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Food miles and food choices: the case of an upscale urban hotel in Hong Kong

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ABSTRACT

The nature of food production and consumption has changed dramatically in recent decades. Food sources for hotels and resorts have been an increasingly important sustainability topic in recent years. Where food is sourced has important implications for the economic, environmental and socio-cultural sustainability of tourist destinations. Based on where food is sourced and the mode of transportation, food miles is calculated for an upscale urban hotel in Hong Kong over a 12-month period. Greenhouse gas emissions associated with these food miles are computed. Over three-quarters of the food and beverages procured travelled via sea, the most energy efficient mode of transportation. Follow-up interviews with the hotel's procurement and executive chefs reveal the motivation behind these purchase decisions. While quality of food is the main driver for chefs, the procurement department take quality and cost into consideration. These different motivations provide potential conflict in sourcing food sustainably. Another issue raised is that food being procured from nearby countries may have questionable health and safety standards. Just because food can be procured closer to the destination does not necessarily mean it is the most sustainable option.

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Introduction

Food sources have been an increasingly important topic of interest for scholars and practitioners alike in recent years. There are several reasons for this. One reason is that "local" food is seen to be important for marketing a specific locale, creating a point of differentiation in an increasing globalized world (Hall, Mitchell, & Sharples, 2003). Local food tourism, particularly in rural areas, provides an opportunity to showcase and maintain regional identity and promotes cultural appreciation and regional distinctiveness (Everett & Aitchison, 2008; Sims, 2010). Local food is seen as a way of achieving authenticity (Dickinson, Lumsdon, & Robbins, 2011; Sims, 2009). However, claims about "local food" being "better" are not always substantiated (Roggeveen, 2014).

Proponents for the localization of food cite economic benefits as one of the reasons for focusing on the origin of food used in hotels and restaurants in a destination. Food imports represent a loss of income to the local economy as imports represent a leakage out of the economy. Weak linkages between hotels and restaurants and the agriculture sector, mean hotels, restaurants and resorts need a consistent high-quality supply of goods delivered from abroad (Berno, 2006; Rogerson, 2012). The reasons given to not purchase locally produced food are substandard quality of ingredients and insufficient quantities. Strengthening the linkages between agriculture and hotels and restaurants

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helps reinforce the food supply chain and ultimately keeps tourism expenditures in the local destination (Telfer & Wall, 2000).

Another reason for the increasing emphasis on local food is environmental. Food production and consumption make up part of the ecological footprint of an economy (Gössling, Hansson Borgstrom, Horstmeier, & Saggel, 2002). With heightened awareness of greenhouse gas emissions and its effect on climate change, and consumers' mindfulness of healthier lifestyles, where food comes from and how it is produced has become embedded into citizens' consciousness (Coley, Howard, & Winter, 2011; Gössling, Garrod, Aall, Hille, & Peeters, 2011). There is heightened awareness of the issues associated with the modernization and mechanization of food supply chains (Green & Dougherty, 2009).

Given the sustainability implications of food production and consumption, there has been an increasing but limited amount of research into quantifying the sustainable development of food in tourism (Gössling et al., 2011). Past studies on the sustainable development of food examine only one or two food groups. This is because of the complexity of agribusiness systems and the data requirements needed for a holistic assessment (Beer & Lemmer, 2011). Food miles is a commonly understood measure of the distance food travels between production and consumption (Gaballa & Abraham, 2007). Food miles comprises only one part of life-cycle assessment that is used to assess the sustainability of food. Van Passel (2013) suggests that enhanced food miles, which takes into account the total external (environmental, economic and social) costs of transporting food, including accident costs, congestion costs, air pollution and noise pollution from transport as well as considering the transportation mode and transport efficiency, is a more complete measure.

This research examines sources of food, food miles and associated greenhouse gas emissions from food transportation for an upscale hotel in Hong Kong. Twelve months' worth of procurement data capturing food items, food sources, economic value and transportation methods have been collected. These quantitative data have been augmented with semi-structured interviews with the hotel's three executive chefs, and members of the procurement department and food and beverage management to examine the purchasing decisions and motivations for the current choices and sources of food and beverages in the hotel. This case provides insights for other luxury hotels concerned about the sustainability of their food choices and the subsequent impact these choices can have on the environment.

Hence, the objectives of this research are: to examine the source of food and beverages for an upscale hotel by value; to calculate the food miles for an upscale hotel; to estimate the subsequent greenhouse gas emissions associated with these purchases; and to understand the drivers of the purchase decisions of food and beverages of this urban hotel. The following section reviews previous research on the origin of food sources and food miles. The subsequent section outlines pertinent details of the context of this research followed by a description of the methodology used to achieve the research objectives. The findings are then presented followed by the conclusions and recommendations for this and other luxury hotels to better manage and plan for their food requirements.

Literature review

There have been significant changes in food production, distribution, and retailing systems over the last 50 years due to the modernization of agriculture, globalization, improvements in transportation infrastructure and lower transport costs and the growth and concentration of food retailers who exhibit market power (Jones, 2002). As such, few studies have been able to quantify the total environmental burden of individual food items (Jones, 2002). A complete assessment of the environmental impacts of food supply would include scoping out and quantifying all the processes involved in the production, processing, packaging, transportation, consumption and waste management of individual food items (Jones, 2002). In fact, waste management and disposal in the context of food is an under-research component of the food supply chain (Beer & Lemmer, 2011). Tukker and Jansen (2006) undertake a detailed review of the environmental effects of a variety of economic activities, including food, clothing, housing and transport. They find that food contributes about 20%–30% of

the total environmental impact. In the food category, the main contributors to energy consumption are meat products (5%–12%) and dairy products (4%–5%).

Scholars have implemented several different methods to estimate the environmental impact of food and beverage production and consumption. These include ecological footprint analysis (Collins, Flynn, Wiedmann, & Barrett, 2006; Wackernagel & Rees, 1996), life-cycle analysis (LCA), means/end analysis (MEA) (Jones, 2002) and food miles (DEFRA, 2005; Paxton, 1994). The first three methods include all stages involved in food production, packaging distribution retailing and disposal.

Van Passel (2013) provides a useful critique of the food miles concept as a guiding tool to assess sustainability. Food miles focuses solely on the transportation of food from the "farm" to the "table". The assumption here is the greater the distance food travels, the larger the impact on the environment. While the concept is easy to understand, food miles as a means to assess sustainability is too simplistic as it ignores other relevant sustainability issues (Van Passel, 2013; Weber & Matthews, 2008). The concept of enhanced food miles (Van Passel, 2013) takes into account the total external costs of food transport including economic, social and environmental external costs. There have been some attempts to estimate enhanced costs. Recent analyses have reported not only food miles but also explicitly linked these distances with greenhouse gas emission and climate change (Coley et al., 2011; Pratt, 2013; Smith & Smith, 2000). Greenhouse gas emissions are derived from the distance travelled, the mass transported and the mode of transportation used (Coley et al., 2011).

Extending the concept of enhanced food miles, food chain sustainability (Van Passel, 2013) takes into account all relevant economic, social and environmental aspects including the externalities caused by food production, packaging, marketing, sale and consumption of foods. The LCA methodology is suitable to assess the environmental impact associated with food production (Brentrup, Küsters, Kuhlmann, & Lammel, 2001). Cost and time factors impose limitations on undertaking LCA for a large number of food items (Roggeveen, 2014). Coley et al. (2011) argue that the use of food miles is an incomplete measure, preferring the life cycle approach. Nevertheless, they acknowledge it is an almost impossible task to conduct a full LCA for the 101 food items they analyzed. They revert to a food miles analysis. Hence, past LCA and MEA studies have tended to concentrate on only one or two food items. Jones (2002) concentrated on dessert apples in two UK towns. Likewise, Milà i Canals, Cowell, Sim, and Basson (2007) also examine the energy efficiency in a life cycle assessment of apples. Kooijman (1993) compares imported versus local fresh peas. For Sweden, Carlsson (1997) compares the energy consumption of domestic and imported carrots and tomatoes. de Backer, Aertsens, Vergucht, and Steurbaut (2009) perform an LCA on leeks. Grant and Beer (2008) undertake an LCA of greenhouse gas emissions from irrigated corn through to its processing into corn chips. Roggeveen (2014) uses an LCA quantitative method to analyze the supply chain for fresh tomatoes from Australian farms to fruit shops in Sydney, Australia. In near all analyses, averages for the estimates are taken which may or may not reflect the diversity of different production, transportation and consumption system (Beer & Lemmer, 2011). While these studies have undertaken analyses of one or two food items, no studies have examined food sustainability and procurement for an organization, like a hotel, in the tourism context.

Jones (2002) finds that transportation is responsible for a considerable fraction of the total energy consumption in the life cycle of fresh apples. In most cases, energy used in the transportation of the apples exceeds that used in its cultivation. Local sourcing minimizes transport-related energy consumption and carbon dioxide emissions. Carlsson (1997) and Kooijman (1993) corroborate Jones' findings that local sourcing is more environmentally sustainable and less energy intensive than imports. Conversely, Roggeveen (2014) finds that, for fresh tomatoes in Australia, on-farm greenhouse gas emissions in the production process are far greater than those produced in the transportation portion of the supply chain. Milà i Canals et al. (2007) emphasize the importance of seasonality and energy costs associated with storage.

Although being only one part of the food production and consumption chain, food miles assessments provide policy-makers with insights into the environmental costs and benefits of food transportation. Several studies have been conducted in a range of locations (Garnett, 2003; Pretty, Ball,

Lang, & Morison, 2005; Stephens, Pretty, & Sutherland, 2003; Subak, 1999). Using the food miles method, DEFRA (2005) estimates that for the UK, the transportation of food is significant and growing. In 2002, the transportation of food totaled 30 billion vehicle kilometres and produced 19 million tonnes of carbon dioxide. DEFRA (2005) notes the complexities associated with measuring food miles. These include (1) the mode of transport; for example, air transport is very energy intensive, sea transport is relatively efficient (Milà i Canals et al., 2007), (2) transport efficiency – within each mode of transport, energy efficiency is dependent on the distance travelled, the vehicle size and make and model of the vehicle (Beer & Lemmer, 2011), (3) the food production system where the food is grown – both Stancu and Smith (2006) and Beer and Lemmer (2011) point out that food imported from distant locations using energy-efficient production systems with efficient transportation might have lower energy consumption than local food production, and (4) economic and social costs and benefits – transportation of food is only one component to consider.

The international trade of food and globalization need to be considered. Different national diets have contrasting environmental impacts. Animal products have a substantially higher greenhouse gas footprint than fruit and vegetables (Beer & Lemmer, 2011). Reducing meat consumption among consumers who tend to prefer organic food could slow greenhouse gas emissions and hence mitigate climate change (Ravn Heerwagen, Mørch Andersen, Christensen, & Sandøe, 2014). Beer and Lemmer (2011) note that it is only when fruit and vegetables are air freighted that the environmental costs escalate. Following on from Stancu and Smith (2006), Fuentes and Carlsson-Kanyama (2006) highlight that more environmentally efficient production systems can mitigate the additional environmental transportation costs of food miles.

In the US context, Weber and Matthews (2008) compare the life cycle greenhouse gas emissions associated with food production and compare these with food transportation, i.e. food miles. Food travels on average 1640 kilometres, although the total life cycle supply chain food miles is 6760 kilometres. In contrast to Jones (2002), Weber and Matthews find that, although food is transported long distances in the United States, greenhouse gas emissions associated with production contribute 83% for an average US household compared to 11% for emissions associated with food miles. Furthermore, they demonstrate that if the average American household bought "local", they would reduce greenhouse gas emissions by only 4%–5%. However, if the same households replaced one day per week's consumption of red meat and/or dairy to other sources of protein, they could achieve the same reduction in greenhouse gas emissions.

On a much smaller scale, Pratt (2013) estimates the food miles and associated carbon dioxide emissions for a small ecotourism venture in Fiji. In 2008, a kilogram of food in this tourism operation travelled an average of 1065 kilometres. Following a decision to be more "sustainable" and import less food and grow more food on the island, a kilogram of food only travelled an average of 497 kilometres in 2009, a reduction of over 50%. Pretty et al. (2005) assess the full economic cost of a weekly basket of food in the UK by analyzing the environmental costs of transporting 12 crop and livestock commodities from the farm gate, to transporting food to retail outlets and then to consumers' homes and finally waste disposal costs. The authors find that farm externalities (the environmental costs of producing food), costs associated with food miles, domestic shopping transport and subsidies to the agricultural sector are the main hidden costs. They conclude by recommending that farm externalities and food miles be minimized and that consumers shift to more environmentally friendly shopping preferences (less red meat) and transport choices. Weber and Matthews (2008) also note that red meat is 150% more greenhouse gas intensive than chicken or fish.

This research contributes to the literature and an understanding of sustainable food sourcing. As noted above, previous studies have focused on one or two food groups. This research examines food miles and food sustainability issues over a 12-month period for all food and beverages procured by an upscale hotel. Hence, access to this proprietary data has enabled a holistic view of food procurement in the hospitality industry. Unlike other previously published research, analysis of procurement data with the accompanying qualitative interviews provides not only the quantification of the food miles and associated carbon emissions but also an understanding of the motivations behind the

purchase decisions. Further research is needed in a range of contexts. The large majority of previous research on food miles and understanding sustainable food sourcing has originated out of the USA or Europe. There has been little research on this topic in the Asian context. Given that the Asia and Pacific region has been the fast growing in terms of international tourist arrivals (increases of 6.1% per annum over the 2005–2015 period) and arrivals to the region are forecast to increase by 331 million to reach 535 million in 2030 (UNWTO, 2016), insights into food sustainability can inform policy-making and heighten awareness of sustainability measures.

The context: an upscale urban hotel

International tourist arrivals to Hong Kong have grown markedly in recent years. In the year 2000, international tourist arrivals totaled 13.1 million. By 2014, this number had increased to 60.8 million (Hong Kong Tourism Board, 2015). The large increase has been primarily attributed to tourists from Mainland China. The share of Mainland China tourists increased from 29.0% to 77.7% over the same period, primarily due to the introduction of the Individual Visit Scheme, which permits Mainland China tourists to visit Hong Kong and Macau on an individual basis. Prior to the introduction of this scheme, Mainland China residents could only visit Hong Kong on business visas or on group tours. This increase in tourism demand has coincided with high hotel occupancy rates, which increased from 70% in 2003 to 89% in 2013 (Hong Kong Census and Statistics Department, 2015).

Retained imports, in general, and imports of food and beverages to Hong Kong have risen rapidly over the last 15 or so years (Hong Kong has a high volume of re-exports). For example, retained imports of food stuffs rose from HK$ 45.3 billion in 2003 to HK$ 131.8 billion in 2013 (Hong Kong Census and Statistics Department, 2015). Geographically, Hong Kong consists largely of steep, hillside. Only 7 km^2 of land are actively farmed (Hong Kong Government, 2015). The amount of land available for agriculture and livestock has decreased over the last decades as the demands for public housing has increased. Local farms provide 2% of the vegetables, 60% of live poultry and 7% of the live pigs, Hong Kong residents consumed in 2013 (Hong Kong Government, 2015). There were 43 local pig farms and 29 local poultry farms in 2014. Furthermore, much of Hong Kong's manufacturing sector has moved across the border to Mainland China to take advantage of lower costs of doing business. The manufacturing sector, which includes food processing, has decreased in both absolute and relative terms. In 1980, the manufacturing share of GDP was 23.7%. By 2013, the share had decreased to only 1.4%. Thus, the macroeconomic and ecological environment of Hong Kong suggests it will be difficult for Hong Kong hotels and restaurants to domestically meet the food and beverage requirements of the increasing number of tourists.

The context of this research is a four-star hotel situated in East Tsim Sha Tsui, opening in 2011; the hotel offers 26 suites and 236 deluxe rooms, has three restaurants, conference facilities, a 500-seat ballroom, heated outdoor swimming pool, health club, and spa area. One of the restaurants is a fine dining outlet that provides dim-sum and seasonal Cantonese cuisine. Another food outlet is an international buffet-style restaurant and another outlet, located on the ground floor, is a café by day and bar by night. This hotel is classified as a "tariff A" hotel by the Hong Kong Tourism Board, placing the hotel in the luxury category based on indicators, including facilities, location, staff-to-room ratio, average achieved room rate and business mix. This hotel's competitors are other luxury international-branded hotels.

As a busy upscale hotel on Hong Kong, the hotel provides a useful case study with which to examine the issue of food sourcing and its associated environmental impact. While Hong Kong is geographically limited, conceptually, the location is the same as other regions or locales in terms of sourcing food. Other research has also examined limited geographical areas. Sims (2009) looks at the issue of local food for the small geographical area of the Lake District and Exmoor, UK. Everett and Aitchison (2008) also take a regional investigation into local foods in their case on Cornwall, UK. With limited land, findings from this case in Hong Kong are also applicable to small islands (Pratt, 2013).

Methodology

This research employs a case study approach. The case study approach has been widely adopted in studies examining food sustainability. This approach is particularly useful in the in-depth study of bounded entities, such as a particular hotel (Quinlan, Babin, Carr, Griffin, & Zikmund, 2015). Case studies can be useful for examining important themes. The rich description and details in the case study of this hotel can build evidence, along with other studies, to develop frameworks and lay a foundation for the generalization of theories (Yin, 2009). By itself, however, case studies may not lead itself to generalizations (Yin, 2009) Nevertheless, through this case study, other destinations and regions can learn from this situation and adapt recommendations for their particular situation.

This research employs a mixed method combining both qualitative and quantitative research methodologies to answer the research questions. The use of mixed methods is complementary rather than competitive so that the two methods combine to produce a superior piece of research (Johnson & Onwuegbuzie, 2004). The use of both qualitative and quantitative approaches helps to better understand the research problems than either approach alone (Creswell & Clark, 2011). To examine the source of food and beverages for an upscale hotel by value, calculate the food miles and estimate the subsequent greenhouse gas emissions associated with these purchases, we adopt a supply-side approach to answer these questions. Other methods to understand sustainable dining choices from a demand-side would best be explored by speaking to hotel guests. Furthermore, analyzing menus from the different restaurants/looking at the imagery on the hotel's website to see how food is being promoted as well as analyzing comments on social media sites would also give useful insights into sustainable food choices. However, this is beyond the scope of the current research and we leave it to other scholars to explore these issues.

Hong Kong is a suitable context for food tourism research as the Hong Kong Tourism Board actively promotes the territory's gastronomy through its tourist information offices in Hong Kong, in the region and on its website (Mak, Lumbers, & Eves, 2012). Hong Kong offers unique and diverse gastronomy which can be a motivating factor for tourists to visit the destination (Kivela & Crotts, 2006).

Quantitative data analysis

The hotel's procurement department provided detailed data from the procurement system for the whole of 2013. The database contained every order of food and beverage for the year 2013. In total, there were almost 79,000 food and beverage orders. For each type of food and beverage product, number of units, the unit cost, the total cost of the order and the outlet which the food and beverage was ordered for as well as the source country and the mode of transport was provided. We recognize that several orders could arrive to the hotel in the order, for example, on the same delivery truck or same flights but there is no way of knowing this. This information was not recorded in the database. This is a limitation of the database. Hence, this double counting of distance travelled may mean that food miles calculated is higher than in actuality. The items were forwarded to the researchers in Microsoft Excel format and then imported into SPSS for analysis. In total, there were 78,784 different orders placed by the procurement department of the hotel in 2013, worth a value of HK$60,218,313 (US$7,764,094). The three most expensive items ordered were one kilogram of Dried Abalone from Yoshihama Japan worth HK$21,780 (US$2,808); 800 grams of Dried Fish Stomach from Pakistan worth HK$19,015 (US$2,452); and Imperial "Grade A" Birds Nest from Indonesia worth HK$11,150 (US$1,438). The lowest priced items were "Equal" Sugar Sweetener 1 gram packet for HK$0.18 (US$0.02) a piece and quail eggs from China worth HK$0.33 (US$0.04) each. The 78,784 orders involved multiple orders throughout the year of certain products. Table 1 shows the number of unique products ordered throughout the year. In total, there were 2980 different products ordered through the procurement department of the hotel. In the dry goods category, there were 817 different products ordered, followed by 617 different types of drinks ordered. The ingredients for dim sum

Table 1. Number of different food and beverage products.

Food category	Unique products
Dry goods	817
Drinks	617
Meat	379
Pastry	344
Fruit & vegetables	246
Seafood	211
Dairy	152
Japanese	85
Dim sum	78
Noodle	51
Total	2980

and noodles had the least amount of different products ordered with 78 and 51 different products in these categories, respectively.

To calculate food miles, each food and beverage order was demarked as travelling by air, land and sea to the hotel. For items travelling to the hotel by land, these came from either Mainland China or Hong Kong. A centralized location of origin was used to estimate the distance travelled. Google Maps was employed to calculate the distance travelled over land. For food and beverage travelling by sea, a similar method was used to calculate the distance from the source country over land to the port of origin, via Google Maps, and again from the Port of Hong Kong to the hotel (15.3 kilometres). For the sea-based travel, the website www.ports.com was used to estimate the distance travelled. This distance takes into account the shipping route (rather than a direct point to point distance) and was denoted in nautical miles. This was converted to kilometres so the units of measurement were the same. For goods travelling by air, a similar method was used, whereby the distance for the estimated food source to the source country airport and the distance from Hong Kong International Airport to the hotel (35.4 kilometres) was estimated using Google Maps. The distance covered through the air was estimated using Great Circle Mapper (www.gcmap.com).

After food miles (or kilometres) has been calculated, it is customary to take into consideration the mode of transportation used to deliver the food, as this will impact the amount of greenhouse gases emitted. Previous studies have used tonne-kilometre as a common measure to take into account both the mass of produce and the distance the food has been transported (Coley et al., 2011). However, the dataset provided does not have a weight for all the items. Some items reported by weight but other items only reported units such as "packet" or "piece". Therefore, to calculate carbon dioxide emissions, CO_2 emissions per passenger-km by mode of transport will be used to estimate the carbon emissions for the distance travelled. The emissions will differ based on assumptions about the utilization of vehicle capacity and fuel efficiency of the modes of transport used. However, as with other published literature, an average is taken. Specifically, we use the data for CO_2 emissions per passenger-km by mode of transport from the European Environment Agency (2015).

Qualitative semi-structured interviews

Semi-structured in-depth interviews prove very useful when some aspects of the research are well known and comparable information is sought, but some other aspects of the investigation are largely unknown and information is expected to be gained from the conversation (Silverman, 1993). Qualitative interviews were undertaken with key hotel staff involved directly with requisitioning and procurement of food commodities. Three Executive Chefs were selected to be interviewed because they are responsible for food requisitions for the three main restaurants. The Food and Beverage (F&B) Director and Food Procurement manager were also selected due to their depth of knowledge of food commodities and direct responsibility for overall F&B budget requirements. Four had been employed from the opening of the hotel (five years) and the F&B Director just 14 months.

Prior to the interviews, the purpose of the interview and interview questions were communicated to the participants so that they were aware of the purpose of the study. The interviews lasted between 45 and 60 minutes. Each interviewee signed a consent form agreeing to the interview conditions and that ethical practices will be undertaken with anonymous coding and storage of data. Each interview is transcribed, and then coded using NVivo 10 software. All interviewees reviewed their transcripts to confirm their accuracy.

Participants were asked questions on their food ordering and requisitioning of hotel food commodities. One-on-one, separate, audio-recorded interviews were conducted with each respondent on-site at prescheduled times at the hotel. The interview was divided into five sections, which provided the framework for the presentation of results and their discussion that follows. The first section of the interview identified the respondent's main job role, length of time employed in their current position and areas under their control. The second section required respondents to comment on their role in the purchase of commodities for their designated food outlet and general knowledge of distance travelled, country of origin and overall cost consideration when selecting commodities. The third section sought comment on the menu design and menu engineering as this was directly related to the ordering of food commodities. The fourth section asked the respondent more specific questions as to the type of food commodity that was ordered. In the fifth and final section, the respondent was asked if any challenges were encountered in food procurement.

Quantitative findings

Ten food and beverage categories were provided in the database by the hotel. As shown in Table 2, the most orders were for fruit and vegetables. This is self-explanatory as fruit and vegetables have to be ordered more frequently as they have a limited life span compared to other categories, such as dry goods, which can be stored for longer periods of time. That category comprised about one-fifth of all orders but only made up 6% of the value of all orders. Seafood and meat have relatively fewer orders by volume (13.3% and 11.7%, respectively) but the value of items in these categories, in total, is very high, and hence these categories provide a larger share of the total value of the hotel's procurement in 2013 (20.1% and 28.7%, respectively).

Food sources

Examining the value and volume of orders by source, Table 3 shows China provides over HK$16 million worth of food and beverage items to the hotel in 2013. This represents 27.1% of the total procurement. Locally (Hong Kong) sourced food and beverage products comprise 22.4% of the orders but only 13.5% of the value (just over HK$8 million of the HK$60 million that the hotel procures). Europe and the UK provide over 12,000 orders (15.5%) of the volume of orders but 18.1% of the economic value of those orders. This is because many of the beverages are sourced from Europe,

Table 2. Volume & value by F&B category.

Food category	Number of orders	Percentage	Volume of orders	Percentage
Fruit & vegetables	15,523	19.7%	$3,569,626	5.9%
Dry goods	14,283	18.1%	$10,672,039	17.7%
Meat	10,470	13.3%	$12,093,446	20.1%
Seafood	9219	11.7%	$17,270,910	28.7%
Drinks	8945	11.4%	$7,264,719	12.1%
Pastry	6972	8.9%	$3,624,681	6.0%
Dairy	5797	7.4%	$2,458,890	4.1%
Dim sum	2767	3.5%	$901,916	1.5%
Noodle	2724	3.5%	$262,377	0.4%
Japanese	2072	2.6%	$2,038,908	3.4%
Total	78,772	100.0%	HK$60,157,512	100.0%

Table 3. Volume & value of F&B by source country.

Source country/region	Number of orders	Percentage	Value of orders	Percentage
China	22,765	28.9%	$16,339,950	27.1%
Hong Kong	17,659	22.4%	$8,130,393	13.5%
Europe/UK	12,199	15.5%	$10,880,330	18.1%
North America	10,492	13.3%	$8,074,313	13.4%
South East Asia	8024	10.2%	$8,262,308	13.7%
North Asia	2979	3.8%	$2,860,164	4.7%
Australia/NZ	1789	2.3%	$3,946,222	6.6%
Central/South America	1626	2.1%	$1,164,723	1.9%
Middle East/Africa	869	1.1%	$473,396	0.8%
Central Asia	382	0.5%	$86,515	0.1%
Total	78,784	100.0%	HK$60,218,313	100.0%

including the UK (Table 3). Similarly, countries from South East Asia provide 10.2% of the orders but 13.7% of the economic value of the total purchases by the hotel. This is due to the fact that 68% of all the purchases from South East Asian countries are seafood, which tend to be relatively more expensive than other items, in general.

The hotel's procurement of meat comes predominantly from China. Meat orders comprise almost three-quarters (74%) of the value of meat orders (Tables 4 and 5). Orders from Europe are dominated by

Table 4. Number of F&B orders by source-by-category.

By number	Source country/region									
Food category	Hong Kong	China	Europe/ UK	South East Asia	Central/ South America	North America	North Asia	Middle East/ Africa	Central Asia	Australia/ NZ
Drinks	27.4%	1.0%	21.3%	0.7%	16.1%	4.2%	2.9%	4.6%	0.0%	22.1%
Dairy	10.2%	0.0%	23.8%	0.0%	0.0%	6.8%	0.0%	0.0%	0.0%	21.0%
Dim sum	14.6%	0.2%	0.2%	1.0%	0.0%	0.2%	0.3%	0.0%	1.3%	0.0%
Dry goods	9.1%	18.2%	15.3%	24.9%	0.8%	36.4%	12.0%	10.0%	89.8%	3.1%
Fruit & vegetables	0.7%	24.6%	2.1%	35.5%	73.9%	40.2%	8.2%	84.7%	0.0%	16.5%
Japanese	0.0%	0.2%	0.0%	0.0%	0.0%	1.3%	63.0%	0.0%	0.0%	0.0%
Meat	0.0%	46.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Noodle	12.1%	1.4%	1.2%	0.1%	0.0%	0.0%	4.1%	0.0%	0.0%	0.0%
Pastry	18.2%	0.0%	28.8%	0.0%	0.0%	1.5%	1.0%	0.0%	0.0%	3.5%
Seafood	7.6%	8.4%	7.3%	37.9%	9.2%	9.5%	8.4%	0.7%	8.9%	33.7%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 5. Value of F&B orders by source-by-category.

By value	Source country/region									
Food category	Hong Kong	China	Europe/ UK	South East Asia	Central/ South America	North America	North Asia	Middle East/ Africa	Central Asia	Australia/ NZ
Drinks	29.4%	1.5%	30.1%	1.2%	24.0%	3.8%	1.5%	8.5%	0.0%	16.1%
Dairy	4.6%	0.0%	12.2%	0.0%	0.0%	5.5%	0.0%	0.0%	0.0%	7.8%
Dim sum	10.1%	0.1%	0.1%	0.5%	0.0%	0.1%	0.1%	0.0%	0.8%	0.0%
Dry goods	21.0%	10.2%	11.6%	16.0%	12.3%	23.6%	19.5%	76.4%	71.8%	42.8%
Fruit & vegetables	0.3%	4.6%	0.6%	14.2%	16.3%	12.7%	5.6%	14.0%	0.0%	2.8%
Japanese	0.0%	0.2%	0.0%	0.0%	0.0%	2.7%	62.5%	0.0%	0.0%	0.0%
Meat	0.0%	74.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Noodle	1.4%	0.4%	0.3%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%
Pastry	13.0%	0.0%	22.1%	0.0%	0.0%	1.1%	0.6%	0.0%	0.0%	1.7%
Seafood	20.2%	8.9%	22.9%	68.1%	47.4%	50.5%	8.8%	1.1%	27.3%	28.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6. Value of F&B by source-by-mode of transportation.

	Source country/region										
Mode of transportation	Hong Kong	China	Europe/ UK	South East Asia	Central/ South America	North America	North Asia	Middle East/ Africa	Central Asia	Australia/ NZ	Total
Air		0.2%	41.7%	35.4%	41.4%	18.3%	15.9%	9.6%		4.4%	16.8%
Land	96.0%	96.9%									39.3%
Sea	4.0%	2.9%	58.3%	64.6%	58.6%	81.7%	84.1%	90.4%	100.0%	95.6%	43.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

beverage (30.1%) and seafood (22.9%) orders by value. Goods imported from South East Asian countries consist predominantly of seafood orders, whereas goods imported from Australia and New Zealand come from a mix of different food and drink categories including drinks (16.1% by value – mostly wines), dry goods (42.8% by value) and seafood (28.8% by value). Hong Kong-produced goods include drinks, such as soft drinks, dim sum products, locally caught seafood and ingredients that go into pastries.

The category of Food & Beverage products and the source country will determine the main mode of transportation of how the items arrive in Hong Kong. Those products which are flown into Hong Kong arrive at Hong Kong International Airport and then have to be transported over land to the hotel, located in East Tsim Sha Tsui, a distance of about 35 kilometres. If goods arrive to Hong Kong by sea, the port is located in Tsing Yi, a distance of 15 kilometres from the hotel.

Table 6 shows the proportions of value of F&B by source country and by major mode of transportation. In the aggregate, 43.9% of F&B ordered by the hotel arrived in Hong Kong by sea, another 39.3% arrives in Hong Kong by land, that is across the border from China and the remainder (16.8%) is flown in from Hong Kong. As noted above, those source market that are further away and that supply non-perishable products are more likely to transport these F&B products predominantly by sea. For example, countries in North America, North Asia, Central Asia, the Middle East/Africa and Australia and New Zealand transport over 80% of their produce by sea. China, sharing a border with Hong Kong, transports 96.9% of its F&B supply to the hotel via land transportation. Europe/UK and South East Asia have a relatively large proportion of their F&B produce transported to the hotel via air transportation, 41.7% and 35.4% respectively. This is because, as noted in Table 5, South East Asian countries supply a high proportion of the hotel's fruit & vegetable and seafood needs. The relatively high proportion of air transportation for goods supplied from Europe/UK can be explained by the fact that many of the pastry products are sourced from that origin.

Food miles

Using the methodology to calculate distances the food and beverages travelled outlined above, we take the distance from each country to the hotel in Hong Kong by the mode of transportation and multiply this by the number of items ordered from each country. Tallying this up, the food and beverages ordered by the hotel travelled 445,889,848 kilometres (277,063,020 miles). Put another way, this is the equivalent of the food and beverages travelling around the Earth's circumference approximately 11,126 times. The food and beverages that travelled via sea consisted of 77.8% of the total (347,005,816 kilometres), that which travelled via air comprised 18.9% of the total distance travelled (84,340,082 kilometres) and the remainder (3.3%; 14,543,949 kilometres) travelled by land. The average distance per item ordered is 5660 kilometres.

Applying the respective CO_2 emissions by mode of transportation from the European Environment Agency to the distances by each mode of transport, the total amount of CO_2 emissions generated is 27,294 tonnes. From the website http://www.epa.gov/cleanenergy/energy-resources/calculator.html, this is the equivalent to the annual greenhouse gas emissions from 5746 passenger cars or 9783 tons of waste sent to the landfill. It is also the equivalent of the CO_2 emissions from 63,474 barrels of oil consumed. The amount of carbon emitted would need to be sequestered by

699,846 tree seedlings grown for 10 years or 22,372 acres of US forests in one year. In terms of emissions, emissions released by sea transportation totaled 59.6%, emissions by air transportation totaled 34.6% of total emissions and the remaining 5.8% came from emissions due to land transportation.

Qualitative findings

Qualitative interviews are used to shed light on the quantitative findings. The quantitative data findings in terms of food origins were shown to the chefs and hotel management in the interviews for their comments and reactions. All food commodities, although requisitioned by each chef, were ordered through the procurement department of the hotel. The main themes to appear out of the qualitative research are: the issue of quality of ingredients versus the cost; awareness of food origins and perception of low-/high-quality source markets; and the balance between the frequency of deliveries, the lack of storage space and need for fresh ingredients.

All interviewees were aware of the cost implications when requisitioning commodities and orders were in line with forecasted budgeting. This can be illustrated from the following comment from the procurement department:

> They (Chefs) don't set any particular budget for food items but they need to meet the food cost (of a percentage) … as to make sure that customers can afford the price, if it is of a high cost that cost will be passed on to the consumer.

One chef indicated that food miles was not a priority when requesting commodities. For the chefs, quality of the F&B commodities was the main criteria for selection. This is shown in the following comment:

> Not really [worried about food miles]… not really worried about that… what procurement arrange. Only care about the quality - not where the food is from. [Chef]

The procurement department had overall control over the origin, quality and pricing of the requisitioned food commodities; this was driven by quality and price. As explained by the procurement department:

> All decisions are based on quality and price… before we make a direct import item we will calculate the overall cost and compare it with the overall purchase price and see if it is justified to make a direct import.

However, the focus only on quality by chefs is in contrast to comments from the procurement department where cost was also a significant driving factor when purchasing food commodities. The mode of transportation used to transport the food, rather than food miles, was more of a concern for the procurement department as they acknowledged that food transported via sea was more cost-effective than that delivered by air.

> We will consider the use of products from the closest origins in order to reduce / shorten the shipping distance.
>
> … would prefer to use by sea…more cheaper - as opposed to air and other transport methods.
>
> Normally most products come by sea as the product cost is much lower, apart from things like durian (the shelf life, berries etc?).

The chefs were aware that food and beverages were ordered from many different countries, as illustrated by the following comment:

> … we do have some products from all over the world: South America, some from America, Europe, Japan, Australia, New Zealand. [Chef]

However, almost 29% of commodities by volume and 27% of the value of all F&B were sourced from China (Table 3). This was somewhat surprising for the chefs, as there were some doubts as to

the quality of the food sourced from China. One comment from management illustrates some customer concerns:

> Some people (customers) have not ordered an item for example; someone asked where the chicken was from. One was from China and the other from Australia, the customer said that he would not ever eat chicken from China.

Given food miles is not priority for chefs or the procurement department, as the focus is on quality (chefs and procurement department) and costs (procurement department), the researchers then asked if the hotel promoted the fact that a wide range of quality food is sourced from around the world. When asked whether the origin of food commodities was written on the menu, all interviewees stated that this was undertaken for signature and high-quality items such as durian from Malaysia, foie gras from France or beef from Australia. The following comment from a chef illustrates these two points:

> Yes, some of the signature dishes must specify where it is from because some is top quality from Malaysia or top quality foie gras from France.

For a busy upscale hotel, the lack of food storage is a problem. Daily deliveries are required. The following comments from the procurement manager illustrate this point further:

> They are 'Just in Time' orders. So, not stored but generally arrive on the day needed for use. It is not easy here because of the storage issues, as we need to buy only very small quantities. The chefs need to buy daily.

The lack of storage of food at the hotel has a two-fold effect on the sustainability of the F&B procurement. The lack of storage space means that F&B orders need to be more frequent and in smaller quantities, adding to the cumulative distance that the food needs to travel. Conversely, the more frequent orders of smaller quantities may result in less wastage as food will be fresher and have less potential to spoil.

When asked about the use of organic foods, the ordering of organic foods is also driven by price and therefore there was hesitation to requisition organic food commodities by the chefs. Because of the price premiums, there was little interest in obtaining organic foods.

> … we tried before [to obtain organic food] but because these organic ingredients are quite expensive…the ones labeled 'organic you' pay more

In sum, findings from the interviews augment the quantitative analysis. In general, the chefs choose food commodities from a wide range of sources and focus primarily on the quality of products. However, the procurement department had overall control over the source of food commodities ordered unless specifically requested (for example, durian from Malaysia). The decision as to the country of origin, and hence the distance travelled for the procurement department, is dependent upon both quality and price of food commodities. The procurement department is concerned with where F&B is sourced primarily due to transportation costs. Tables 3 and 4 indicate that China is the main source market for fruit and vegetables and meat. Given the qualitative evidence that some hotel guests prefer not to eat food from China, country of food origin might be an area that both chefs and the procurement department should be more concerned with.

Shipping was the main mode of transport of commodities to their destination (see Tables 6 and 7). This is supported through comments from the procurement department where sea is

Table 7. Value of F&B by category-by-mode of transportation.

	F&B category										
Mode of transportation	Drinks	Dairy	Dim sum	Dry goods	Fruit & vegetables	Japanese	Meat	Noodle	Pastry	Seafood	Total
Air		19.2%	3.2%	2.3%	43.9%	12.3%		6.9%	46.5%	34.0%	16.8%
Land	36.0%	15.4%	93.0%	30.9%	21.4%		100.0%	62.5%	29.1%	14.0%	39.3%
Sea	64.0%	65.4%	3.8%	66.8%	34.7%	87.7%		30.6%	24.4%	52.1%	43.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

noted as the preferred transportation method. One significant factor that is highlighted through the interviews is the lack of available storage for food and beverages. This may impact overall costs due to more frequent deliveries and also the inability to purchase and store in bulk. However, this obstacle was balanced by the overriding factor of freshness and quality.

Conclusions and recommendations

In an increasingly globalized world, the issue of "local" food has become important to hotels and restaurants and their guests. This research estimates the food miles for an upscale hotel in Hong Kong. The annual food and beverages sourced for this hotel travels an estimated 445.9 million kilometres per year. This is the equivalent of the food and beverages travelling around the Earth's circumference approximately 11,126 times. This distance, taking into account the different modes of transportation, produces 27,294 tonnes of CO_2. This is one of the first attempts to estimate food miles and associated carbon emissions for an individual hotel property. As such, it can provide a benchmark for other hotels and restaurants with which to compare themselves.

Over three-quarters of the food and beverages travelled via sea, the most energy-efficient mode of transportation. As noted by Jones (2002), transporting food by air is more energy intensive than by road, which is more energy intensive than food transported across water. In this research, food transported by air comprises 12.2% of the number of orders, 16.8% of the value of the orders but 34.6% of the total CO_2 emissions. When given a choice, and given the fact that energy is expended during the storage process, preference should be given to transporting food products over long distances by ship (Milà i Canals et al., 2007). Using sea transportation from more distant locations is likely to result in lower carbon emissions than sourcing from farms closer to hotels and restaurants that use air transportation or even road transport (Coley et al., 2011).

In determining where food is sourced, the chefs are motivated predominantly by the quality of ingredients while the procurement department also takes into consideration the cost, as well as quality. One specific contribution of this research is to highlight the trade-offs that are made between quality and costs which may lead, in some circumstances, to food being procured from countries with questionable health and safety standards. Just because food can be procured closer to the destination does not necessarily mean it is the most sustainable option. Socio-economic and health factors need to be considered (Beer & Lemmer, 2011). Care needs to be taken that upscale hotels can meet the guests' requirements for high-quality food and beverages sourced in a cost-effective way. Concerns about the quality of food procured from certain regions mean that clear, open communication between chefs and procurement departments is essential.

Given the space and land restrictions that an urban city like Hong Kong faces and the growing food requirements to satisfy both the local and tourist populations, upscale hotels and restaurants could leverage the fact that their food is sourced from all over the world and is of the highest quality. Instead of stating that smoked salmon is on the menu, hotels and restaurants could highlight on the menu that the smoked salmon comes from Norway or Scotland. This could potentially turn a negative into a positive. Those eating at these establishments may perceive they are getting good value by eating the highest quality products, even though the food has travelled a long distance.

Promoting food that is in season and food that is required to be stored for shorter periods of time seems a straightforward recommendation. It is fair to say that consumers have limited information at the time of purchase and consumption of where food comes from, let alone how it is produced (organic versus conventional) and transported (Milà i Canals et al., 2007). Others have suggested that environmental labels be provided on food so that information can be communicated to consumers (Jones, 2002). A transport-related environmental indictor for fresh produce could be considered. Providing this kind of information will at least give consumers the choice to purchase low-transportation

food products. They can then make informed decisions so they can choose to act (or not) on their environmental beliefs.

Carbon labelling has been proposed as a way to inform consumers as to the greenhouse gas emissions associated with a food item's production and/or supply chain. There are mixed opinions as to the success of this strategy. Roggeveen (2014) and Blake, Mellor, and Crane (2010) argue that product labelling alone will not change consumer opinion toward making more sustainable food choices. There is no proposal to undertake this at this hotel.

In upscale hotels, there is consumer expectations that an extensive range of seafood, fruit and vegetables will be available throughout the year. However, for Hong Kong, a policy of import substitution is not viable given the land resources available. For a city-state like Hong Kong, a dietary shift can be a more effective strategy of lowering the environmental footprint than buying local (Weber & Matthews, 2008). Ravn Heerwagen et al. (2014) propose marketing and promoting organic food as a way to entice health conscious and environmentally aware consumers to lower their meat consumption, given the positive correlation between increased consumption of organic foods and potential climate change mitigation. However, this research reveals that the promotion of organic food is not a priority – chefs feel the cost premium of organic food is not justified.

Gössling et al. (2011) suggest a range of food management strategies that could apply to upscale urban hotels and restaurants, which would enhance sustainability. Suggestions are provided in three areas: purchases, preparation and presentation. For the procurement department, source as little as possible vegetables grown in heated greenhouses, reduce food transported by air, and purchase as little imported beef as possible. Purchase more locally produced foods, more grains, more chicken and pork and foods that will store longer. In terms of preparation, more sustainable hotels and restaurants are encouraged to purchase energy from renewable sources, and menus could be re-engineered so that dishes offer less meat and more vegetables and ensure better planning so to avoid waste.

Acknowledging that tourists' spending on food can comprise up to a third of their total expenditure (Torres, 2003), more research into the nexus between food production and food consumption in the tourism sector is needed. While the findings and subsequent conclusions of this research can be adapted to other upscale hotels and applicable to other geographically limited destinations, further research is warranted in a variety of contexts in different countries.

We first calculate food miles but we note, like Van Passel (2013), that using food miles as a single sustainability indicator is insufficient. Food miles is a useful and easy-to-understand measure but does not take into account the mode of transportation used to move the food or fuel type (Roggeveen, 2014). We then take into account the transportation mode and transportation efficiency to derive enhanced food miles. We consider carbon costs, but due to a lack of data, we are unable to include other essential transport externalities such has accident costs, congestion costs, noise pollution and air pollution. These externalities and other economic and social costs are important in assessing the sustainability of food (Van Passel, 2013). Comprehensive life cycle assessments would be a more holistic way to measure the full environmental impact, if data were available, so that food production and food disposal can be taken into consideration.

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No potential conflict of interest was reported by the authors.

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