-Why Do Hotels Find Reducing Their Carbon Footprint Difficult?

Abstract

Purpose

The term 'carbon footprint' emerged during the early 2000s, but many hotels remain unaware of what they should do to implement a comprehensive programme to reduce carbon footprint despite having some environmental measures. This study investigates the barriers to reducing hotel carbon footprint and explores why many hotel managers remain bystanders.

Design/methodology/approach

In-depth semi-structured interviews were conducted with hotel executives to understand what hinders hotels' implementation of comprehensive programmes to reduce their carbon footprint. The NVivo 11 software package was used to organise data and code the transcribed interviews to identify patterns and themes.

Findings

The findings identified several main barriers. They were (1) a lack of understanding, (2) a lack of owner initiative, (3) difficulty with measurements, (4) a lack of stakeholder coordination and support, (5) a lack of a strong mediator, (6) balancing interests, and (7) risky investment. The findings of this study suggest some specific strategies for overcoming these barriers.

Research limitations/implications

The study sample was restricted to the Hong Kong hotel executives interviewed; therefore, the findings will not reflect the full picture of managerial perceptions. Drawing on the foundations laid by this study, researchers could collect quantitative data from hotels in other countries to conduct a cross-cultural study.

Originality

Very few studies have investigated barriers to carbon-footprint reduction programmes. Specifically, none have been published in the hotel environmental management literature. This study represents a preliminary step towards understanding the barriers that prevent hotels from implementing the programmes.

Keywords: Barriers, Carbon Footprint, Hotel Industry, Qualitative, Managers

1. Introduction

Carbon emissions have been falling since the outbreak of COVID-19 in late 2019. For instance, carbon emissions reduced by about 18% between early-February and mid-March 2020 in China as a result of the fall in coal consumption and industrial outputs (Stone, 2020). However, the United Nations Secretary-General António Guterres in his International Mother Earth Day's message warned, '*The current crisis is an unprecedented wake-up call*' and the drop will not last long if governments have no plan to deal with greenhouse gases (GHGs) to create more sustainable, resilient and inclusive societies (United Nations, n.d.).

In the hotel industry (not including bed and breakfast (B&B), guesthouses and hostels in this study), daily operations lead to carbon emissions due to the consumption of large amounts of energy, water and non-recyclable products (Schubert et al., 2010). According to the United Nations World Tourism Organization (UNWTO), hotels and other types of accommodation account for 2% of the 5% of global carbon dioxide emitted by the tourism sector (UNWTO, n.d.). This figure indicates that carbon emissions and carbon footprint reduction in the hotel industry need to be addressed especially when the industry is consistently growing with over 700,000 hotels around the world according to Condor Ferries' Hotel Industry Statistics & Trends 2020. To help protect the environment, many hotels are implementing different environmental programmes from energy and water-saving programmes, recycling solid food waste to implementing formal environmental management systems (EMSs). Some have also installed different environmental technologies to help meet their environmental goals (Chan et al., 2017; Chan et al., 2020).

With regard to carbon emissions, previous studies have concluded that the main driver of carbon emissions of hotels is the energy consumption (Becken, 2013; Bohdanowicz et al., 2011). For instance, in Hong Kong, the three main types of energy used in hotels are normally gas, diesel fuel and electricity to operate all engineering services systems (e.g., heating, ventilation and air-conditioning (HVAC), hot water system, and lighting) and to provide hotel guests with quality services (Deng, 2003). According to Deng and Burnett (2000), electricity dominated the energy consumption in the hotels surveyed in their study. They further found that HVAC and lighting systems consumed about 70% of total electricity use in a hotel while kitchens of hotels with food and beverage outlets and hot water heating systems consumed gas. A few hotels also used diesel oil as fuel for boiler plants to generate water and steam. Chan and Lam (2002) when studying pollutant emissions by the Hong Kong hotels emphasised that hotel operators need to address the heavy use of electricity, which is supplied by the local utilities as the consumption indirectly contributes to GHG emissions, the carbon footprint. This helps explain why many hotels mainly focus on saving in electricity in their environmental programmes.

Not many hotels emphasise comprehensive carbon footprint reduction in their environmental programmes, probably because assessing carbon emissions in a hotel context could be a lengthy process due to the variety of hotel services and amenities. Hotel managers may find it difficult to set operational boundaries to reduce carbon footprint that also include other indirect activities in addition to hotel operations. In addition, their lack of environmental knowledge

(Erdogan & Baris, 2007) and the need to involve multiple stakeholders (e.g., suppliers and contractors to follow hotel green procurement requirements, employees and customers to support a hotel carbon-footprint reduction programme etc.) in the hotel supply chain may make them hesitate to introduce the initiatives. Therefore, investigating why hotel managers focus less on carbon footprint reduction whilst implementing other environmental programmes is important, especially when anecdotal evidence indicates that hotel managers have begun to discuss carbon footprint, but very few know how to implement a comprehensive programme that optimises reduction. For instance, a regional director of engineering of a luxury hotel group in Hong Kong told the author that many hotel managers and engineers do not know what should be included to reduce carbon footprint because there are too many.

Carbon footprint was defined as the amount of CO_2-equivalent emissions directly and indirectly caused by a given activity (Wiedmann & Minx, 2008). Reducing the carbon footprint is extremely important to ease global warming. In various settings, academic research has largely focused on the following: ways to reduce the carbon footprint in healthcare, telecommunication, financials, utilities, industrials, consumer staples (Hrasky, 2012) the relationship between the carbon footprint and environmental management of the small and medium enterprises in textile, processing, manufacturing and food sectors (Giama & Papadopoulos, 2018), the integration of the carbon footprint into supply chain management in the automobile industry (Lee, 2011) and carbon auditing in the logistics industry (McKinnon, 2010) rather than barriers to reducing the carbon footprint. In the hospitality field, previous hospitality studies on the carbon footprint have generally reviewed the relationship between energy saving and carbon reduction (Oluseyi et al., 2016), the impact of inventory on the carbon footprint (Puig et al., 2017), carbon footprint analyses (Hu, et al., 2015) and carbon footprint reporting (De Grosbois & Fennell, 2011). However, research investigating the barriers to implementing comprehensive carbon-footprint reduction programmes in the hotel sector remains scarce, while there is no empirical evidence of hotel managers' perceptions of the factors that prevent hotels from implementing such programmes. In other words, there is a dearth of knowledge exists on possible barriers to the implementation of carbon-footprint reduction programmes in the hotel industry. Previous studies of the carbon footprint have provided little insight into the challenges faced by hotel managers when considering the implementation of reduction programmes. To respond to Chan and Hsu's (2016) call to hospitality researchers to investigate the carbon footprint issue in a hotel context, this study therefore used qualitative research methods to investigate the barriers to programme implementation. Specifically, the research objectives were as follows:

- to investigate potential barriers to the implementation of comprehensive carbon-footprint reduction programmes in the hotel industry,

- to recommend possible strategies to minimise the barriers identified.

2. Literature Review

2.1. Carbon footprint in tourism and hotels

GHGs mainly include carbon dioxide, nitrous oxide, methane, water vapour and other gases (Kweku, et al., 2017). Carbon dioxide emissions are the main cause of the greenhouse effect (Rehan & Nehdi, 2005), which is a main factor leading to global warming. To help reduce the GHG emissions, carbon audits, which can reveal the major sources and levels of GHG emissions, are typically used to understand and measure carbon footprint. The term 'carbon footprint' was declared the word of the year in 2007, according to Britain's Oxford University Press. The Oxford Dictionary defines the term as the amount of carbon dioxide (CO_2) released into the atmosphere as a result of individual, organisational or community activities. Wiedmann and Minx (2008) simply defined carbon footprint as the amount of CO_2-equivalent emissions directly and indirectly caused by a given activity. To assess the carbon footprint, estimate different business sector footprints and address GHG accounting and reporting, the Greenhouse Gas Protocol Initiative (the GHG Protocol) was developed (Filimonau et al., 2011).

Tourism's global carbon footprint increased from 3.9 to 4.5 Gt CO_2 eq between 2009 and 2013, accounting for about 8% of global GHG emissions (Lenzen et al., 2018). The hotel industry's contribution to carbon emissions should not be neglected due to their round-the-clock operations and heavy consumption of energy, water and other amenities to provide quality services to hotel guests. When studying the carbon footprint of tourism in Barcelona, Rico et al. (2019) discovered that hotels were accountable for 70% of the accommodation sector's GHG emissions. Hotels with a higher star rating were found to produce three time more emissions than those with a lower star rating and five times those of the most basic facilities (Díaz Pérez et al., 2019).

In most cases, it is however difficult to calculate the exact carbon footprint generated by a company due to the complex processes in its supply chain (Koiwanit & Filimonau, 2021; Liu et al., 2017; McKinnon, 2010). In the hotel industry, it is commonly believed that GHG emissions are closely related to a hotel's energy consumption. Filimonau et al. (2011) indicated that saving significant amounts of energy could help hotels reduce their carbon footprint. Many previous studies of the carbon footprint have focused on energy use or its efficiency, whereas a few have addressed other carbon sources. For instance, Oluseyi et al. (2016) assessed the relationship between energy consumption and the carbon footprint by studying hotels in Nigeria and recommended that the annual energy consumption per unit guestroom be kept at no more than 40.278 MWh/guestroom to help reduce emissions. Xuchao et al. (2010) benchmarked energy use and GHG emissions in Singapore's hotel industry. The focus of these studies could probably be due to the belief that energy consumption, especially electricity use, is the main source of a hotel's carbon footprint. However, the carbon emissions of other accommodation services may have been underestimated (Filimonau et al., 2011). Using case study of an international tourist hotel, Hu et al. (2015) investigated GHG emissions through a complete life cycle inventory and found that other hotel service carbon emissions (e.g., hotel laundry services, production process and transportation of hotel amenities) should not be neglected, although energy consumption remains the main source of the carbon footprint. Pieri

et al. (2016) also found that a hotel's location significantly affected tourists' carbon footprint. When investigating the generation of carbon footprint in hotels, Lai (2014), categorised hotel carbon emissions into scope 1 - direct emissions (e.g., combustion in a hotel's heating, ventilation, and air-conditioning systems), scope 2 - energy indirect emissions (e.g., consumption of electricity purchased from utility) and scope 3 – other indirect emissions (e.g., overseas business travel by hotel staff) based on the guidelines of the GHG Protocol and other similar documents. In addition to the energy-focused boundary, Lai's three main scopes of carbon emissions helps set a more comprehensive boundary of carbon footprint covered in this hotel study.

In the hotel industry, the implementation of different programmes to reduce the carbon footprint seems an inevitable trend. For instance, Ramkissoon and Sowamber (2018) in their ICHRIE research report indicated that LUX* Resorts & Hotels has implemented a Tread Lightly initiative aiming at reducing carbon emissions of the hotel group. The programme includes encouraging the hotel guests to pay a carbon footprint offsetting fee, implementing different carbon reduction projects such as renewable energy solar project, installing energy-efficient lighting; investing in energy management system to improve energy efficiency of heating ventilation and air conditioning system, and buying carbon credits in some accredited offsetting projects etc. Other hotel groups like Global Hyatt Hotels, Hilton Hotels Corp. Fairmont Raffles Hotels International and Marriott International have also shown their company commitment to reduce carbon footprint by reducing GHG emissions and energy consumption (De Grosbois & Fennell, 2011). In fact, the latest Cornell Hotel Sustainability Benchmarking Index 2020 indicates that carbon emissions per square metre of hotels around the world has decreased by 10 percent since 2015. However, De Grosbois and Fennell (2011) commented that only 27 hotel companies out of the 150 companies analysed in their study had explicitly stated their commitment to address carbon footprint reduction. This reflects that many hotels are still standing at the crossroads. However, no previous studies have attempted to investigate what prevents hotels from implementing various carbon-footprint reduction programmes.

2.2. Barriers to carbon footprint reduction and other green-related initiatives

Despite the research gap in the hotel sector, a review of the literature identified some barriers to carbon footprint reduction and other green-related initiatives. They are discussed in the following section.

In the textiles and clothing sector, Muthu et al. (2012) conducted a case study and found that the fibre composition of textile materials complicated the life cycle inventory of the recycling process, leading to an increased carbon footprint. The case study indicated that in order to optimise carbon footprint reduction of textile products people need to address the difficulties faced by recycling of textile products at the end-of-life. Olatunji et al. (2019) investigated the drivers and barriers to carbon footprint reduction in the supply chain of manufacturing sector and found that a large proportion of manufacturing organisations were struggling to reduce their carbon emissions during their delivery process. These scholars identified some major barriers including a lack of relevant systems, a lack of adequate resources, a lack of

standardised approach to carbon auditing, data inaccuracy and inadequate collaboration with supply chain partners. Both studies reflect that the multiple stakeholders in a company supply chain in terms of their knowledge, technology and commitment would affect the effectiveness of the company carbon-footprint reduction programmes. The effect is significant because the Carbon Disclosure Project (CDP) indicates that the supply chain of a company is responsible for more than 50% of its carbon emissions (Kearney, 2010). In terms of individual's behaviours, Cherrier et al. (2012) found that the financial constraints to purchase more expensive and lower carbon footprint products, the time constraints to find alternatives, and the social struggles involved in convincing one's friends and family members prevented the individuals who consciously aimed to lower carbon footprint from reducing their carbon footprint.

Although very few studies have focused on the barriers to carbon footprint reduction, the barriers to implementing other environmental programmes have been identified. For instance, Zhang et al. (2011) reported that high costs for green appliance design and energy-saving material, insufficient policy implementation efforts, lengthy planning and approval processes for new green technologies, a lack of knowledge and efficiency in implementing green building regulations, unfamiliarity with green technologies and conflicts of interest between stakeholders were all major influences on green property development in China.

Meanwhile, Quazi (1999) reported that the complexity of the standards governing the system, legal ramifications leading to a company's liability as a result of the serious non-compliance to the system, a lack of incentives, a lack of management commitment or full employee involvement, implementation costs, and unclear employee responsibilities could hinder EMSs implementation. Hillary (2004) identified 48 barriers to the adoption of EMSs in small- and medium-sized enterprises (SMEs) and divided them into eight dimensions: (1) resources; (2) understanding and perception; (3) implementation; (4) attitudes and company culture; (5) certifiers/verifiers; (6) economics; (7) institutional weaknesses; and (8) support and guidance.

Research in hospitality has also shed some light on various barriers to green-related initiatives. Chan (2008, 2011) adopted Hillary's (2004) research instrument to investigate the barriers to EMS adoption in the hotel industry, also concentrating on small- and medium-sized hotels (SMHs). He identified the lack of knowledge, skills, professional advice, resources and certifiers/verifiers, outcome uncertainty and implementation and maintenance costs as the main obstacles to a hotel's adoption of a formal EMS and concluded that internal barriers such as hotel managers' lack of knowledge and skills, resources and maintenance cost played a significant role in impeding the EMS adoption. For SMHs in particular, the lack of urgency, ambiguity over EMS standards, the absence of qualified verifiers/consultants, conflicting guidance and inconsistent support were the main barriers to adoption.

Yusof and Jamaludin (2014; 2018) studied 5 hotels in Malaysia and found 12 barriers preventing hotels from going green. The barriers were further categorised into three main types: (1) highly significant barriers included a lack of green experts, a lack of resources (e.g., manpower and equipment) and difficulties in balancing the quality of service with environmental performance; (2) less significant barriers consisted of high implementation costs, the lack of government regulation and enforcement and difficulties in managing and training staff; and (3) smaller barriers included a lack of green information and knowledge, uncertainty about green outcomes, a lack of support from owners and management, high maintenance costs, a lack of consumer support and a lack of networking with green suppliers.

Wan et al. (2017) identified some major barriers to going green when examining environmental awareness, initiatives and performance in the Macau hotel industry: a lack of government regulations on environmental management, financial constraints, a lack of environmental management staff and a potentially negative impact on the guest experience (especially big spenders in hotel casinos). Meanwhile, Baker et al. (2014) investigated hotel customers' participation in green activities and discovered the following customer barriers: inconvenience, perceptions of cost-cutting and decreased luxury. Chan et al. (2018, 2020) conducted qualitative and quantitative research to investigate barriers to the adoption of environmental technologies in hotels and identified the following: (1) monopolised after-sales service; (2) human resource limitations; (3) lack of government and initial support; (4) financial performance; (5) lack of green knowledge and green networks; (6) impact on the customer experience; and (7) environmental feasibility. These were grouped into three main categories: (1) product-related barriers, (2) external barriers and (3) internal barriers.

In the food service industry, Kasim and Ismail (2012) found that the weak enforcement of environmental laws and regulations, a scarce and intermittent green supply chain, non-existent trade pressure and low customer and community demand for green restaurants were barriers to embracing environmentally friendly practices.

The above-mentioned barriers could likely be grouped into two main types according to Post and Altman (1994). They are (1) industry-specific barriers and (2) organisational barriers. Industry-specific barriers are those barriers which affect all organisations in a line of business (e.g., competitive pressures and industry regulations, capital costs, technical information, and configuration of current operations), whereas organisational barriers may hinder a company's capacity from dealing with any form of change (e.g., employee attitudes, management leadership, and poor communications etc.). The industry-specific barriers and organisational barriers are in fact quite similar to those barriers described by Chan (2008) as external and internal barriers.

In summary, this review of the relevant literature revealed nine main recurring categories despite mixed views on the barriers to carbon footprint reduction and other green-related initiatives. Table 1 presents the main categories and their associated barriers. The barriers identified shows the main challenges facing companies interested in changing their operations and practices to environmental measures. Although some barriers to other green-related initiatives may not be the factors hindering hotel managers in their efforts to implement a comprehensive carbon-footprint reduction programme, the identified barriers can serve as reference for the investigator in interpreting the qualitative data collected from interviews. Post and Altman (1994)'s industry barriers and organisational barriers can also help understand which group of barriers identified in the present study actually make it more difficult for hotel managers to progress towards the programme.

(Pls. insert table 1 here)

Accordingly, a framework based on the categories above was developed to better understand the factors preventing hotels from implementing comprehensive programmes to reduce their carbon footprint and to guide fieldwork investigations. In-depth face-to-face interviews with

experienced hotel executives were conducted to identify relevant factors. The research methodology is discussed in greater depth in the following section.

3. Methodology

This study used a qualitative approach to investigate what prevents hotel managers from focusing on carbon footprint reduction in the hotel context. It strived to understand on a personal level of the views and perceptions behind the managers' actions, a qualitative approach not only allowed the investigator to stay close to the empirical world (Blumer, 1969) but also allowed for detailed analysis of changes that addresses how and why they come out (Cassell & Symon, 1994). To ensure the collection of rich qualitative data for analysis, the following informant selection criteria were used: (1) at least one year of hotel work experience; (2) full-time hotel employees; and (3) no interns. Using purposive and snowball sampling strategies (Miles et al., 2013), the researcher approached the target sample, including hotel general managers, engineering directors and environmental management and sustainability directors, who were highly involved in hotel environmental policy planning and implementation. The semi-structured interview schedule used in this study was piloted with several hotel managers responsible for environmental programmes. The interview schedule was mainly divided into three sections: (1) warm-up, (2) development and (3) closing. The warm-up section was intended to inform the participants of the main aims of the research project and to create a relaxing and comfortable interview environment (Hammersley, 1993). The participants were then asked to provide background information and their work history. In the development section, they were asked their views on carbon footprint reduction in hotels, what barriers prevented their hotel from implementing different programmes to reduce the carbon footprint and possible remedial actions. In the closing section, the participants were asked to add any information that may have been missed and to suggest anyone who could provide the researcher with additional information. Interviews with the participants were conducted in their office (or company's training room) since many people feel most comfortable in their own offices. During the interviews, the researcher behaved in a non-judgmental manner to encourage the participants to open up and tell the story of their experience.

Eventually, qualitative data were collected from 22 informants, which fell within the suggested number of 15 to 40 (Köseoğlu et al., 2020). Table 2 presents the 22 informant profiles. Each interview lasted between 45 and 90 minutes. Specific themes emerged from the data after 19 interviews, so the researcher conducted 3 further interviews to confirm the saturation level. The interviews were transcribed verbatim by a research assistant who had been trained to conduct qualitative studies and data analysis during her PhD studies. We used inductive and theoretical approaches to our data analysis (Miles & Huberman, 1994) because an inductive approach identifies new data elements while a theoretical approach considers previous research of which the literature review provided a basis to develop a coding scheme to categorise the identified data, which then led to the generation of themes and mapping of concepts. The research

assistant used the NVivo 11 software package to help organise the unstructured qualitative data and code the transcribed interviews by employing open coding. Then, the author and the assistant together analysed, interpreted the data, re-read the interview transcripts to identify and compare the concepts and repeatedly discussed the coding schemes to establish the categories and then relate a category and its subcategories by using axial coding. (Strauss & Corbin, 1990). For instance, from the open coding, several subthemes: '*limited function of hotels association*', '*requiring an organisation to help centralize hotel waste management*', and '*the influential power of hotel owners association*', were identified. Then the subthemes were subsequently categorised into a main theme: '*Lack of a strong mediator*'. In addition to the use of NVivo 11 software programme to strengthen credibility of this qualitative research by supporting the researcher in the analytical process of coding and analysing textual data, research protocol including an overview of the study, the field procedures, interview questions and a guide for the research report was also used to substantiate the research (Yin, 2003).

(Pls. insert table 2 here)

4. Findings and Discussion

4.1. Profiles of the informants

Eight informants were senior executives from corporate or executive offices, 10 were from engineering departments, of whom 2 were also appointed as hotel EMS managers, and 2 were from human resource departments, 1 of whom was also the hotel's 'green champion'. The remaining two informants were executives from the finance department and the rooms division. In terms of experience, 36% had worked in the hotel industry for 30 years or more and 27% for at least 15 years. Employees of local hotel chains made up 40.9% of the sample, with 50% from international chains. The remainder worked in independent hotels. Most informants (86.4%) worked in four- or five-star hotels, with only 13.6% employed in three-star hotels. Hotels with eco-labels (e.g., ISO 14001, Green Key, the Platinum Award of Planet 21, the Leeds Platinum Award, BEAM Plus and Green Hotel Global & Schneider) employed 59% of the informants.

Based on the qualitative findings, numerous barriers to a comprehensive carbon-footprint reduction programme were identified and some strategies suggested. These were organised into the following themes for further discussion:

- Lack of understanding
- Lack of owner initiative
- Difficulties with measurement
- Lack of stakeholder coordination and support
- Lack of a strong mediator
- Balance of interests
- Risky investment

4.2. Lack of understanding

Some informants reflected that carbon footprint reduction was unpopular due to a lack of understanding. For instance, informant 12 stated, '*I don't know the volume of carbon emissions, what the numbers mean and how many trees it represents … If the concept was simplified and more people learnt about it, I think it would then be widely applied.*' Informant 2 added that '*there is no such information in our field. Most of our senior managers are arts graduates and they lack any knowledge of science.*' Informant 4 who was a general manager of an international chain hotel commented, '*I've heard this term, but honestly speaking, I do not quite understand it.*' This could reflect the general lack of understanding across the industry. Hotel managers rarely promote 'carbon footprint reduction' in their environmental management programmes. Instead, they emphasise saving energy and water and waste reduction (Ali et al., 2008; Deng, 2003; Kularatne et al., 2019). This is likely due to their understanding that energy use is closely related to GHG emissions (Becken, 2013). This finding implies that hotel managers and employees with little environmental knowledge need to be educated (Chan, 2008) to better understand and interpret the meaning of the carbon footprint. As mentioned by Armstrong et al. (2020), it is important to identify a method that can accurately gauge people's knowledge of the carbon footprint, as their understanding will determine whether they are capable of developing and implementing more comprehensive programmes to reduce the carbon footprint rather than just focusing on energy savings. Therefore, establishing a channel for hotel managers and employees to share and learn about the carbon footprint and possible methods and technologies to reduce this footprint should be considered. As suggested by informant 1: '*the local hotels association could organise some relevant workshops such as a carbon footprint workshop and seminar to provide hoteliers with a platform to share and communicate with each other.*' Informant 2 also suggested that '*some international hotel brands could develop a model and carbon footprint manual or audit …*' A document clearly and comprehensively indicating the inputs and outputs of the carbon footprint of daily hotel operations and their calculation is essential to help hotel managers understand the issue and determine effective reduction plans.

4.3. Lack of owner initiative

The implementation of various carbon-footprint reduction programmes requires extra resources and investment; for example, the installation of equipment and technologies to achieve the outcome. Most informants reported that the owners' hesitation to invest would make it hard to put it into practice. Informant 7 explained, '*no matter how well aware you are of carbon footprint reduction; it will not be the main reason hotel guests choose to stay at your hotel. But you need to invest quite a lot of resources to develop it, and owners may not think it is worth doing.*' Informant 2 further added, '*Only very few hotel owners may consider this, maybe 2 or 3 out of 10, … if they can spend less or do less to meet the minimum requirements, I don't think they will spend more.*' Reducing the carbon footprint normally involves introducing different environmental management programmes that may require additional investment to purchase equipment or technologies to achieve environmental goals. The large investment costs will probably prevent owners who prioritise profits from taking the initiative. To motivate hotel owners' active involvement in comprehensive carbon footprint reduction, informant 3 suggested that the local government should implement new policies to offer incentives to owners. The informant explained, '*In fact, it is hard for us to do so, as we have limited space … the space would therefore be utilised for more important priorities. If the government changed regulations to support hotel owners and developers, for example, a Gross*

Floor Area (GFA) exemption to allow more space to store the recycling facilities etc…, then, it would be easier for us to implement…' This finding is in line with the studies by Chan and Wong (2006) and Chan et al. (2018), indicating that any investment in environmental management requires the continued support of owners, the hotel's corporate office and government.

4.4. Difficulties with measurement

Almost all informants mentioned the difficulties of measuring the carbon footprint as one of the barriers. As carbon footprint reduction is related to detailed behaviour monitoring and many small applications, difficulties in measuring carbon footprint inputs and outputs hinder the implementation of such programmes by hotel managers. Informant 15 who was a general manager pointed out that '*it is hard to calculate every single item you purchase … We just pay the money … but how much carbon emissions? It is hard to consider it in the total calculation.*' This finding is in line with that of De Grosbois and Fennell (2011) and Olatunji et al. (2019) who mentioned that many organisations struggle to reduce carbon emissions in their delivery process due to the absence of relevant systems and standardised approaches to carbon auditing. There are so many different areas and items related to the carbon footprint involved in a hotel's 24/7 operations to consider that many hotels do not know how and where to start. When asked how to solve this problem, informant 12 who was an engineering director and EMS manager suggested that some international leading hotel groups could serve as a model for others by developing a comprehensive carbon-footprint reduction programme as a standard reference point. The informant stated, '*international hotel groups could work on a model and develop a carbon footprint manual or audit, … I think that could be very influential and powerful, … it could even be extended to hotel suppliers to identify those qualified for the business.*' In addition to establishing a good industry model that demonstrates effective carbon-footprint reduction practices, one informant suggested developing a formally recognised carbon footprint certification specifically for the hotel industry. This would provide hotel managers with a channel to learn how to conduct carbon footprint measurements to ensure a reduction in their carbon footprint in daily hotel operations. Chan and Hsu (2016) suggested more investigations should be conducted on the methods to calculate carbon footprint in hotels. It is clear from the findings of this study that identifying a method to quantify the carbon footprint of typical hotel operations is essential and important so that hotel managers can track the GHG emissions and carbon footprint of different operations and service delivery processes.

4.5. Lack of stakeholder coordination and support

Post et al. (2002) stated that the long-term survival and success of a firm is determined by its ability to establish and maintain relationships with its critical stakeholders. Similarly, in order to implement effective hotel carbon-footprint reduction programmes, stakeholder coordination is required, especially when it involves many different areas, items and delivery processes. However, some informants had difficulty in finding external and internal partners to coordinate key activities in the process. For instance, informant 3 stated, '*It is hard to find a recycling company here to collect those lamp bulbs, bottles or batteries. Even if you pay for the service, it may not be that easy to find a company.*' This finding echoes Erlandsson and Tillman's (2009) environmental information collection and communication study indicating that insufficient stakeholder involvement is an obstacle. Internally, close coordination between various hotel departments plays an important role in the success of a reduction programme. However, the findings revealed that interdepartmental and intradepartmental coordination can affect the effectiveness of a programme. This was reflected in informant 12's comments: '*It needs the*

support of various parties, ... it is hard to rely on the engineering department only. If you want to use local ingredients instead of overseas products to reduce the carbon footprint ... if the chef says no, there will be resistance.' The finding supports Sharma's (2009) advocacy that companies must reduce inter-manager and inter-departmental conflicts to reduce environmental impact reduction. It is clear that a carbon-footprint reduction programme can hardly be accomplished if hotel managers fail to secure coordination and support from both external and internal stakeholders. This issue requires hotel managers to pay more attention to identifying the main stakeholders in their carbon-footprint reduction programmes and to develop different strategies to encourage them to participate and optimise the performance goal. To deal with external stakeholders such as suppliers and hotel guests, hotel managers should consider their various characteristics and then develop different engagement programmes to lead them to work together towards carbon footprint reduction goals. Internally, hotel senior executives could demonstrate their commitment by actively participating in the programme to model the behaviour required and influence their subordinates. Informant 6 emphasised that '*Our hotel suggested that staff take shared responsibility to encourage all senior managers to participate in the programme ... each department has its own role and takes its own initiative.*' The full involvement of hotel employees is one of the critical success factors in any environmental programme (Chan et al., 2014; Chan & Hon, 2020; Pham et al., 2020). Hotel executives must create a win-win business model to engage their main stakeholders, whether external or internal, to implement the programme successfully by eliciting their support and coordination.

4.6. Lack of a strong mediator

Most informants felt that the lack of a strong mediator in the hotel industry to help drive and promote carbon footprint reduction has hindered programme development. Informant 5 explained, '*Although there is a hotels association here, it has limited functions ... therefore, someone needs to raise our shared concerns and enable our representative to speak for us.*' Informant 12 emphasised that '*If we only rely on the hotel itself to sell the policy, it is a little bit hard. It needs a lot of support from other parties. There is a lack of a mediator to push such practices.*' Identifying a strong mediator responsible for communicating, training and promoting the concept of the carbon footprint to the hotel industry as well as who conveys the industry's concerns to the relevant authorities would reduce this barrier. The mediator could also lead industry support for carbon footprint reduction. For example, informant 20 pointed out, '*if there is an organisation that can help us optimise facilities and find a centralised space to collect and store waste, that is, if there was a channel to transfer waste for fertilizer, which would be better. But, we can only practice on our own now.*' When asked who might be a potential mediator, many informants felt that the hotel owners association should take on the role. Informant 4 explained, '*Owners are the main stakeholders, the hotels are their properties. If the hotel owners association could speak out by raising the need for carbon footprint reduction, its appeal would have more influential power than the hotels association.*'

4.7. Balance of interests

Reducing the carbon footprint may affect hotel service quality and the interests of different stakeholders due to their widespread influence. Therefore, some hotel managers hesitate to implement a reduction programme. Some informants indicated that the hotel guest experience could be affected by changes in hotel amenities or services to reduce the carbon footprint. In addition, the interests of the shareholders of a hotel company would be affected by the investment in carbon footprint reduction. As, informant 1 stated, '*hotels need to balance the*

benefits of different stakeholders such as shareholders and customers.' The findings are in line with Lee's (2011) study concluding that a company should meet its customers' and other stakeholders' needs when implementing programmes to respond to increased climate change challenges. This is understandable as a hotel's investment in the programme could affect the company's value and the return on assets (Lee & Heo, 2009; Lee & Park, 2009). Informant 11 further explained, '*some guests may have special requirements and we strive to satisfy them. For instance, Japanese guests need to have hotter water to bathe; they will complain that the water is not hot enough. Our hotel normally sets the water temperature between 60–65 degrees centigrade. They suggest we adjust it to 70 degrees. So, we need to balance different interests.*' Further, the findings indicate that different types of stakeholders hold different values and beliefs (Stenzel, 2000). Therefore, hotel managers need to promote the advantages of reducing the carbon footprint to their target stakeholders, perhaps by developing a green hotel marketing programme (Chan, 2014; Chan 2013). This could communicate trustworthy and user-friendly information on the carbon footprint implications of investments and their impact on the stay of hotel guests.

4.8. Risky investment

The findings revealed that most informants doubted the effectiveness of carbon-footprint reduction programmes in terms of cost savings. They commented that it would be hard to guarantee savings by reducing the carbon footprint and therefore it was risky to invest in such programmes and the facilities required. Informant 2 stated, '*We would need to calculate the hourly operation situation when applying the new facilities. But how confident are we about realising savings, it will be hard or may not even be realised in the end.*' Informant 8 added, '*As there will be no immediate return or outcome, it is hard to imagine the effects of investment.*' It is clear that hotel managers relate carbon footprint reduction to investment costs and cost savings. This makes hotel managers reluctant to implement various programmes to reduce the carbon footprint, which could be somewhat risky to incorporate into existing business practices. These findings are in line with Chan's (2008) study concluding that high investment costs impede the implementation of hotel environmental programmes. Understandably, hotel managers need to consider the cost of investments and ROI (Return on Investment) when running a business. In their study on the adoption of environmental technologies, Chan et al. (2018) explained the advantages of incorporating green ideas when building a new hotel. Outcome uncertainties and other concerns could be eased. As informant 11 mentioned: '*The government announced that there is a lot of new land, which is open for green development, ... like using environmentally friendly materials or more natural light, or other possible ways to construct environmentally friendly buildings. Our hotel practitioners have also been advised to do so when we undertake innovative projects or build new hotel buildings.*' Given this opportunity, hotel developers could perhaps consider building a 'green hotel' during the planning phase of a new hotel project to reduce the obstacles hotels commonly face when considering 'going green' later on (Chan et al., 2020).

5. Conclusions and Implications

This study investigated the barriers to implementing a comprehensive carbon-footprint reduction programme in hotels. Reducing the carbon footprint is extremely important due to

the greenhouse effect. Although research has covered a range of issues involved in saving energy, water and reducing different types of solid waste, no study to date has explored the potential barriers to carbon footprint reduction in the hotel industry. To answer the question of what is preventing hotels from implementing different programmes to reduce their carbon footprint, a series of in-depth interviews with hotel senior executives was conducted.

5.1. Theoretical implications

This study is the first attempt to explore the barriers to carbon footprint reduction in hotels and the factors underlying these barriers in the hotel context. The investigation is heterogeneous amid previous hotel environmental management studies normally focusing on different environmental initiatives and environmental management systems in relation to driving forces, barriers and implementation. Limited number of studies focused on carbon management issues in hospitality (Sharma & Chen, 2020), the findings and discussion therefore contribute to the environmental management literature in the hospitality industry by expanding the body of research on the management of carbon footprint reduction in the hotel industry. Addressing the gap in the literature, this qualitative study lays the theoretical foundation for further in-depth research and support development of construct measurement.

Results of this study suggest that the main barriers to carbon footprint reduction in hotels are both industry-specific and organisational, which is consistent with the claims by Post and Altman (1994). The industry barriers are related to these four aspects: (1) difficulties with measurement; (2) lack of a strong mediator; (3) balance of interests; and (4) risky investment. On the other hand, the main organisational barriers are related to such aspects as: (1) lack of understanding, (2) lack of owner initiative, (3) lack of stakeholder coordination and support. These two groups of barriers appeared to significantly affect any motivation to reduce the carbon footprint of the hotels surveyed. In addition, these identified barriers in general are consistent with previous studies focusing on barriers to green initiatives mentioned in the literature review section.

However, barriers like difficulties in measuring the inputs and outputs of carbon footprint generated from daily hotel operations; lack of a strong mediator in the hotel industry and balancing the interests of different stakeholders of a hotel company are unique to carbon-footprint reduction programmes. There may be some reasons for this. First, the measurement of carbon footprint is likely a very complicated and difficult task to carry out because there are so many different operational areas and parties (e.g., suppliers in the supply chain) for hotel managers to consider. Because of the absence of standardised systems to carbon auditing, hoteliers may not bother spending time on developing a comprehensive carbon-footprint reduction programme because their focus is normally on hotel business and quality service to their guests (Chan, 2008). In addition, hotel managers' understanding of the operational boundary for carbon footprint may be not very clear that may hinder them from developing a thorough and well-designed programme. More in-depth research is therefore suggested to explore their understanding. Second, due to the lack of an influential mediator to lead the industry to support for carbon footprint reduction and convey the industry's concerns to the relevant authorities, the managers will very unlikely take the initiative to develop a comprehensive programme to reduce carbon footprint. It is probably because of their unclear understanding and the relatively relaxed environmental regulations set for the industry. Third,

the time and resources needed to engage different stakeholders whose support and cooperation (e.g., following a hotel procurement requirements and delivery processes by suppliers, customers' support to hotel reduction programmes and full involvement of employees) will significantly affect the outcome of a carbon-footprint reduction programme could be lengthy. Balancing their interests also requires 'tailor-made' strategies to deal with (Chan, 2021). The high cost of engaging them could be a problem for hotel managers to develop an effective programme. Researchers would need to include these unique barriers in their research to assess if the factors will play a significant role in impeding carbon footprint reduction in a hotel context. Furthermore, this study suggested different possible strategies to reduce the identified barriers. Overall, the findings of this study shed light on the barriers to carbon footprint reduction in hotels and suggest specific strategies to overcome them, which afford new insights into implementing a comprehensive carbon-footprint reduction programme in the hotel industry.

5.2. Managerial implications

The study's findings offers several specific insights to senior hotel executives responsible for environmental management. Although many hotel managers are aware of environmental protection, they normally do not know how to implement a comprehensive carbon-footprint reduction programme. The findings imply that the managers are likely to continue to implement their existing environmental programmes mainly focusing on energy savings due to the belief that the consumption is the main source of carbon footprint. Notwithstanding this, to help slow global warming, the hotel industry should take a step further to not only expend their environmental programmes to other boundaries of carbon footprint but also involve their stakeholders in the supply chain with the aim to influence their activities and choices to avoid carbon emissions completely. Kearney (2010) emphasised that a company's supply chain is responsible for more than 50% of its carbon emissions.

Alongside the identification of potential barriers to reducing the carbon footprint of hotels, this study contributes to hotel environmental management and operations by providing hotel executives with specific strategies to overcome them, thus gaining the ways to further reduce carbon emissions in the industry. As shown in Table 3, these strategies include the following: (1) lobbying the hotels association to organise more relevant activities to enhance hotel managers and employees' understanding of carbon footprint and its inputs and outputs during daily hotel operations so that they can not only focus on energy saving but also other effective carbon-footprint reduction programmes. The hotel executives may have limited knowledge about carbon footprint in terms of its calculation and estimation boundaries. In fact, the findings indicates that hotel managers want more workshops and sharing activities offered by hotels association. As reflected by informant 17: '*The environmental/engineer committee of the hotels association can organise different sharing platforms for us to exchange ideas with different partners, ... to discuss common issues encountered by our hotel operators, and to seek help from the association.*' (2) working closely with the hotel owners association to influence government policy to support the need for carbon footprint reduction because the involvement of hotel owners, which is the most efficient and effective way, help influence local government and help interested hotels to optimise their facilities to reduce their carbon footprint. Informant 4 who is from the executive office of an international chain hotel emphasised that '*... the*

appealing power is substantial if the owners association can voice out the need of carbon footprint reduction.' (3) motivating international hotel groups that have established good carbon-footprint reduction polices to share their manual and audit experience with other hotels lacking of the experience. The information sharing by the hotel groups not only can make those with less experience implement the programmes smoothly but also help them identify carbon emissions of other accommodation services. Informant 12 with seven years' experience of working in the hotel industry suggested, '*Some international hotel brands ... can work as a model.*' (4) setting up carbon footprint certificates and developing methods to quantify hotel carbon footprint inputs and outputs by, for example, hotels association so that hotel operators with the detailed information know how and where to start with when considering a systematic and comprehensive reduction programme. This is an important strategy to overcome the barrier of difficulties with measurement, as our findings indicated that many hotel managers have been struggling to reduce carbon footprint as a result of the absence of relevant and standardised systems to carbon auditing, (5) communicating reliable and user-friendly information on the implications of the carbon footprint to target internal and external stakeholders via green hotel marketing to gain their support and engage them in the programme (e.g., promoting shared responsibility between all hotel staff). This may help not only reduce the barrier of lack of stakeholder coordination and support, but also encourage the internal and external stakeholders in a hotel's green supply chain to participate in the implementation process of a carbon-footprint reduction programme, and (6) building green hotels with installation of all necessary facilities and technologies from the beginning in order to significantly reduce the obstacles hotels commonly face when considering different carbon-footprint reduction programmes when in operations. A director of engineering concluded that '*About the topics on carbon emissions and energy savings ... find possible ways to build environmental buildings ... Our hotel practitioners should do so when we undertake innovation projects or build new hotel buildings.*' These recommendations could encourage hotel executives to consider developing and implementing more comprehensive carbon-footprint reduction programmes by improving their understanding of the main barriers and possible strategies to reduce them.

(Pls. insert table 3 here)

5.3. Limitations and future research

This exploratory study has several limitations. First, the data were collected from a series of in-depth interviews with hotel senior executives in Hong Kong, therefore the findings are not widely generalisable. However, the results can be generalised in terms of theoretical propositions. Second, the interview data collected were confined to past accounts of relevant hotel executives' views of the barriers to reducing the carbon footprint, although informants were chosen for their involvement and proximity to reduction programmes. Future studies could collect quantitative data from hotel companies in other countries to conduct cross-cultural research to identify the differences and similarities between hotels of different types and sizes. Similar studies could also be expended to other sectors in the hospitality and tourism

industry such as airlines, restaurants, theme parks and travel tours etc. to explore the similarities and differences for carbon footprint reduction.

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Table 1 Main Categories of the Barriers to Carbon Footprint Reduction and Other Green-Related Initiatives

Categories	Barriers
Resources	- Lack of adequate resources (e.g., manpower and equipment) - Lack of time to find alternatives - Lack of money to purchase expensive products to reduce the carbon footprint - Lack of installation of relevant systems - High implementation and maintenance costs
Understanding and perception	- Uncertainty of outcome of green initiatives - Lack of urgency to implement environmental management system - Non-existent trade pressure - Difficulty balancing service quality with environmental performance
Implementation	- Complexity of standards governing environmental management system - Lack of a standardised approach to carbon auditing - Inaccuracy of data - Inadequate collaboration with supply chain partners who are responsible for more than 50% of a company's carbon emissions - Insufficient policy implementation efforts - Lengthy planning and approval process for new green technologies and recycled materials
Product itself	- Composition of materials - Complicated recycling process life cycle inventory that affect the optimisation of carbon footprint reduction
Community	- Social struggles to convince peer groups and family members prevent individuals from achieving carbon footprint reduction - Low community and customer demand to reduce carbon footprint
Knowledge and skills	- Lack of environmental knowledge and awareness - Unfamiliarity with environmental technologies - Lack of professional advice - Ambiguity over environmental management system standards
Stakeholders	- Scarce green supply chain - Lack of networking with green suppliers - Conflicts of interest between stakeholders - Lack of full employee involvement - Negative impact on guest experience

Legal	• Legal ramifications due to serious non-compliance to environmental management system • Lack of efficiency implementing regulations and bylaws • Lack of government regulation and enforcement
Support and guidance	• Lack of management commitment • Lack of green experts in hotels • Lack of incentives • Inconsistent support • Unclear employee responsibilities • Absence of qualified consultants • Conflicting guidance by consultants

Table 2. A detailed list of hotels informants

Informant	Type of hotel	Star rating	Green label/EMS	Department/unit	Sex	Age range	Years of experience in the hotel industry	Years of experience in current job
1	International chain	5	Yes	Engineering & EMS	M	35-44	16	9
2	Local chain	4	No	Corporate office	M	45-59	30	7
3	Local chain	4	No	Engineering	M	35-44	10	4
4	International chain	3	No	Executive office	M	Over 60	30	3.5
5	International chain	3	No	Engineering	M	Over 60	15	5
6	International chain	5	Yes	Corporate office	F	35-44	8	8
7	International chain	3	Yes	Corporate office	M	45-59	Over 30	5
8	International chain	5	Yes	Human resources & EMS	F	35-44	15	8
9	International chain	5	Yes	Engineering	M	45-59	30	3
10	Local chain	4	Yes	Executive office	M	45-59	32	11
11	Local chain	4	Yes	Engineering	M	Over 60	Over 40	7.5
12	Independent	4	No	Engineering & EMS	M	35-44	7	1
13	International chain	4	Yes	Finance office	M	45-59	28	4
14	International chain	4	No	Engineering	M	45-59	29	4
15	Local chain	5	No	Executive	M	45-59	38	2
16	Local chain	5	No	Engineering	M	45-59	13	3
17	International chain	5	Yes	Engineering	M	35-44	10	1
18	Independent	5	Yes	Engineering	M	45-59	15	4 months
19	Local chain	4	No	Rooms division	M	45-59	Over 30	Over 20
20	International chain	4	Yes	Human resources & EMS	M	35-44	10	5
21	Local chain	4	Yes	Corporate office	F	25-34	7	7
22	Local chain	4	Yes	Corporate office	M	25-34	4	4

Table 3 Possible Strategies to Overcome Barriers to Reducing the Carbon Footprint of Hotels

Barriers	Possible Strategies
• Lack of understanding	• Establishing an information channel to educate hoteliers about their carbon footprint • Lobbying the hotels association to organise some relevant activities
• Lack of owner initiative	• Influencing government policy to gain support
• Difficulties with measurement	• Sharing the carbon footprint manuals and audits of international hotels that have established good carbon footprint reduction policies • Setting up carbon footprint certificates • Developing methods to quantify hotel carbon footprint input and outputs
• Lack of stakeholder coordination and support	• Promoting shared responsibility between all hotel staff • Identifying the main stakeholders in a carbon footprint reduction programme to develop different strategies to influence them
• Lack of a strong mediator	• Helping interested hotels to optimise their facilities to reduce their carbon footprint • Association of hotel owners raising awareness of the need to reduce the carbon footprint to increase the impact
• Balance of interests	• Using green marketing to promote the advantage of reducing carbon footprint to target stakeholders • Communicating reliable and user-friendly information on the implications of the carbon footprint to target stakeholders
• High risk	• Building green hotels from the beginning