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RESEARCH ARTICLE

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Environmental sustainability in restaurants. A systematic review and future research agenda on restaurant adoption of green practices

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ABSTRACT

The adverse impact that restaurants have on the environment has received widespread attention in the last decade from both practice and academia. The current study aims to find, catalog, and synthesize the research body addressing green issues in the restaurant industry. We utilize the systematic literature review method to identify and analyze 68 research articles addressing environmental unsustainability problems in the restaurant industry. The research profile identifies the time trends of publication, key journals, countries studied, methods used, and restaurant types discussed in these studies. The results indicate that green restaurant research has grown exponentially recently and is now past its infancy. Through a detailed qualitative content analysis, we uncover five key thematic foci: stakeholders and their roles, sources of environmental unsustainability, green initiatives adopted by restaurants to address environmental unsustainability, outcomes of adopting green practices, and various ways of measuring greening practices. Research limitations and gaps of each of the themes are presented, with potential future research questions proposed for each gap. We then summarize the results of our review in a green restaurant ecosystem research framework.

KEYWORDS

Green restaurant; environmental impact; environmental unsustainability; systematic literature review

Introduction

The restaurant industry is far from being good for the environment. Restaurants generate enormous quantities of food waste, plastic waste, and emissions while simultaneously consuming huge quantities of water and energy (Kasim & Ismail, 2012). According to a 2018

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report, restaurants throw away approximately 390,000 tons of edible food every year in the United States alone, an astronomical amount of waste that, if properly recovered, could provide close to 643 million meals to people in need (Cochran et al., 2018). Furthermore, close to 40 billion pieces of non-biodegradable cutlery are thrown out each year (Tenenbaum, 2019). Most of this single-use plastic cutlery ends up in the oceans (Wilcox et al., 2016), where they have proven to be "most deadly" for sea life who mistake these objects for food (Ocean Conservancy, n.d.). On the demand side, environmentally responsible consumption is increasing among restaurant consumers, with patronage increasing at restaurants that implement green practices (Bacig & Young, 2019; S. Y. Jang et al., 2015; Moon, 2021). All of these consequences and trends have generated increased attention worldwide toward understanding how and why restaurants are environmentally unsustainable and how this issue can be remedied. Alternatively, how restaurants can be made into green restaurants? Here, a green restaurant may be defined as a way of setting up and operating a restaurant in an environmentally friendly and energy-efficient way (Lorenzini, 1994).

The increased attention toward better understanding restaurants' environmental unsustainability has also generated similar interest in academic circles. This is evident from the fact that recent review studies have been published on sustainability issues in the hospitality sector (Filimonau & De Coteau, 2019; Higgins-Desbiolles et al., 2019; Kim et al., 2017). Kim et al. (2017), in particular, reviewed green hospitality research. They found that only 15 studies (10.5% of their sample) focused on the green restaurant-related issues, thus indicating that the topic or area is relatively new and possibly in its infancy. Similar trends were also observed by Higgins-Desbiolles et al. (2019) in their sustainability review of studies investigating restaurants until 2015. However, both review studies were not exclusively dedicated to restaurants' environmental impact, which has become a greater issue of interest in the last decade or so. Furthermore, after the publication of these review studies, the related research on green restaurants has now grown to incorporate various other issues.

Such studies have included the role of top management (Baloglu et al., 2022; Y. J. Jang, 2020), the role of employees (Iraldo et al., 2017; Y. F. Wang, 2016), the role of customers (Hwang et al., 2020; Trafialek et al., 2019), sources of environmental unsustainability (Baig et al., 2019; Filimonau et al., 2020), green processes (Hatjiathanassiadou et al., 2019; Ma & Ghiselli, 2016), and outcomes of greening in restaurants (Cantele & Cassia, 2020; Park et al., 2020). Due to the overwhelming increase in the number of published studies, the time is now right to step back and examine how the research around this subject has advanced to chart possible future research avenues. In particular, we argue that a review capturing various sources of environmental unsustainability and ways to address them is missing in the extant literature. Such a review is thus essential to identify the key sources of such unsustainability, ways to tackle them, and also the key stakeholders who can enable the transformation from environmental unsustainabile restaurants to green restaurants. In doing so, we seek to contribute to the discussion by presenting a unifying model of how and why restaurants can go green. The current study thus addresses this gap in the literature by presenting a systematic literature review of the research on green restaurants.

The following six key research questions guide our review. **RQ1.** What is the research profile of the research on green restaurants? **RQ2.** Who are the different stakeholders responsible for restaurant greening? **RQ3.** What are the different sources of environmental unsustainability in restaurants? **RQ4.** How are different unsustainabilities

addressed using different green initiatives? **RQ5.** What do restaurants gain from implementing green practices? And **RQ6.** What are the different key performance indicators (KPIs) and measures available to track green practices in restaurants?

The remainder of the manuscript is structured as follows. The next section presents the methodology used in the review. This is followed by a discussion of the thematic foci before a discussion on the gaps in the extant literature is presented as well as suggested research questions arising from them. After a discussion of a unifying research framework, the manuscript concludes with a discussion on the review's implications and conclusions.

Scope of the review

The Oxford dictionary defines a restaurant as "*a place where you can buy and eat a meal*" (Oxford Dictionary, 2020, para. 1). Owing to this loose definition, our study includes establishments like cafés, fast food restaurants, and luxury restaurants in addition to casual restaurants. Before defining the scope of "green," it is important to recognize what constitutes going green in the restaurant industry as well as what the sources of environmental unsustainability or 'non-greenness' are. The current review, therefore, seeks to understand these factors. Restaurants are responsible for a variety of "non-green" practices like the generation of food waste (Chiang & Sheu, 2020; Filimonau et al., 2020; Hatjiathanassiadou et al., 2019; Heikkilä et al., 2016), usage of non-sustainable materials in packaging and service delivery (Fieschi & Pretato, 2018; Tenenbaum, 2019), bad waste disposal strategies (Filimonau et al., 2020), and wasteful practices leading to the inefficient use of energy and water (Hatjiathanassiadou et al., 2019), among others. On the other hand, restaurants have also recently started implementing green practices and have started reaping a variety of benefits, including a green image (Hwang et al., 2020; Namkung & Jang, 2017) and enhanced firm performance (Chiu & Hsieh, 2016). Some of these green practices include better forecasting of demand (Mu et al., 2019), finding an alternative use for kitchen waste (Ishak & Kamari, 2019), leftover management (Filimonau et al., 2019), and reusable or biodegradable cutlery (Trafialek et al., 2019).

Considering the broad scope of "green" then, we define green as *any kind of environmentally responsible practice that is instituted by a restaurant to minimize its impact on the environment*. These practices may be associated directly with the food served itself or may be associated with the restaurant ambiance or technology used.

Methodology

We used the systematic literature review (SLR) method to identify and analyze the literature (Tranfield et al., 2003). The SLR method is commonly used to carry out literature reviews as it can generate a less biased and highly reproducible result (Jin & Wang, 2016). The SLR method is especially popular in hospitality-related reviews (Gomezelj, 2016; Hlee et al., 2018; Mariani et al., 2018). Furthermore, SLR is an advised method if guiding research questions are available (Munn et al., 2018). We designed a three-step process for identifying the literature to ensure the highest possible reproducibility of our process. First, we determined the inclusion and exclusion criteria based on our guiding research questions. Second, we identified the relevant keywords. Next, we ran

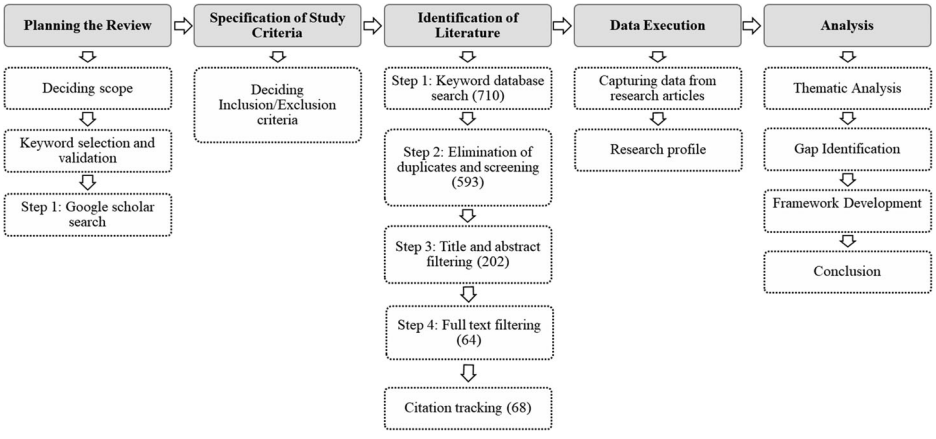

Figure 1. Systematic review method used in the study mapped to various sections of the article.

keyword searches in popular research databases. The SLR method used in the study is summarized in Figure 1.

Inclusion/exclusion criteria

Referring to the research questions mentioned in the introduction, the review captures all studies addressing the journey of restaurants from environmental unsustainability to becoming a green restaurant. We believe that it is important to know the sources of environmental unsustainability and what practices are being adopted to address them. In addition, motivations in terms of firm outcomes also need attention as restaurant managers are likely to adopt green practices if they can justify the investment. Considering the above, we believed empirical studies would be ideal as they discussed real-life restaurants and their initiatives to go green.

Referring to prior literature in SLRs (Kushwah et al., 2019), the scope of the review, and adapting our criteria accordingly, this review has five inclusion criteria: (a) studies addressing the source of environmental unsustainability in restaurants, (b) studies addressing environmental initiatives in restaurants, (c) studies addressing some kind of outcomes from implementing green initiatives and how to measure them, (d) studies in English, and (e) studies across all years available in the database. Furthermore, we eliminated studies based on the following criteria: (a) studies on foodservice industries other than restaurants like catering, (b) non-peer-reviewed literature like conference proceedings, magazine articles, and websites, (c) reviews and conceptual and editorial works that are not based on real-world data, and (d) studies that address consumer adoption of green restaurants without addressing the restaurant perspective of adoption.

Keyword identification

The keyword identification was a multi-step process. We initially searched “green” and “restaurant” in Google Scholar before going through the titles, abstracts, and keywords

of the 100 most relevant search results. We also went through reviews on topics related to restaurants as well as reviews on sustainability to observe the search keywords used by them. We noted down these keywords, and three researchers discussed their validity. Since we wanted to restrict our review to only restaurants, we ignored keywords like "food services" and "catering" for alternative words to "restaurants". However, we added "sustainability", "sustainable practices", "environmental impact", and "environmental practices" as alternative green keywords. Our final list of keywords was "restaurant," "green," "environment*," "sustain*", "environmentally responsible practices," "pro-environmental," "environmentally friendly practices," and "environmental management."

Identification of literature

After the keyword identification, we moved on to the identification of studies. First, the combinations of selected keywords were searched in the Web of Science (WOS) and Scopus research databases. Both databases list most of the hospitality journals and are commonly used in hospitality-related reviews (Booth et al., 2020; Mariani et al., 2018). The search yielded 710 results, of which 453 results were from Scopus, and 357 results were from WOS. To ensure the review's high reliability, we excluded all non-peer-reviewed research works, including conference proceedings, books, and book chapters. We also excluded articles that were not in English. After eliminating duplicates from a combined Scopus and WOS results list, we were left with 593 studies. The search was performed in March 2021.

We then read the titles and abstracts of the remaining studies to gauge the relevance of each study. We were then left with 202 studies that addressed some concepts of green restaurants from the restaurant's perspective. We then proceeded to read the full text of each paper. We did not include studies that did not have a restaurant as their locus of study. Studies investigating only the consumers' adoption of green restaurants were eliminated in this stage unless, the impact of their adoption on the green restaurants was also studied. After the elimination step, we were left with 52 studies. We were a bit unsure whether to include twelve studies from the technology domain that addressed alternative usage for restaurant wastes as they were not done in a restaurant setting. However, we decided to include them in the discussion as we saw they fit into one of the potential themes that were forming at the time, that is, green measures adopted by the restaurants. Thus, we were left with 64 research articles at this juncture. We then performed manual forward and reverse citation tracking of each research article to find any studies we may have missed. We found four more research articles through this process, bringing the total to 68 research articles.

The final set of 68 studies included in the review were thoroughly read independently by three researchers. All of the researchers independently carried the open and axial coding of the relevant studies based on the primary issue discussed in the study (Stanfill et al., 2010). We noted down eight key points of interest in each research article, including the topic of research, stakeholder addressed, contextual setting (the type of restaurant), research method, publication year, journal, citation accrued, and gaps portrayed. The three researchers then conferred and discussed the different projected themes to arrive at the final set of research themes. We developed a robust

coding schema to minimize subjectivity. Coding conflicts were resolved by an open discussion of each code and its statements (Chinh et al., 2019). The most experienced researcher acted as the discussion leader. A summative table of the codes was circulated, and proposed themes and subthemes by each researcher were individually discussed. Furthermore, the guiding research questions were initially consulted to ensure the relevance of the theme. Disagreements between the researchers were decided by voting. The final list of codes was then presented to an expert in the field who validated the themes and the subthemes. The discussion thus yielded five thematic groups and several subthemes which adequately address how and why restaurants should go green. The results of this analysis are presented as a research profile and thematic foci in the following sections.

Research profile

The most prominent publication outlets for green restaurant research were *the International Journal of Hospitality Management, Sustainability, and Journal of Cleaner Production*, with six research articles each. However, other hospitality journals were behind sustainability-oriented journals like *Sustainability* and *Journal of Cleaner Production*. Journals with at least two research studies published on green restaurants are presented in Figure 2 below. Furthermore, Dr. Viachaslau Filimonau is the most productive author in the area, with five research publications.

Regarding the trend of publication in the area, we found that 69% of the literature has been published in the last few years, indicating that interest in green restaurants is picking up at an exponential rate. Our results are concurrent with that of Kim et al. (2017), which observed that green restaurant studies were in their infancy in 2015, with only 15 studies published at the time of writing their review of green hospitality. Considering that the review has garnered over 52 citations in the last few years, we may safely assume that it has contributed significantly to the area's growth. Figure 3 represents the trend of publications across the years.

Regarding the study's research context, we observed the types of restaurants and country of study in the literature. However, some studies did not explicitly mention the type of restaurant in which their study was conducted. Furthermore, some studies were experimental in nature and were not conducted in a real restaurant setting (Bacon &

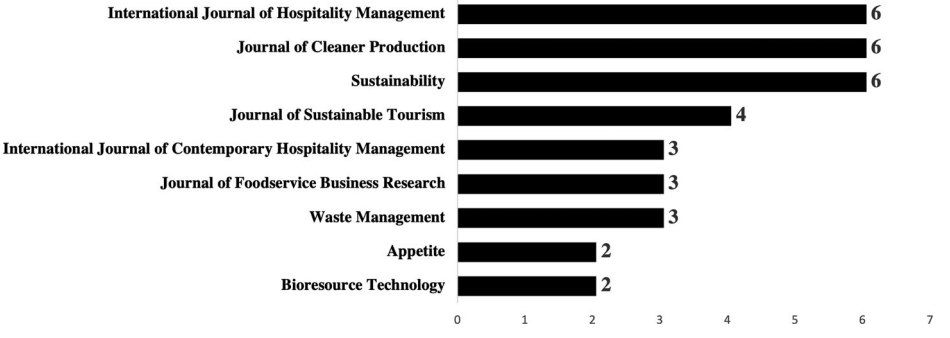

Figure 2. Most prominent outlets of publication of green restaurant research.

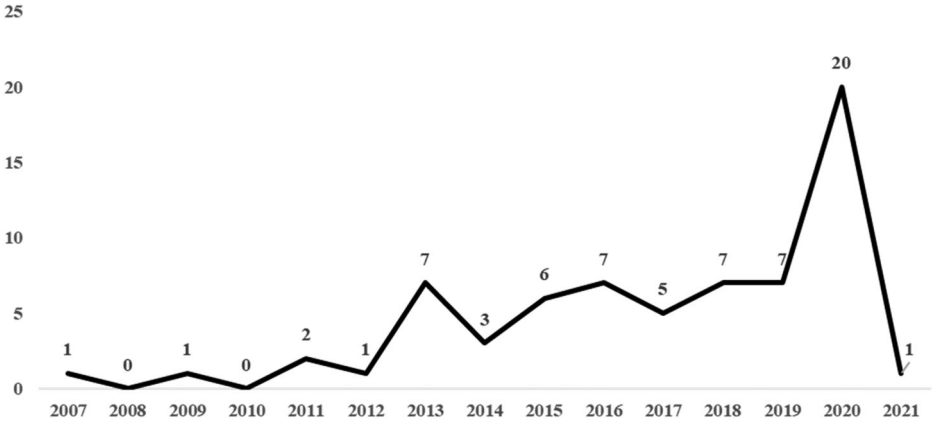

Figure 3. Trend of studies on green restaurants.

Krpan, 2018). The frequency of each type of restaurant mentioned can be seen in Figure 4 below. The most studied country context in the extant literature was the United States of America (USA), with eight studies. This is followed by the United Kingdom (7), Taiwan (6), and China (5).

Regarding methodological distribution, 12 studies were technical in nature and primarily adopted experiments to determine alternative uses for restaurant waste. Of the remaining 62 empirical studies, 45 adopted a quantitative method. Structural Equation Modelling (SEM) was the most common method used, with 11 studies testing their hypothesis using this method. Experiments based on restaurant-goers were quite popular as well, with eight studies investigating their hypotheses through experimentation. Fourteen studies adopted a qualitative research design. Finally, three studies were scale development and mixed-method based studies.

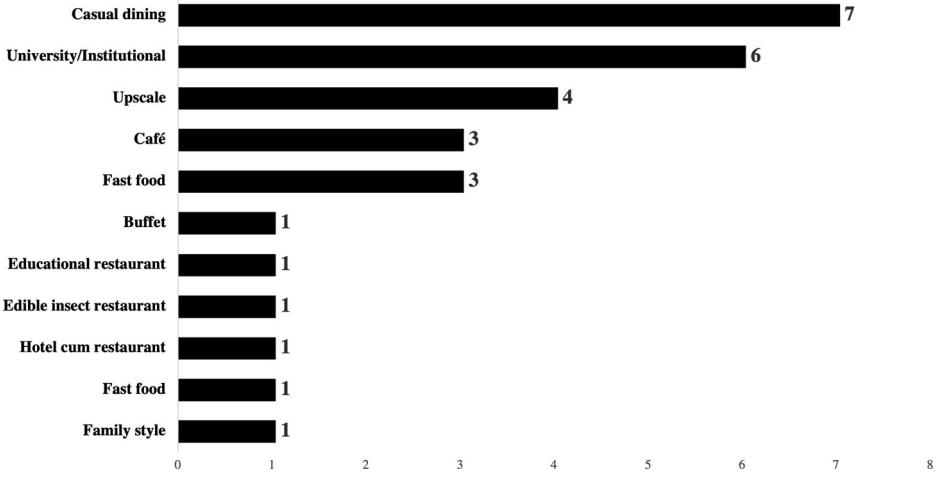

Figure 4. Types of restaurants studied.

Thematic foci

We identified the emerging thematic foci of the prior literature on green restaurant research as (a) key stakeholders and their roles, (b) sources of environmental unsustainability, (c) green initiatives adopted to tackle unsustainability, (d) outcomes of different green initiatives, and (e) measuring greening and key performance indicators (KPIs). All five research themes are discussed below. Figure 5 presents a summary of each theme and its components.

Key stakeholders and their roles

A stakeholder is any person or group of persons who are interested in a particular issue (Freeman, 1984). Our analysis of the relevant literature on green restaurants suggests that there are a total of six critical stakeholders that drive or hinder the greening process in restaurants. These stakeholders are (a) top management, (b) employees, (c) the customers, (d) policymakers, (e) NGOs, and (f) researchers. These stakeholders may be better classified as either internal and external based on their location relative to the restaurant. Top managers and employees are internal stakeholders, while customers, policymakers, and enabling organizations are external to the firms.

Internal stakeholders: top management and employees

Top managers and restaurant employees are considered the two key stakeholders internal to the firms (Kasim & Ismail, 2012). The upper echelons theory posits that firms reflect their top management (Hambrick & Mason, 1984). Here, top management may refer to a manager, decision-maker, or entrepreneur at the restaurant's helm. The results from the selected studies of this review agree with the theoretical perspectives of the upper

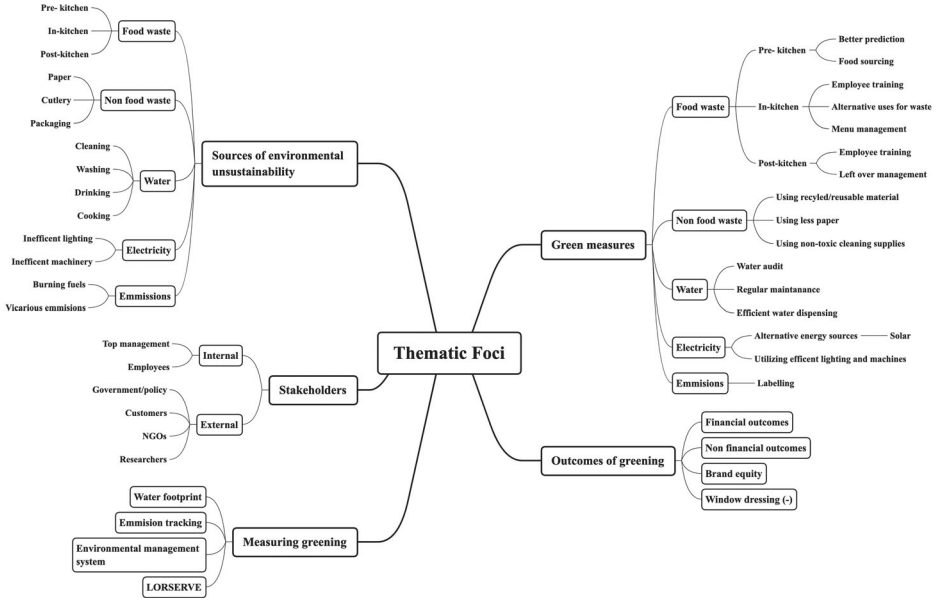

Figure 5. Thematic foci of green restaurant research.

echelons theory as the greening process is often guided by the top manager's green values and their ability to formulate a green policy for the restaurant staff to implement (Filimonau et al., 2019). Furthermore, the literature also observed that greening requires substantial capital investment in terms of employee training or asset procurement and is thus financially taxing (Baloglu et al., 2022). Greening also requires managers' vision and willingness to change their incumbent systems to charge more for green restaurant services from the customers (Choi & Parsa, 2006; Iraldo et al., 2017).

The extant literature has discussed that the top managers drive greening through their environmental values. For instance, in their study of green restaurants in the United States, Jang (2020) showed that entrepreneurs with environmental values showed awareness of the adverse impacts of businesses on the environment and were cognizant of stakeholders' needs, and, in turn, exhibited environmental leadership. That is, they considered the implications of their various decisions at the restaurant. Furthermore, the results were consistent across fast food, casual dining, and upscale restaurants. The study also showed that chain restaurant entrepreneurs were more likely to consider stakeholder suggestions when constructing environmental measures. In another related work, Choi and Parsa (2006) found that a manager's environmental and social values made them willing to charge up to 6% extra from customers after implementing green initiatives like recycling and reducing pollutants. The strategic implication of this is that managers who are willing to take the risk to increase costs are successful in differentiating their restaurants from their competitors.

Prior literature has also observed that the top management can hinder the practicing of green initiatives in restaurants (Kasim & Ismail, 2012). Scholars have suggested that since the top management is aware that green practices increase positive perceptions among customers, they may try to engage in window dressing or superficial greening (Baloglu et al., 2022), wherein restaurants adopt "green" initiatives that reduce their costs or increase their positive image without actually contributing to environmental sustainability (Baloglu et al., 2022). Furthermore, the poor managerial attitude to greening and badly designed greening restaurant policies can increase unsustainability and negatively impact greening (Filimonau et al., 2019a). Moreover, managers without adequate forecasting skills and who do not invest in employee training can also increase food wastages (Filimonau et al., 2019a).

Employees of a restaurant are another significant internal stakeholder discussed in the extant literature (Y. F. Wang, 2016). Tan et al. (2019) have shown that all green initiatives require constant support and awareness on the employees' part to adopt green practices successfully. As such, it is fair to say that the top management constitutes the formulation of the green strategy, while the employees constitute the real execution. However, because employees are in charge of such a critical task, a lack of skills or awareness on their part can inevitably lead to both food and non-food wastages inside the restaurant (Heikkilä et al., 2016).

Employee demographic characteristics like age, gender, and higher education can also play a role in environmental values, which impact their commitment to green policy (Yucedag et al., 2018). However, there is no clear consensus in this regard. While Yucedag et al. (2018) showed that men are more likely than women to possess environmental values, Wang (2016) found that women are more likely to exhibit green behavior. Furthermore, there is ample evidence outside of the hospitality domain that women are

generally more concerned about their impact on the environment than are men (Braun, 2010; del Mar Alonso-Almeida, 2013; Galbreath, 2019). The variable differentiating these studies was the country context. We thus can infer that the country's cultural environment may drive these gender differences. Furthermore, women top managers and managers who are older and less educated were also shown to exhibit lesser awareness of green initiatives, indicating that trends are similar at the top management level (Lang et al., 2020).

External stakeholder: customers, government and policy, NGOs and researchers

The extant literature discussed four key external stakeholders: customers, policymakers, researchers, and NGOs as partner organizations. The customers represent the restaurant system's demand-side and play an important role in driving green behavior by recognizing and becoming patrons of restaurants that adopt green practices (Hwang et al., 2020). Furthermore, their active participation is essential to ensure that green initiatives are successful (M. J. Kim & Hall, 2019). For instance, Trafialek et al. (2019) showed that restaurant customers in Poland and Lithuania appreciated reusable cutlery and local ingredients in the foods. However, customers may sometimes be unwilling to dine in restaurants that implement green initiatives (Peng, 2020). This may be particularly true for luxury restaurants where implementing green services can lower customers' willingness to adopt green restaurant services due to the perceived functional, financial, hedonic, and self-perception risks (Peng, 2020). One study even found that customers believe that they might find the experience less luxurious, not worth the money, and not enjoyable or not suited for their image (Peng, 2020). Accordingly, the restaurant implementing green measures may be in double jeopardy as they may lose their investment and customers. Moreover, Trafialek et al. (2019) showed that customers sometimes do not notice green investments like environmentally safer energy, alternative sources of protein, or the initiatives undertaken for reducing food wastage. The impact of such ignorance could lead restaurants to actively avoid investing in factors that customers do not notice, like a green dining environment, and concentrate only on visible factors like reusable cutlery (Baloglu et al., 2022).

The review of the prior literature indicates that there is a paucity of research on external stakeholders beyond the customers. This limited body of literature suggests that policy and government are significant antecedents of greening (de Visser-Amundson, 2020; Hatjiathanassiadou et al., 2019). However, scholars have observed that the lack of a well-codified policy can hinder the adoption of greening practices in restaurants (Filimonau et al., 2019a). For instance, (Tan et al., 2019)in a study of Malaysian restaurants, Tan et al. (2019) noted that government support for greening is minimum, and greater support in terms of education and support would help restaurants adopt greening practices faster and more efficiently. Nevertheless, research addressing the role of this policy is scarce and needs further inspection. Furthermore, the literature is currently unsure of what the policy should specify as the greening metrics that should be tracked to ensure such greening. In addition to governmental support, restaurants may also require support from other organizations to implement greening practices. For example, to donate excess food successfully, restaurants sometimes engage with external organizations that collect and distribute these leftovers on their behalf (Lee et al., 2020). Similar results were also seen by de Visser-Amundson (2020), who observed that multi-stakeholder partnerships helped reduce food waste by 21% among Dutch restaurants.

Finally, researchers who find alternative uses to restaurant wastes are important external stakeholders that are often ignored in the literature. The selected studies in this area are primarily from technology-oriented journals (Hamada et al., 2020; Ishak & Kamari, 2019; Outili et al., 2020). We have incorporated them into our list of stakeholders as we believe they provide a valuable contribution to effective restaurant waste management by suggesting a variety of innovative recycling options. All of the critical stakeholders and their roles are summarized in Figure 6 below.

Sources of environmental unsustainability

Unsustainability in restaurants can occur from two key components, 1) avoidable wastages and 2) emissions. The extant literature presents several classifications of avoidable waste in a restaurant setting. One way to classify the waste is based on whether the waste has its origins in food or another source. Furthermore, food waste can be classified based on the place of origin, such as pre-kitchen, in-kitchen, and post-kitchen (Filimonau & De Coteau, 2019). Food wastage can also be classified as arising from food preparation, spoilage on-site, and customer plate excess (Kantor et al., 1997). However, we believe classifying based on origin covers a wider range of food waste. In addition to these wastes, studies have also addressed wastages of water and electricity during both the production and serving processes at restaurants (Baloglu et al., 2022; Lee et al., 2020). The second theme is dedicated to identifying the key drivers in each of the unsustainability categories discussed in this section. Table 1 summarizes the studies that have addressed each subtheme of avoidable waste.

Food waste

There are three primary types of food waste: pre-kitchen, in-kitchen, and post-kitchen. We classify all processes before food reaches the kitchen as pre-kitchen antecedents. This predominantly involves forecasting food requirements and procuring raw materials. One significant driver of this type of food waste is bad forecasting and

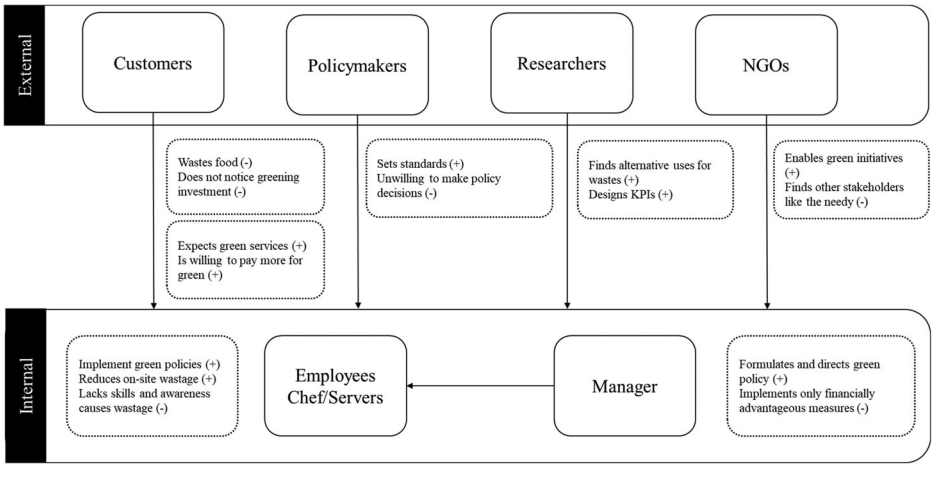

Figure 6. Roles of key stakeholders.

Table 1. Studies Addressing Different Types of Unsustainability in Restaurants.

Type		Drivers	References
Food Waste (Filimonau et al., 2019a)	Pre-kitchen	Poor forecasting, operational inefficiency, menus, food sourcing	(Filimonau et al., 2019a) (Hatjiathanassiadou et al., 2019) (Filimonau et al., 2019) (Trafialek et al., 2019)
	Kitchen-based	Spoilage and damage in cooking, cooking skills, non-green recipes, used oil.	(Filimonau et al., 2019a) (Tan et al., 2019) (Heikkilä et al., 2016) (Chiang & Sheu, 2020) (Carmona-Cabello et al., 2020) (Filimonau et al., 2020)
	Post-kitchen	Consumer behavior, recklessness, serving loss, plate leftover, unskilled staff, service-related.	(Filimonau et al., 2019a) (Heikkilä et al., 2016) (Tan et al., 2019) (Filimonau et al., 2019) (Filimonau et al., 2020)
	Others	Competition	(Heikkilä et al., 2016)
Non-food waste	Packaging, point of sale receipts, napkins, cutlery		(Y. F. Wang et al., 2013) (Tan et al., 2019) (Fieschi & Pretato, 2018)
Other wastes	Electricity/ energy	Inefficient lighting and equipment	(Y. F. Wang et al., 2013) (Hu et al., 2013)
	Water	Inefficient menus and recipes, employee mismanagement, inefficient water practices	(Hatjiathanassiadou et al., 2019) (Y. F. Wang et al., 2013) (Hu et al., 2013)
	Food-related gas emissions	Greenhouse gas generated in sourced meat, burning of fuel.	(Majumdar et al., 2013) (Brunner et al., 2018) (Freeman et al., 2019) (Allen et al., 2021)

miscommunication between staff and management (Heikkilä et al., 2016). Several studies in multiple settings have observed that bad forecasting is an antecedent of food waste (Filimonau et al., 2019a; Filimonau et al., 2019). Furthermore, procurement inefficiencies and not using food that is procured locally may also lead to pre-kitchen wastages (Trafialek et al., 2019).

In-kitchen food waste is primarily driven by internal stakeholders, such as the cook or the chef. Among the generated food wastes, about 45-65% of the wastes originate during preparation and are thus in-kitchen in nature (Baldwin et al., 2011). The primary driver of in-kitchen food waste is spoilage and damage in the cooking process, which is largely caused by a lack of cooking skills among the restaurant employees (Filimonau et al., 2019a; Filimonau et al., 2020). Significant wastes also result from badly crafted recipes, which result in excess wastage in restaurants (González-García et al., 2020).

Post-kitchen food waste is primarily driven by customers' preferences and attitudes (Heikkilä et al., 2016). Approximately 30-34% of food waste can be accounted for through consumer plate leftovers and is thus post-kitchen in nature (Baldwin et al., 2011). Leftovers are generated due to two main mechanisms. First, a consumer may not like the food served due to their norms, preferences, and expectations. Second, the lack of portion control may end up with too much food being served for the consumer to finish eating (Filimonau et al., 2019a; Mu et al., 2019). Furthermore, restaurant policies may also lead to food waste. For instance, keeping a buffet open for too long or too short may cause excess food waste in stale food or leftover food (Heikkilä et al., 2016). Besides the three types mentioned above, food waste may also be driven by competitive pressures to regularly change menus, which makes forecasting difficult (Heikkilä et al., 2016). However, this observation also implies that each antecedent of food waste may be linked to each other, whereby one element makes another worse and thus creates an ecosystem of food waste generation.

Non-food wastages

Non-food wastages that do not have their origins in food preparation or serving are primarily generated from packaging and paper material (Tan et al., 2019; Y. F. Wang et al., 2013). Non-food waste can also arise from cutlery and tableware usage with non-biodegradable materials like plastics (Fieschi & Pretato, 2018). These also include wastage of utilities like water and electricity. Water is a pervasive resource in a restaurant as it is used inefficiently at multiple levels, including ingredients in cooking, washing, landscaping, cleaning, and customer consumption (Baloglu et al., 2022; Lee et al., 2020). For instance, scholars agree that meat and animal protein leave a much larger water footprint than plant-based alternatives (González-García et al., 2020; Hatjiathanassiadou et al., 2019). Electricity wastage is also equally pervasive and usually wasted due to employee mismanagement and inefficient equipment and lighting (Y. F. Wang et al., 2013).

Emissions

Emissions are another source of unsustainability in restaurants (Hu et al., 2013). The studies in our sample discussed two types of emission. The first type is the direct emission from the burning of fuels in the kitchen (Majumdar et al., 2013) and vicarious emissions from ingredients like meat (Brunner et al., 2018). Direct emissions are further impacted by the quality of fuel used. For instance, kerosene instead of Liquid Petroleum Gas (LPG) would result in more emissions (Majumdar et al., 2013). The second type of emissions arises from vicarious sources like food sourcing and supply. For instance, meat production is more emission-prone than vegetarian food production (Kurz, 2018). Another case of emissions that has received some attention is the emission due to food delivery (Allen et al., 2021).

Green measures adopted by green restaurants

Restaurants are increasingly becoming aware of their wastages and impact on the environment. (Sakaguchi et al., 2018)In their study of US restaurants, Sakaguchi et al. (2018) showed that 65% of the restaurants measured their food waste, and 84% of the restaurants had recycling bins. The green measures adopted by restaurants have thus been divided based on the drivers of wastes discussed in the prior section. Green initiatives may also be divided according to whether they are food-based or dining environment-based (Namkung & Jang, 2013). Specifically, food-based initiatives will focus on addressing food wastes, while dining environment-based initiatives will address some aspect of non-food wastes like electricity and recycled material in the restaurant. However, for our analysis, we continue with the classification of food and non-food-based categories established in the previous section as several dining environment-based measures are covered in environmental measures that address non-food, water, and electricity wastages. The key initiatives have been summarized in Table 2 below.

Prevention and reduction of food waste

Regarding the food-based measures, the extant literature has discussed how each driver of food waste may be addressed. For instance, the difficulty in forecasting may be addressed in one of four ways. The first is to reduce the complexity of the prediction of food required. This may be accomplished by reducing the number of variables required

Table 2. Green Measures Adopted for Different Wastage Categories.

Component	Key Initiatives			References
Food waste	Pre kitchen	Forecasting issues,	Pre-ordering of items Reducing menu variety, local procurement, Using technological interventions, supplier tie-up	(Mu et al., 2019) (Filimonau et al., 2020)
		Food sourcing	An alternative source of protein, local and seasonal ingredients.	(Trafialek et al., 2019) (Tan et al., 2019)
	In Kitchen	Reducing preparation waste	Efficient recipes, employee education, menu reconfiguration, reuse cooking oil	(Hatjiathanassiadou et al., 2019) (Ma & Ghiselli, 2016)
		Alternative uses for kitchen waste	Biodiesel from cooking oil, biodiesel from composting food waste, chimney oil to nano-light sensors	(Outili et al., 2020) (Ishak & Kamari, 2019) (Das et al., 2018) (Nguyen et al., 2017) (Hamada et al., 2020) (Pleissner et al., 2015) (Kyzas & Deliyanni, 2015) (Velazquez Abad et al., 2015)
	Post Kitchen	Leftover management	The takeaway, doggy bag, rescue recipes, donation, portion control, staff training, off-site disposal, recycling, and composting	(Mu et al., 2019) (Filimonau et al., 2019) (Tan et al., 2019) (Babakhani et al., 2020) (Filimonau et al., 2020) (Batat, 2020)
		Other interventions	Labeling green products, "nudging,"	(Visschers & Siegrist, 2015) (Filimonau et al., 2017)
Non-Food waste	Reusable cutlery, recycled products, non-toxic cleaning products, paper, compostable cutlery, not using plastic			(Trafialek et al., 2019) (Tan et al., 2019) (Razza et al., 2009) (Batat, 2020)
Electricity	Environmentally friendly source of energy, employee education, efficient lighting and equipment			(Trafialek et al., 2019) (Tan et al., 2019) (Y. F. Wang et al., 2013) (Lee et al., 2020) (Hu et al., 2013)
Water	Regular water audit, employee awareness education, menu reconfiguration, regular plumbing maintenance, appropriate water dispensers			(Tan et al., 2019) (Hatjiathanassiadou et al., 2019) (Lee et al., 2020) (Ma & Ghiselli, 2016)
Emissions	Labeling on the menu			(Filimonau et al., 2017) (Babakhani et al., 2020) (Kurz, 2018)

in such a prediction, such as by reducing the number of items on the menu (Mu et al., 2019). The second way of ensuring better prediction is by reducing the supply uncertainty of ingredients by sourcing them locally (Mu et al., 2019). The third way, which requires more attention, is the use of technology to enable customers to pre-order their dishes before arriving at the restaurant, thereby enabling restaurants to procure and prepare only what may be actually needed (Mu et al., 2019). However, this strategy is also prone to risks like technical glitches and customers not turning up to collect the order. However, we argue that this has not received adequate attention in the extant literature. The fourth way of improving forecasting is to have a good relationship with suppliers to have more frequent deliveries to reduce the time frame for the prediction (Filimonau et al., 2020).

Leftovers are another major component of food waste that may be generated both in-kitchen and post-kitchen. Leftovers may be of two types: First, plate waste from the consumer, and second, the food that is prepared in excess (Filimonau et al., 2020). The extant literature has suggested that leftover food-management involves finding alternative consumers for excess food and that it is easier for smaller and fine-dining restaurants to

implement these measures than, say, a larger casual dining restaurant where the volume of waste may be higher (Filimonau et al., 2020). In addition to on-site and off-site recycling and composting, leftover management can be done in four different ways. First, customers may be offered takeaway and doggy bag options of the leftover food to reduce half-eaten food waste (Filimonau et al., 2020; Mu et al., 2019). However, guests feeling embarrassed to take away their leftovers is a significant barrier (Filimonau et al., 2020). Second, food that was not eaten but was prepared or acquired in excess or unused excess ingredients can be repurposed into "rescue recipes" that utilize the leftover ingredients and food into new servable recipes (Filimonau et al., 2019; Filimonau et al., 2020; Mu et al., 2019). Third, the leftover food can be donated to either employees or those in need (Filimonau et al., 2019a; Filimonau et al., 2019; Tan et al., 2019). However, chain restaurants are less likely to engage in a donation as it may adversely impact their brand (Sakaguchi et al., 2018). Fourth, rather than addressing the leftovers after they have been created, some restaurants are engaging in portion control to serve an appropriate quantity that minimizes waste (Filimonau et al., 2019a; Filimonau et al., 2019; Filimonau et al., 2020; Mu et al., 2019). However, the type of restaurant can also impact this portion controlling measure. For instance, implementing portion control was an issue for chain-affiliated restaurants that had to stick to their standard operating procedures (Filimonau et al., 2020). Furthermore, some customers may see such measures as offering less value for their money (Filimonau et al., 2020).

Prevention and reduction of non-food wastes and emissions

Two primary green measures for reducing non-food waste have been studied. The first set of measures concentrate on reducing wastes generated from packaging and receipts by replacing disposable cutlery with reusable ones and using substitutes for paper. A good example of this is replacing paper receipts at the point of sale (Trafialek et al., 2019). These sets of measures may also lead to the replacement of toxic cleaning and maintenance supplies with less harmful substitutes or reducing the overall impact of the dining environment by utilizing recycled materials (Tan et al., 2019).

The next set of measures concentrate on reducing utility wastage. The extant literature has noted that when restaurants adopt green initiatives, they usually begin by targeting a reduction in waste and energy and water consumption (Blanco et al., 2009; Hsieh, 2012). A vital step to conservation begins with regularly monitoring water use to identify sources of wastages (Lee et al., 2020). For instance, restaurants can identify menu items that require more water and emissions to prepare and then reconfigure their menus to reduce such items (Hatjiathanassiadou et al., 2019; Pulkkinen et al., 2016). Furthermore, proper employee training and awareness to actively conserve water have also been suggested in the extant literature (Tan et al., 2019). Other water conservation initiatives may focus on aspects of water use like cleaning, manual dishwashing, using thawing procedures, not using running water (Martinelli et al., 2012; Lo et al., 2011), utilizing appropriate water pipes and dispensers, scheduling regular plumbing maintenances (Lee et al., 2020), not pre-pouring water at the tables, and using water-efficient landscaping (Baloglu et al., 2022). Furthermore, using innovative and efficient machinery to thaw meat has been known to give a return on investment in up to 15.5 months in Chinese restaurants. This figure may encourage restaurant managers to invest in machinery. Regarding the conservation of electricity, the literature has suggested three main

approaches. The first approach is to switch from traditional electricity sources to alternative renewable sources (Trafialek et al., 2019) like solar energy (Lee et al., 2020). Second, restaurants can invest in appropriate training for their employees (Tan et al., 2019), or, third, invest in energy-efficient lighting and equipment (Y. F. Wang et al., 2013).

Visschers and Siegrist (2015) suggested that labeling foods according to their climate-friendly nature is another intervention to reduce emissions waste. Their results showed that climate-friendly meals were as equally tasty as non-climate friendly meals and that customers preferred to buy such menu items. Thus, making customers aware of the green option available in a restaurant is an important factor to consider when greening. This was also noted in the literature as "nudging" the customer to make a more sustainable choice (Kurz, 2018). For instance, Filimonau et al. (2017) showed that consumers made greener choices if they were made aware of the origin and greenhouse emission content of the foods on their menu. The results concur with those of Kurz (2018), which studied vegetarian dishes' visual cue in university restaurants. However, in a contradictory study using visual carbon labeling in menus, Babakhani et al. (2020) showed that customers paid little attention to sourcing and carbon emissions labels. However, the results may have been influenced by the fact that the experiments were conducted in a non-restaurant setting on university students. The other studies discussed here were studied in a real restaurant setting using actual customers.

Nudging can be done using a variety of visual cues. For instance, the information may just be displayed in simple text (for example, CO_2 emission in the production of this dish is xx kg/portion) or more creative visual cues (for example, traffic light colors to represent the intensity of the impact) (Babakhani et al., 2020; Filimonau et al., 2017) or some text can be highlighted as compared to others (Kurz, 2018). Therefore, there are a variety of future research opportunities to determine the optimum menu design to elicit green responses from customers (Filimonau et al., 2017). It is also interesting to note that all of the studies mentioned were conducted in a casual dining setting. Thus, more attention may be needed to understand if the results vary with the type of restaurant.

Finding alternative uses for wastes

The following studies discussed the repurposing of kitchen-based wastes into useful alternative items. Ishak and Kamari (2019) showed that proper composting of food waste using specific insects can create biodiesel that may be used as a renewable energy source. Similarly, used cooking oil from the kitchen has also been converted into biodiesel (Das et al., 2018; Outili et al., 2020; Velazquez Abad et al., 2015). Several other alternative uses have been discussed in the extant literature (Hamada et al., 2020), such as using potato peels for pharmaceutical effluent treatment (Kyzas & Deliyanni, 2015). However, these are not related to restaurant measures and may require cooperation with external stakeholders to collect waste and perform the required actions. However, the extant literature does not explicitly discuss the role of these external stakeholders.

Outcomes of the green restaurant measures

Adopting green practices has been linked to several positive outcomes for the restaurant implementing them. Such green practices create a green image that has been linked to

increased adoption intention among consumers. Furthermore, these consumers are more likely to engage in positive word-of-mouth as a result (Hwang et al., 2020). Other studies have concurred with these findings but note that outcomes may depend on the restaurant type. For instance, Namkung and Jang (2013) found that food waste-based measures were more effective than dining environment measures in generating brand equity in upscale restaurants. In contrast, the opposite was true for casual dining restaurants. More such comparative studies may be required to ascertain which environmental measures may suit which type of restaurant. However, this may also induce the "window-dressing" mentioned earlier, whereby restaurants will only implement initiatives that customers can see (Baloglu et al., 2022). Other positive benefits of implementing green practices include firm performance mediated by competitiveness (Cantele & Cassia, 2020; Iraldo et al., 2017; Perramon et al., 2014), firm performance in general (Chiu & Hsieh, 2016; Y. J. Jang, 2020; Llach et al., 2013), customer satisfaction (Cantele & Cassia, 2020) and non-financial performance like customer satisfaction, loyalty and retention (Y. J. Jang, 2020; M. J. Kim & Hall, 2020; Park et al., 2020), as well as employee satisfaction and motivation (Y. J. Jang, 2020). In addition, greening can also contribute to United Nations Sustainable Development Goals, particularly Goal 12 (responsible consumption and production) (de Visser-Amundson, 2020).

However, there are also possible negative consequences of greening, such as the consumer's perceived functional, hedonic, self-perception, or financial risk in adopting the green initiatives implemented (Peng, 2020). Furthermore, as discussed earlier, consumers may simply not notice the green initiatives at all (Baloglu et al., 2022). Since these initiatives present significant investments, this may be potentially disastrous for a restaurant. However, more studies may be needed before drawing conclusive implications.

Measuring greening – key performance indicators and scales

Several studies have developed scales and key performance indicators (KPI) to measure and track a restaurant's greening. Identification and tracking of KPIs are essential for both government and restaurant policy formulation. Furthermore, reliable scales are required by both academics and practitioners alike to measure the success of green initiatives. This theme is dedicated to summarizing the KPIs and scales discussed in the extant literature.

Tan et al. (2019) studied Malaysian restaurants and proposed an Environmental Management System (EMS), which constitutes eight key parameters that relate closely to the previous section's measures. The areas include water efficiency and conservation, energy efficiency and conservation, recycling and composting, sustainable food, recycled products, non-toxic paper, cleaning products, and employee education. Among the studies captured, this was perhaps the most extensive list of KPIs. However, the operation of such KPIs and how they should be tracked were not elaborated upon, thus revealing an opportunity for future research.

Other studies focused on KPIs as well. For instance, Hatjiathanassiadou et al. (2019) studied university restaurants and developed a water footprint score of menus to calculate the water used in making each item. Their analysis was particularly useful as they exhibited that vegetarian menus, on average, leave a lower water footprint than traditional menus. It was interesting to note that one more study using a water footprint

as a KPI was also conducted in Brazil's university setting who also advanced weight of food waste as a metric (Strasburg & Jahno, 2017). Considering the similar context of the two studies, more such studies may be needed to quantify menu item wastes in different contexts. Another KPI was advanced by Hwang et al. (2020), who studied waste in terms of the emissions they generate in their procurement and preparation. Wang et al. (2017) measured food waste as the weight of food wasted in the restaurant. These measures are all food-specific and allow for easy evaluation of food items on the menu. Another way is to conduct a life cycle assessment (LCA) to determine the long-term environmental impact of food in terms of energy and emissions. Similar such initiatives were observed in Spain by Batlle-Bayer et al. (2020). Pulkkinen et al. (2016) also presented a similar study where they used LCAs to identify unsustainable inputs to craft more environmentally friendly menus.

Coming to non-food-related wastes, the European Commission published a product environment footprint (PEF) pilot study in 2016 to understand the impact of manufacturing and the use of a particular product on the environment (European Commision, 2017). Fieschi and Pretato (2018) applied this metric to the cutlery used in Spain's restaurants to calculate their PEF. Their results showed that using compostable tableware with organic recycling is a greener alternative for restaurants. Razza et al. (2009) presented a similar study and used life cycle assessment (LCA) to assess the environmental impact of compostable cutlery in fast-food restaurants, finding that their use is better than the current single-use cutlery. This study opens up opportunities for future studies to evaluate other non-food wastes as well as alternative materials in restaurants for packaging or cutlery.

Other studies addressed the specific gap of the absence of exclusive scales to evaluate green restaurants. Cheng et al. (2019) developed a service quality scale (LORSERVE) for the case of LOHAS (Lifestyles of Health and Sustainability) restaurants. They identified seven key areas that determine service quality: the internal sense of happiness, transitiveness, environment, healthy catering, service commitment, green practicability, and thoughtfulness. However, a LOHAS restaurant is a hybrid of a green and healthy restaurant. Therefore, there is a need for scales that measures parameters like service quality, particularly for green restaurants.

Gaps and future research direction

The extant literature on the greening of restaurants has extensively studied the antecedents, processes, and outcomes of greening and the role that each stakeholder plays in the process. However, the growing interest in this area and the existing research base provide several interesting gaps in our understanding. Addressing each of these gaps may thus provide research questions to advance the green restaurant literature. An overview of these gaps and possible research questions arising from them are mentioned in Table 3 below.

Framework development

The research on green restaurants is growing exponentially. The year 2020 has been identified as the inflection point in the trend. The time is now right to understand

what the major components in restaurant greening are. Guided by our research questions, we developed five different themes and their interlinkages. We present our green restaurant research framework below, using an antecedent-process-outcome model to summarize our results (Kotlar et al., 2018).

We argue that the antecedents-process-outcome model is adequate for this purpose based on the following reasons. First, it is important to reiterate that the aim of the current review is to identify how and why restaurants should go green. It is thus important to understand the various antecedents that enable this process. Furthermore, it is important to track the outcomes of the process motivating managers by highlighting the positive side of going green. Second, although we have performed an extensive review to enumerate the components from the extant literature and its resultant gaps, it is likely that future studies will add several more subcomponents. Therefore, the proposed framework must be resilient to such future changes. The antecedent-process-outcome model by itself does not have any fixed components. This flexibility is, therefore, advantageous because it can be extended in the future with any number of antecedents, processes, outcomes, and contextual factors to make the model more robust. Third, the framework provides a bird's eye view of the entire green restaurant ecosystem and can act as a ready reference for academicians and practitioners.

The proposed framework consists of four primary components, (1) the antecedents of green restaurant issues, (2) the different green restaurant issues and processes to address them, (3) outcomes of green restaurant measure adoptions, and (4) contextual factors. The framework is presented in Figure 7.

The first component of the framework comprises the antecedents of different greening issues. As discussed in Theme 1, the greening of restaurants is influenced by the actions of the various stakeholders involved. We classified these actors into internal stakeholders and external stakeholders. Internal stakeholders constitute managers and employees, whereas external stakeholders constitute customers, policy, NGOs, researchers, and any other stakeholder that future research may uncover. Each stakeholder plays its own part in enabling or hindering green operations.

The second component of the framework is the different greening processes and how they address the different kinds of environmental unsustainability created in a restaurant. Each of the above stakeholders contributes to the generation of unsustainability. However, customers usually have to assume limited responsibility in ensuring greening. The top management is largely responsible for providing adequate restaurant greening direction (Choi & Parsa, 2006), and employees are either motivated or possess innate the awareness and values required to execute such initiatives (Y. F. Wang, 2016). This was discussed in detail in Themes 1, 2, and 3. Furthermore, various measures and scales addressed in Theme 5 may be utilized to design and execute green initiatives.

The third component of the framework is the outcomes of the greening process. Our review finds that restaurants gain several financial and non-financial outcomes from engaging in greening activities. These may manifest as greater competitiveness and performance (Cantele & Cassia, 2020; Iraldo et al., 2017; Perramon et al., 2014), enhanced employee satisfaction and retention (Y. J. Jang, 2020; Park et al., 2020), and customer adoption and satisfaction (Cantele & Cassia, 2020), as discussed in Theme 4. However, a possible negative outcome is window-dressing to generate a "green image" (Baloglu et al., 2022).

Table 3. Research Gaps and Research Questions for Each Theme.

Themes	Gaps	Possible Research Questions
Role of Stakeholders	The role of external facilitating stakeholders has not been addressed adequately (Apps, NGO) The role of policy and government in formulating green restaurant policy is lacking. The role of the demographic characteristics of the stakeholder. The role of social entrepreneurs requires more attention.	1. Who are the other external stakeholders in the greening of restaurants? 2. What is the role of NGOs in the food security space in green restaurant practices? 3. What is the role of restaurant aggregators and booking apps in the greening of restaurants? 4. What role do the demographic characteristics of the stakeholders play in their enabling or hindering green practices? 5. What is the role of the cultural environment in the relationship between demographic characteristics and greening behavior? 6. How can entrepreneurs help to reduce the problem of waste generation through creative business models?
Sources of waste	Role of culture in food waste generation Some countries generate less food waste than others. External generators like food delivery	1. Is the food waste generation mechanism dependent on country or regional culture? 2. How does the type of food various regions influence food waste generation? 3. What are the practices used in low food waste generation countries like India and Greece? 4. How to account for food and non-food waste generated by takeaway dining? 4. What is the role of food delivery and table pre-booking facilities on food waste generation?
Green measure	The role of consumer participation in the success of green measures has not been addressed. Only one study investigated the role of technology and the internet. It is not clear how pre-ordering impacts food wastage. Customers are sometimes unaware of financially taxing greening measures. The role of creative marketing initiatives like creative messaging has not been investigated. Lack of government support It is unclear what would be an ideal way to "nudge" customers to make green decisions through proper menu design.	1. What is the role of consumer participation in the success of greening measures? 2. What is the role of consumer demographic variables in participating in green measures? 3. What is the role of the type of restaurant? 5. How can we better communicate greening initiatives? 6. What is the role of green messaging on restaurant websites? 7. How can government policy support be designed for restaurant greening? 8. What is the best way to design a menu to "nudge" customers to make green dining decisions? 9. Is a visual form of nudging better than the text form? 10. Are the results different for different kinds of restaurants, like casual or upscale?
Outcomes	The role of most green measures on outcomes has not been investigated. Benefits at customer and restaurant levels have received all the attention. Positive outcomes drawn from green practices are dependent on restaurant type and environmental measures. Negative outcomes of greening have not received adequate attention.	1. What is the impact of green measures discussed on firms' outcomes? 2. What are the moderating and mediating variables in ensuring positive outcomes? 3. What are the negative consequences of greening? 4. How can it impact restaurant performance?
Measuring greening	Lack of particular scales and measures Studies not addressing how KPIs can impact policy formulation Several indicators of environmental impact assessment exist. Their application to the restaurant needs further attention.	1. What are the other key KPIs that need to be tracked in restaurant greening? 2. How can recycling and use of recycled material be measured? 3. How can electricity wastage be measured for various equipment and lighting in the restaurant? 4. Can the measure incorporate the proportion of renewable energy used? 5. What is an ideal value of KPIs to consider a restaurant "green"? 6. How can KPIs contribute to policy design?

The final component of the framework is the contextual setting. Our review finds that various contextual factors influence unsustainability and the adoption of green initiatives. We observed that the results portrayed by various studies were dependent on the context

of the study. Two levels of context variables were discussed throughout the review, (1) restaurant-level variables like restaurant size and type of restaurant and (2) country or regional-level differences like culture and institutions. Furthermore, restaurant-level characteristics like type of means are influenced heavily by the institutional and cultural factors of a region.

Study implications

Our review of the literature on green restaurants has presented the following academic implications. First, although there have been systematic reviews on greening in the hospitality sector in general (Higgins-Desbiolles et al., 2019; S. H. Kim et al., 2017), to the best of our knowledge, this is the first review to concentrate exclusively on greening in restaurants. We extend the discussion by Kim et al. (2017), who showed that green restaurant research was nascent in 2014. Through our research profile analysis, we demonstrate that the area is now beyond this stage and is currently in exponential growth, with 17 studies in 2020 alone. Thus, the current study is positioned to contribute to the ongoing consolidation of research addressing greening behavior in hospitality-related firms. Identifying the gaps and future research directions also addresses the call for more works to consolidate research and suggest future research avenues in the tourism and hospitality domain (Furunes, 2019).

Second, we present a thematic analysis of the literature and list 30 potential research questions from the gaps identified that future researchers might address to advance the literature on restaurant sustainability. Third, our presentation of the research profile may

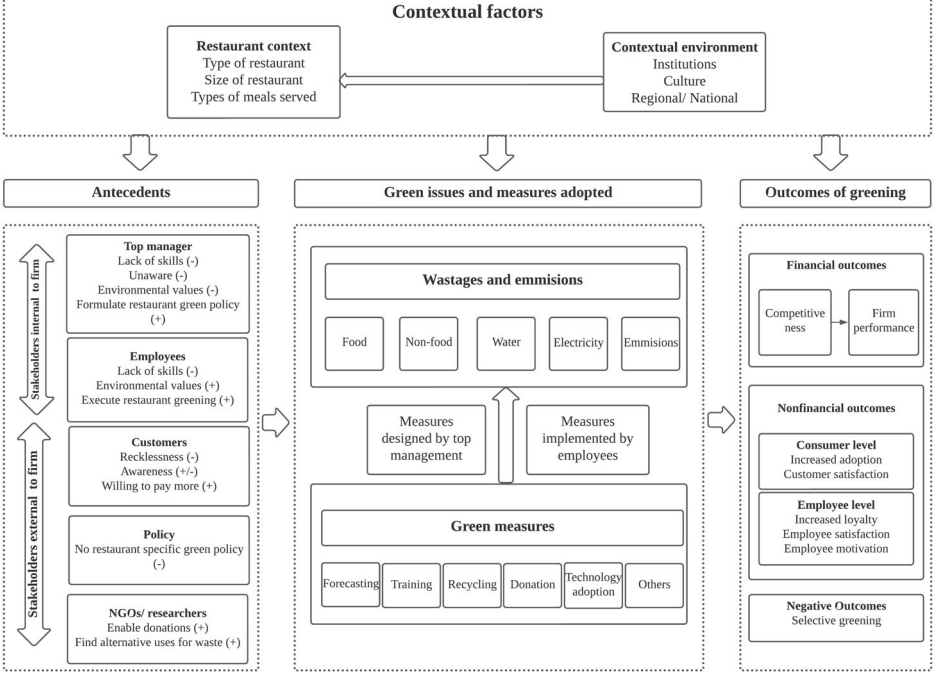

Figure 7. Green Restaurant Ecosystem Framework.

be used by researchers to decide the appropriate outlets, restaurant context, and methodologies for their research studies.

Finally, the green restaurant ecosystem framework developed by our study may be used by researchers as a consolidated reference to gain a bird's eye view of the various research interest in the area, particularly the stakeholders involved, their roles, unsustainability sources, initiatives to address said unsustainability, and various greening KPIs.

We present three key practical implications. First, we have explicated the role of various stakeholders, contextual factors that lead to wastages, and the implementation of green measures to tackle such wastages. The results presented may thus be used by the various stakeholders involved to better understand their role in the restaurants' greening process.

Second, we also touch upon the outcomes that a green restaurant can experience by engaging in greening behavior as well as the importance of top management buy-in to implement the same. Restaurant managers who are currently running restaurants without green initiatives may re-evaluate their position to implement greening initiatives. Furthermore, our analysis also reveals that some restaurant types are more susceptible to environmental unsustainability than others. For instance, we see that chain restaurants are generally more environmentally unsustainable due to their rigid policies and refusal to deviate from them at individual restaurant levels (Sakaguchi et al., 2018). Considering the positive outcomes of greening, chain restaurant owners may want to revise their policies to allow some leeway for individual restaurants in their care to pursue greening activities.

Third, we summarize our results in a green restaurant ecosystem framework. We believe this holds particular significance for policymakers and governments. Understanding the ecosystem is the first step to begin policy formulation. For instance, our review shows that greening requires significant investments. Government policy may implement financial assistance for restaurants that are willing to make the investments to procure the necessary assets to implement green initiatives effectively. Furthermore, governments may note a lack of comprehensive greening policy regarding restaurants and work toward creating one accordingly.

Limitations of the review and conclusion

Our review has four limitations. First, to ensure the review's high reliability and validity, we did not include non-peer-reviewed literature in our analysis. Furthermore, we did not include research works in languages other than English. Third, although adequate care was taken to minimize bias during the qualitative analyses and coding, it is possible that the personal biases of the researchers may have crept into the analysis inadvertently. Finally, as our intention was to track how restaurants can go green, our review was focused on understanding sources of environmental unsustainability, how to measure them, and how to deal with them going forward. Therefore, a detailed review of the theoretical perspectives adopted by the studies was beyond the scope of the review. However, these limitations present opportunities for future research.

As stated earlier, this is perhaps one of the first reviews on the restaurant's perspective of greening. Similar reviews are thus needed from the customers' perspective as well to understand why customers adopt green restaurant services. Such reviews are also possible for other kinds of hospitality firms like hotels and catering businesses.

This study further aimed to summarize and synthesize research questions from the extant literature on green restaurants to present one of the first systematic reviews in this area, particularly from the perspective of how restaurants can go green. To this end, we have rendered structure to the literature and systematically answered our research questions to explicate how and why restaurants should go green. Summarizing the existing literature, we note that restaurants have become more aware of their impact on the environment and are engaging in more green practices accordingly. However, their participation is enabled or hindered by the role of various internal and external stakeholders. Furthermore, various contextual factors like restaurant type and restaurant size impact the different greening measures employed by a restaurant. We also discussed the various KPIs, scales, and models available to measure the greening of restaurants. Our review also plays a role in opening the black-box of "green restaurants." Future studies may thus deconstruct green restaurants into their level of greenness by investigating which green measures have been implemented and which have not. Lastly, we highlighted the limitations of the existing research and proposed research questions to be addressed by future researchers. Through the green restaurant ecosystem framework, we thus call for more research to investigate the antecedents, processes, and outcomes of greening restaurants.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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