Rooftop Garden/Green Roofs	Growing own herbs and vegetables onsite

	Building Envelope	Use of energy efficient windows and insulating walls
Hotel	Use of Recycled/Sustainable Paper	In everyday hotel operations
	Recycling or Donating of Recyclable Materials	Recycling or donating used linens, paper, batteries, air conditioning filters, printer cartridges, light bulbs, and toiletries
	Paperless Payroll	Staff receive e-payroll
	Carbon Tracking, Reporting, and/or Auditing	Tracking, reporting, and/or auditing carbon
	Electronic in Place of Paper	Electronic reader boards in place of paper information in public areas and/or guest rooms (e.g. maps, directory, guides)
	Designated "Green" Rooms	Guest rooms designed with the purpose of the environment
	Use of Recycled Room Material	Use of recycled material in room construction
	Carbon Offset Program	Program that offsets carbon emitted by hotel
	Building Design	Building design that uses a white roof and/or implemented a reflective system
	Double Door Entry Way	Double door entry way in hotel lobby
	LEED Certified	Hotel is LEED certified

Appendix 4

Behavioural	Operations – Equipment	Operations – Programs	Infrastructure
Climate Control by Management	Lighting Control	Waste Assessment of Building	Tree Shading
Energy Savings during "Slow Times"	Energy Efficient Lighting	Tracks Energy Use	Ceiling Fan
Recycling Practices	Lighting Sensors	Energy Levy	Electronic Car Charging Station
Recyclable/Reused/Donated Food Waste	Temperature Sensors	Energy Assessment of Building	Local Plants
Recyclable/Reused/Donated Furniture or Materials	Electronic Sensors	Use of Recycled/Sustainable Paper	Minimum Water Plants
Reusable Dinnerware	Blinds Sensors	Recycling or Donating of Recyclable Materials	Alternate Energy
Recycling Electronics	Dimmable Lighting Controls	Paperless Payroll	Living Wall
Reducing in-room waste	Energy Efficient Appliances/Equipment	Carbon Tracking, Reporting, and/or Auditing	LEED Certified
Safe Disposal of Hazardous Materials	Kitchen Retrofit Efficiency	Carbon Offset Program	Natural Lighting
Paperless Check-in & Check-out	Instantaneous Water Heater	Sourcing from Environmental Suppliers/Products	Pavement
Recycling Sorting Process	Energy Recovery Unit	Refillable Food Dispensers	Alternative Form of Transportation
Guest Education	Energy Recycler Dehumidifier	"Green" Furniture	"Green" Meetings & Business Centres
Staff Training	Alternate Water Heating Method	Sustainable Foods & Drinks	Rooftop Garden/Green Roofs
Vendor Education	Water Efficient Fixtures	Purchasing in Bulk	Building Envelope
Guest Feedback and Comments	Alternative Water Source - toilets	Environmentally Conscious Toiletry Brands	Designated "Green" Rooms
Staff Feedback and Comments	Smart Irrigation System	Locally Produced/Sourced Toiletries	Use of Recycled Room Material
Water Saving Program	Water Use in A/C System	"Green" Dry Cleaning	Building Design
Volunteer Housekeeping	Laundry Efficiency	"Green" Cleaning Products and/or Practices	Double Door Entry Way
Maintenance Plan (Preventative and/or Post)	Rainwater Conservation Program		

Green Team Raising Awareness Linen Reuse Program Towel Reuse Program	Water Assessment of Building Landscaping Irrigation Controlled Water Filtration System Electronic in Place of Paper Paints Low Chemical Gardening or Minimal Use of Gardening Chemicals		

Bibliography

About Green Globe. (2015). Retrieved June 23, 2015, from http://greenglobe.com/about/

AccorHotels: Our Planet 21. (2015). Retrieved June 21, 2015, from http://www.accorhotels.com/gb/sustainable-development/index.shtml

Ali, Y., Mustafa, M., Al-Mashaqbah, S., Mashal, K. & Mohsen, M. (2008). Potential of energy savings in the hotel sector in Jordan. *Energy Conservation and Management 59*, 3391-3397.

Ayuso, S. (2006). Adoption of voluntary environmental tools for sustainable tourism: Analysing the experience of Spanish hotels. *Corporate Social Responsibility and Environmental Management 13*, 207-220.

Ayuso S. (2007). Comparing voluntary policy instruments for sustainable tourism: The experience of the Spanish hotel sector. *Journal of Sustainable Tourism 15*(2), 144-159. Retrieved from DOI: 10.2167/jost617.0

Baylor. (n.d.). Retrieved August 3, 2015 from http://hotelexecutive.com/business_review/3093/the-value-of-green-certification

Bhaskaran, S., Polonsky, M., Cary, J. & Fernandez, S. (2006). Environmentally sustainable food production and marketing: Opportunity or hype? *British Food Journal 108*(8), 677-690.

Bloomberg. (2011). *The Demand for Greenhouse Gas Emissions Reduction Investments: An Inventors' Marginal Abatement Cost Curve for Kazakhstan*. Retrieved from http://www.ebrd.com/downloads/research/economics/publications/specials/Kazakhstan_MACC_report_ENG.pdf

Bohdanowicz, P. (2006). Environmental awareness and initiatives in the Swedish and Polish hotel industries – survey results. *International Journal of Hospitality Management*, *25*(4), 662-682.

Brebbia, C. A. and Pineda, F.D. (2004). *Sustainable Tourism.* Boston: WIT Press.

Brunet, R. (n.d.). Corralling Carbon. *Western Hotelier Magazine*, 27-30.

Bryman, A., Teevan, J.J. & Bell, E. (2009). *Social Research Methods*. (2nd Ed.). Canada: Oxford.

Burritt, R.L., Hahn, T., & Schaltegger, S. (2002). Towards a comprehensive framework for environmental management accounting – Links between business actors and environmental accounting tools. *Australian Accounting Review 12*(2), 39-50.

Carbon. (n.d.). Retrieved June 23, 2015, from AccorHotels Group, Sustainable Development website, http://www.accorhotels-group.com/en/sustainable-development/the-7-pillars-of-planet-21/carbon.html

Carlson Hotels Worldwide Launches "Green Guide" Foundational Tool for Global Environmental Sustainability Program. (2008). Retrieved June 21, 2015, from http://carlson.com/news-and-media/news-releases.do;jsessionid=6RElqDr0Utt2N5RjUU1v2vyj1gpXVqTvffoARQXZeMrJhQ3ei7vX!1952572938?article=4406652

Certified Green Lodging Properties. (n.d.). Retrieved June 23, 2015, from http://www.audubooninternational.org/green-lodging-certified

Chafe, Z. (2005). *Consumer demand and operator support for socially and environmentally responsible tourism.* Retrieved June 23, 2015, from http://www.rainforest-alliance.org/branding/documents/consumer_demand.pdf

Cheung, M. & Fan, J. (2013). Carbon reduction in a high-density city: A case study of Langham Place Hotel Mongkok Hong Kong. *Renewable Energy 50*, 433-440.

City of Mississauga. (n.d.). Mississauga's location in the Greater Toronto Area (GTA) [Map]. Retrieved from http://www.mississauga.ca/file/COM/MAP_gtamap2_new03.pdf

Creswell, J.W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. (4th Ed.). Los Angeles; London; New Delhi; Singapore; Washington DC:Sage.

Dalton, G., Lockington, D. A., & Baldock, T. E. (2008). A survey of tourist attitudes to renewable energy supply in Australian hotel accommodation. *Renewable Energy 33*(10), 2174-2185.

Deloitte. (2015). *European energy market reform: Country profile Belgium.* Retrieved June 23, 2015, from https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-market-reform-belgium.pdf

Deng, S.M. (2003). Energy and water uses and their performance explanatory indicators in hotels in Hong Kong. *Energy and Buildings 35,* 775-784.

Deng, S.M. & Burnett, J. (2000). A study of energy performance of hotel buildings in Hong Kong. *Energy and Buildings 31*, 7-12.

Designed for Sustainability. (n.d.). Retrieved June 23, 2015, from http://www.ihg.com/holidayinnexpress/hotels/us/en/frazer/fzrpa/hoteldetail/green-engage

de Winter, J.C.F., & Dodou, D. (2010). Five-point Likert items: t-test versus Mann-Whitney-Wilcoxon. *Practical Assessment Research and Evaluation, 15*, 1-12.

Dialogue. (n.d.). Retrieved June 23, 2015, from AccorHotels Group, Sustainable Development website, http://www.accorhotels-group.com/en/sustainable-development/the-7-pillars-of-planet-21/dialogue.html

Earn the ENERGY STAR for Your Hotel Properties. (2010). Retrieved June 23, 2015, from https://www.energystar.gov/ia/business/hospitality/Benchmarking_Fact_Sheet.pdf

Eco-Certified Hotels. (n.d.). Retrieved June 23, 2015, from http://www.sabre.com/index.php/about/corporate-responsibility/deliver/eco-certified-hotels

EcoRooms & EcoSuites Certification Recognized by Industry Leaders. (2012). Retrieved June 22, 2015, from https://www.ecogreenhotel.com/EcoRooms&EcoSuites-Certification-Recognized-by-Industry-Leaders.php

Employment. (n.d.). Retrieved June 23, 2015, from AccorHotels Group, Sustainable Development website, http://www.accorhotels-group.com/en/sustainable-development/the-7-pillars-of-planet-21/employment.html

ENERGY STAR Building Manual. (2007). *Facility Type: Hotels and Motels*. Retrieved June 23, 2015, from http://www.energystar.gov/ia/business/EPA_BUM_CH12_HotelsMotels.pdf

Fees for Green Seal Certification under GS-33 Standard for Lodging Properties. (n.d.). Retrieved June 23, 2015, from http://www.greenseal.org/Portals/0/Documents/Fees/2013/GS-33 Certification Fees.pdf

Find Hotels, Inns and Accommodations with the Illinois Hotel and Lodging Association. (n.d.). Retrieved June 23, 2015, from http://www.stayillinois.com/visit_hotels.cfm

Fiorino, D.J. 2006. New environmental policy instruments. Massachusetts: MIT Press.

Font. (2002). Environmental certification in tourism and hospitality: progress, process and prospect. *Tourism Management 23*, 197-205.

Get started with the benchmarking starter kit. (n.d.). Retrieved June 23, 2015, from https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/get-started-benchmarking

Graci, S. & Dodds, R. (2008). Why go green? The business case for environmental commitment in the Canadian hotel industry. *Anatolia: An International Journal of Tourism and Hospitality Research 19*(2), 251-270.

Going green with LEED. (n.d.) Retrieved October 20, 2015, from https://www.cagbc.org/CAGBC/LEED/CAGBC/Programs/LEED/Going_green_with_LEE.aspx?hkey=54c44792-442b-450a-a286-4aa710bf5c64

Green Globe Certification. (2015). Retrieved June 23, 2015, from http://greenglobe.com/green-globe-certification/

Green Globe contact in your region. (2015). Retrieved June 23, 2015, from Green Globe, Green Globe website, http://greenglobe.com/contact-in-your-region/

Green Key Eco-Rating Program. (2015). Retrieved June 22, 2015, from http://greenkeyglobal.com/programs/eco-rating-program/

Green Key Global FAQs. (2015). Retrieved June 22, 2015, from http://greenkeyglobal.com/faq/

Green Lodging Program. (n.d.). Retrieved June 22, 2015, from http://www.audubooninternational.org/green-lodging

GreenLeaders Survey. (n.d.). Retrieved June 23, 2015, from http://ta-green-leaders-tripadvisorltd.netdna-ssl.com/files/upload/pdf/Canada/English/TripAdvisor GreenLeader Survey Questions.pdf

GS-33. (n.d.). Retrieved June 23, 2015, from Green Seal Environmental Leadership Standard for Lodging Properties, Green Seal website, http://www.greenseal.org/Portals/0/Documents/Standards/GS-33/GS-33 One pager.pdf

GS-33 Hotels and Lodging Properties. (2015). Retrieved June 23, 2015, from http://www.greenseal.org/GreenBusiness/Standards.aspx?vid=ViewStandardDetail&cid=0&sid=19

Halbe, A. (2013). *Green energy initiatives in the hotel industry: factors influencing adoption decisions*. (Unpublished masters dissertation). University of Waterloo, Waterloo.

Halsnaes, K., Mackenzie, G. A., Swisher, J. N. & Villavicencio, A. (1994). Comparable assessment of national GHG abatement costs. *Energy Policy 22*(11), 925-934.

Hasanbeigi, A., Menke, C. & Price, L. (2010). The CO2 abatement cost curve for the Thailand cement industry. *Journal of Cleaner Production 18*, 1509-1518.

Hasek, G. (2011, May 2). *The Green Concierge Project Launches in New York's Catskill Watershed Region*. Retrieved June 23, 2015, from http://www.greenlodgingnews.com/green-concierge-project-launches-new-yorks-catskill

Harvey, D.L.D. (2014). Global climate-oriented building energy use scenarios. *Energy Policy 67*, 473-487.

Health. (n.d.). Retrieved June 23, 2015, from AccorHotels Group, Sustainable Development website, http://www.accorhotels-group.com/en/sustainable-development/the-7-pillars-of-planet-21/health.html

HospitalityGreen's Eco-Business Certification Program. (2011). Retrieved June 23, 2015, from http://hospitalitygreen.com/expertise/hg-green-certification

Hotel Energy Solutions. (2011). *Analysis on Energy Use by European Hotels: Online Survey and Desk Research, Hotel Energy Solutions project publications*. Retrieved from http://hes.unwto.org/sites/all/files/docpdf/analysisonenergyusebyeuropeanhotelsonlinesurveyanddeskresearch2382011-1.pdf

How are GreenLeader applications scored?. (2014). Retrieved June 23, 2015, from TripAdvisor, Help Center website, https://www.tripadvisorsupport.com/hc/en-us/articles/200614117

How can I apply to be a GreenLeader?. (2014). Retrieved June 23, 2015, from TripAdvisor, Help Center website, https://www.tripadvisorsupport.com/hc/en-us/articles/200614137-How-can-I-apply-to-be-a-GreenLeader-

Hunter, C. (2002). Sustainable tourism and the touristic ecological footprint. *Environment, Development and Sustainability 4*, 7-20.

IHG Green Engage System. (2015). Retrieved June 22, 2015, from http://www.ihgplc.com/index.asp?pageid=742

Illinois Hotel and Lodging Association StayGreen Hotel Program. (n.d.). Retrieved June 23, 2015, from http://www.stayillinois.com/Green_overview.cfm

Innovation. (n.d.). Retrieved June 23, 2015, from AccorHotels Group, Sustainable Development website, http://www.accorhotels-group.com/en/sustainable-development/the-7-pillars-of-planet-21/innovation.html

Ivankovic, G., & Jerman, M. (2010). The use of decision making information: A comparative exploratory study of Slovene hotels. *Managing Global Transitions 8*(3), 307-324.

Jainkun, H., Zhiwei, Y., & Da, Z. (2012). China's strategy for energy development and climate change mitigation. *Energy Policy*. *51*(1). 7-13. Retrieved from DOI: 10.1016/j.enpol.2012.03.084

Jarvis, N., Weeden, C. & Simcock, N. (2010). The benefits and challenges of sustainable tourism certification: A case study of the green tourism business scheme in the West of England. *Journal of Hospitality and Tourism Management 17*, 83-93.

Jayawardena, C., Pollard, A., Chort, V., Choi, C. & Kibicho, W. (2013). Trends and sustainability in the Canadian tourism and hospitality industry. *Worldwide Hospitality and Tourism Themes, 5*(2), 132-150.

Jhawar, Kohli, Li, Modiri, Mota, Nagy, Poon & Shum. (2012). http://www.environment.ucla.edu/perch/resources/files/ecohotels2012.pdf

Keleş, S. & Bilgen, S. (2012). Renewable energy sources in Turkey for climate change mitigation and energy sustainability. *Renewable and Sustainable Energy Reviews. 16*(7). 5199-5206. Retrieved from DOI: 10.1016/j.rser.2012.05.026

Khemiri, A. & Hassairi, M. (2005). Development of energy efficiency improvement in the Tunisian hotel sector: a case study. *Renewable Energy 30*, 903-911.

Knowles, T., Macmillan, S., Palmer, J., Grabowski, P. & Hashimoto, A. (1999). The development of environmental initiatives in tourism: responses from the London hotel sector. *International Journal of Tourism Research 1*, 255-265.

Local. (n.d.). Retrieved June 23, 2015, from AccorHotels Group, Sustainable Development website, http://www.accorhotels-group.com/en/sustainable-development/the-7-pillars-of-planet-21/local.html

Low Carbon Green Growth Roadmap for Asia and the Pacific. (n.d.). *Fact Sheet*. Retrieved from http://www.greengrowth-elearning.org/pdf/LCGGRM/FS-Low_carbon_development_plan.pdf

Marinoni, O., Higgins, A., Hajikowicz, S., & Collins, K. (2009). The multiple criteria analysis tool (MCAT): A new software tool to support environmental investment decision making. *Environmental Modelling & Software 24*, 153-164.

McKinsey & Company. (n.d.a). *Pathways to a Low-Carbon Economy for Brazil.* Retrieved from http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/pathways_low_carbon_economy_brazil.ashx

McKinsey & Company. (n.d.b). *Pathways to world-class energy efficiency in Belgium.* Retrieved from

http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/energy_efficiency_belgium_full_report.ashx

McKinsey & Company. (2007a). *Costs and potentials of greenhouse gas abatement in Germany*. Retrieved from http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/costs_and_potentials_of_geenhouse_gas_full_report.ashx

McKinsey & Company. (2007b). *Reducing U.S. greenhouse gas emissions: How much at what cost?*. Retrieved from http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/US_ghg_final_report.ashx

McKinsey & Company. (2008b). *Greenhouse gas abatement opportunities in Sweden*. Retrieved from http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/Svenska_Kostnadskurvan_IN_English.ashx

McKinsey & Company, (2015). *Sustainability & Resource Productivity.* Retrieved June 23, 2015, from http://www.mckinsey.com/client_service/sustainability/latest_thinking/greenhouse_gas_abatement_cost_curves

McKinsey & Company. (2009a). *Greenhouse gas abatement potential in Poland*. Retrieved from http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/greenhouse_gas_abatement_potential.ashx

McKinsey & Company. (2009b). *Swiss greenhouse gas abatement cost curve*. Retrieved from http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/GHG_cost_curve_report_final.ashx

McKinsey & Company. (2009c). *China's green revolution: Prioritizing technologies to achieve energy and environmental sustainability*. Retrieved from http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/china_green_revolution.ashx

McKinsey & Company. (2009d). *Pathways to an energy- and carbon-efficient Russia*. Retrieved from

http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/CO2_Russia_ENG_final.ashx

McKitrick, R. (1999). A derivation of the marginal abatement cost curve. *Journal of Environmental Economics and Management 37*, 306-314.

Moran, D., Macleod, M., Wall, E., Eory, V., McVittie, A., Barnes, A., Rees, R., Topp, C. F. E. & Moxey, A. (2010). Marginal abatement cost curves for UK agricultural greenhouse gas emissions. *Journal of Agricultural Economics 62*, 93-118.

Moberg, A. (2006). *Environmental systems analysis tools for decision-making: LCA and Swedish waste management as an example.* Retrieved from http://www.diva-portal.org/smash/get/diva2:9966/FULLTEXT01.pdf

Nature. (n.d.). Retrieved June 23, 2015, from AccorHotels Group, Sustainable Development website, http://www.accorhotels-group.com/en/sustainable-development/the-7-pillars-of-planet-21/nature.html

Nicholls, S & Kang, S. (2012a). Green initiatives in the lodging sector: Are properties putting their principles into practice?. *International Journal of Hospitality Management 31*, 609-611.

Nicholls, S. & Kang, S. (2012b). Going green: the adoption of environmental initiatives in Michigan's lodging sector. *Journal of Sustainable Tourism 30*(7), 953-974.

Maloney, R. (2014, October 29). IHG's Green Engage programme reaches global proportions. *Arup.* Retrieved from http://www.arup.com/News/2014_10_October/29_October_IHGs_Green_Engage_programme.aspx

O'Neill, S. (2014, October 29). IHG commitment brings Green Engage to entire portfolio. *Green Hotelier*. Retrieved from http://www.greenhotelier.org/our-news/industry-news/ihg-commitment-brings-green-engage-to-entire-portfolio/

Pilepic, L. & Simunic, M. (2009). Applying information technology to business decision-making in the hotel enterprises. *Journal of Economic Literature 2*, 411-428.

Pizam. (2009). Green hotels: A fad, ploy or fact of life?. *International Journal of Hospitality Management 28*, 1.

Poser, E. A. (2009). *Setting Standards for Sustainable Tourism: An analysis of US tourism certification programs*. (Unpublished Masters Thesis). Duke University, North Carolina.

Rahman, I., Reynolds, D. & Svaren, S. (2012). How "green" are North American hotels? An exploration of low-cost adoption practices. *International Journal of Hospitality Management 31*, 720-727.

Rivera, J. & deLeon, P. (2005). Chief executive officers and voluntary environmental performance: Costa Rica's certification for sustainable tourism. *Policy Sciences 38*, 107-127

Rundall, T., Martelli, P.E., Arroyo, L., McCurdy, R., Graetz, I., Neuwirth, E.B., Curtis, P., Schmittdiel, J., Gibson, M., & Hsu, J. (2007). The Informed Decisions Toolbox: Tools for knowledge transfer and performance improvement. *Journal of Healthcare Management 52*(5), 325-342.

Sabre Eco-Certified Hotel Directory Questionnaire. (n.d.). Retrieved June 23, 2015, from Sabre Eco-Certified Hotel, Sabre website, https://hoteleservices.sabre.com/SabreEcoCertifiedHotelQuestionnaireFinalRvsd32014.pdf

Santa Fe's Green Lodging Initiative Celebration. (2014). Retrieved June 23, 2015, from http://issuu.com/leoapgiannini/docs/awards_program4-17_issu

Seo, S., Aramaki, T., Hwang, Y., & Hanaki, K. (2004). Fuzzy decision-making tool for environmental sustainable buildings. *Journal of Construction Engineering And Management 130*(3), 415-423.

Sharma, S. (2009). The mediating effect of information availability between organization design variables and environmental practices in the Canadian hotel industry. *Business Strategy and the Environment 18*(4), 266-276.

Sloan, P., Legrand, W. & Chen, J.S. (2009). *Sustainability in the hospitality industry: principles of sustainable operations.* (Ed.). Amsterdam; Boston:Butterworth-Heinemann.

Standard Criteria and Indicators. (2015). Retrieved June 23, 2015, from Green Globe, Green Globe website, http://greenglobe.com/standard/

StayGreen Hotel Recognition Program. (2012). Retrieved June 23, 2015, from Illinois Hotel & Lodging Association, Stay Illinois website, http://www.stayillinois.com/members_green.cfm

The 7 pillars of PLANET 21. (n.d.). Retrieved June 23, 2015, from http://www.accorhotels-group.com/en/sustainable-development/the-7-pillars-of-planet-21.html

The PLANET 21 program. (n.d.). Retrieved June 22, 2015, from http://www.accorhotels-group.com/en/sustainable-development/the-planet-21-program.html

The Travelocity Green Guarantee. (2010). Retrieved June 23, 2015, from Travelocity, Travelocity: Green Hotel Directory website, http://svc.travelpn.com/TravelForGood/gr-directory.html

TripAdvisor. (2015). *Fact Sheet.* Retrieved June 23, 2015, from http://www.tripadvisor.ca/PressCenter-c4-Fact_Sheet.html

Thuot, L., Vaugeois, N., & Maher, P. (2010). Fostering Innovation in Sustainable Tourism. *Journal of Rural and Community Development 5*(1/2), 76– 89.

Trung, D. N. & Kumar, S. (2005). Resource use and waste management in Vietnam hotel industry. *Journal of Cleaner Production 13*, 109-116.

Tzschentke, N., Kirk, D. & Lynch, P.A. (2004). Reasons for going green in serviced accommodation establishments. *International Journal of Contemporary Hospitality Management 16*(2), 116-124. Retrieved from DOI: 10.1108/09596110410520007

Tzschentke, N., Kirk, D., & Lynch, P.A. (2007). Going green: Decisional factors in small hospitality operations. *International Journal of Hospitality Management, 27*(1), 126–133.

UNWTO. (2007). *Tourism & Climate Change: Confronting the Common Challenges.* Retrieved from http://sdt.unwto.org/sites/all/files/docpdf/docuconfrontinge.pdf

UNWTO. (2009). *From Davos to Copenhagen and Beyond: Advancing Tourism's Response to Climate Change*. Retrieved from http://sdt.unwto.org/sites/all/files/docpdf/fromdavostocopenhagenbeyondunwtopaperelectronicversion.pdf

UNWTO. (2011). *Tourism and Sustainability.* Retrieved from http://dtxtq4w60xqpw.cloudfront.net/sites/all/files/docpdf/sustainability.pdf

UNWTO. (2014). *UNWTO Annual Report.* Retrieved from http://dtxtq4w60xqpw.cloudfront.net/sites/all/files/pdf/unwto_annual_report_2014.pdf

UNWTO. (2015). *UNWTO Tourism Highlights.* Retrieved from http://www.e-unwto.org/doi/pdf/10.18111/9789284416899

Update to ENERGY STAR Ratings for Hotels. (2009). Retrieved June 23, 2015, from ENERGY STAR, ENERGY STAR website, https://www.energystar.gov/sites/default/files/buildings/tools/Hotel_Rating_FAQs.pdf

VijayaVenkataRaman, S., Iniyan, S., & Goic, R. (2012). A review of climate change, mitigation and adaptation. *Renewable and Sustainable Energy Reviews. 16*(1). 878-897. Retrieved from DOI: 10.1016/j.rser.2011.09.009

What are the levels of the GreenLeaders Program?. (2014). Retrieved June 23, 2015, from TripAdvisor, Help Center website, https://www.tripadvisorsupport.com/hc/en-us/articles/200614097-What-are-the-levels-of-the-GreenLeaders-Program-

Xuchao, W., Priyadarsini, R., & Eang, L.S. (2010). Benchmarking energy use and greenhouse gas emissions in Singapore's hotel industry. *Energy Policy*. *38*(8). 4520-4527. Retrieved from DOI: 10.1016/j.enpol.2010.04.006

Wang, J.C. (2012). A study on the energy performance of hotel buildings in Taiwan. *Energy and Buildings 49*, 268-275.

Xu, P. P., Chan, E. H. W., & Qian, Q. K. (2011). Success factors of energy performance contracting (EPC) for sustainable building energy efficiency retrofit (BEER) of hotel buildings in China. *Energy Policy. 39*(11). 7389-7398. Retrieved from DOI: 10.1016/j.enpol.2011.09.001

Zhang, J. J., N. Joglekar, J. Heineke, and R. Verma. (2014). Eco-efficiency of service co-production connecting eco-certifications and resource efficiency in U.S. hotels. *Cornell Hospitality Quarterly 55*(3), 252-264.

Zografakis, N., Gillas, K., Pollaki, A., Proylienou, M., Bounialetou, F., & Tsagarakis, K.P. (2011). Assessment of practices and technologies of energy saving and renewable energy sources in hotels in Crete. Renewable Energy. 36(5). 1323-1328. Retrieved from DOI: 10.1016/j.renene.2010.10.015