Restaurant Industry Sustainability:

Barriers and Solutions to Sustainable Practice Indicators

by

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ABSTRACT

Restaurants have a cumulative impact on the environment, economy, and society. The majority of restaurants are small-to-medium enterprises (SMEs). Review of sustainability and industry literature revealed that considering restaurants as businesses with sustainable development options is the most appropriate way to evaluate their sustainable practices or lack thereof. Sustainable development is the means by which a company progresses towards achieving an identified set of sustainability goals and harnesses competitive advantage. The purpose of this thesis is to identify barriers to implementing sustainable practices in restaurants, and explore ways that restaurateurs can incorporate sustainable business practices. Energy consumption, water use, waste production, and food throughput are the four sustainability indicators addressed in this thesis. Interviews were conducted with five Tempe, Arizona restaurants, two of which consider their operations to be sustainable, and three of which are traditional restaurants. Results show that for traditional restaurants, the primary barriers to implementing sustainable business practices are cost, lack of awareness, and space. For sustainability-marketed restaurants, the barriers included a lack of knowledge or legal concerns. The sustainability-marketed restaurants have energy-efficient equipment and locally source a majority of their food purchases. There is a marked difference between the two types of restaurants in perception of barriers to sustainable business practices. I created a matrix to identify whether each indicator metric was applicable and present at a particular restaurant, and the potential barriers to

implementing sustainable practices in each of the four indicator areas. Restaurants can use the assessment matrix to compare their current practices with sustainable practices and find ways to implement new or enhance existing sustainable practices. Identifying the barriers from within restaurants increases our understanding of the reasons why sustainable practices are not automatically adopted by SMEs. The assessment matrix can help restaurants overcome barriers to achieving sustainability by highlighting how to incorporate sustainable business practices.

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INTRODUCTION

This thesis examines sustainability indicators for the restaurant industry. Sustainability researchers typically focus on renewable energies, climate change, water resource management, and other environmental issues without examining the impacts of a specific industry. Because restaurants have significant economic, environmental, and social impacts, restaurants need to be studied from the perspective of sustainability. Addressing the inputs and outputs of the industry, its social influence, and its consumption and use practices will provide us a more comprehensive consideration of sustainability.

I have chosen to study the restaurant industry for three reasons: 1) increasingly more people are starting to demand local, healthy foods from restaurants, 2) restaurants are claiming to being either 'green' or 'sustainable' without certification or standards, and 3) academic literature is starting to define measurable sustainability indicators for the restaurant industry. The high number of restaurant locations, frequency of visits, impact on the US economy, and community-building capacity, coupled with the cumulative environmental impacts of energy, water and food consumption, and byproducts make a case for examining the impacts of restaurants.

Currently, no government regulated or mandated measures exist to monitor restaurants' sustainability claims. Without standards and regulations, business owners have been able to hide behind unsubstantiated claims, or plead ignorance of what constitutes sustainable practices. A few private companies,

such as the Green Restaurant Association (GRA) and the Green Seal for Businesses, offer sustainability consulting services for a fee; for small and medium-sized restaurants, the fee can be prohibitive. However, the general public is beginning to demand changes in restaurant practices and services.

My thesis aimed to understand and describe emerging sustainability practices in the restaurant industry, and to evaluate those practices according to sustainability principles and indicators. After analyzing data from the industry and conducting interviews with Phoenix-area restaurant owners and managers, I developed a flow matrix to help restaurateurs evaluate their sustainability efforts and identify barriers to achieving their sustainability goals. The matrix can also help restaurants identify new opportunities to achieve those goals. In the literature review for my study, I identified recurring themes in the different iterations of sustainability and sustainable development definitions. In this thesis, I identified and discussed key sustainability indicators for the restaurant industry, and examined how restaurant practices align with the sustainability indicators discussed in the literature.

My study examined the current practices of five Tempe, Arizona restaurants. The restaurant owners and managers informed me of the barriers they perceive when considering adopting different types of sustainable business practices. The primary research question was: What do restaurants identify as barriers to sustainable practices through the lens of restaurant sustainability indicators? Subsequent research questions included: Can the identified barriers

reveal opportunities for improving sustainability in the restaurant industry? What are the major environmental impacts of restaurants? And, what are the benefits to restaurants of incorporating sustainable business practices?

Two of the participating restaurants market themselves as sustainable (Restaurants A and B), while the other three are traditional restaurants (Restaurants C – E). Restaurant A is located on property owned by Arizona State University (ASU), has a capacity of 60 in the dining room, and is a bistro-style restaurant serving breakfast and lunch to young adults and professionals. Restaurant A opened in 2006, closed for a time because of the economic collapse, and reopened for business in September 2010. Restaurant B is located on ASU-owned property, has a capacity of 250, and serves local, organic, and sustainable food with a French influence, primarily to ASU students, faculty, and staff. Restaurant B opened in October 2008 and recently expanded its hours to include breakfast service. Restaurant C describes itself as a family-owned gastro-pub that has been in operation since October 2009. Restaurant C has a capacity of 179 and primarily serves ASU graduate students, faculty, City of Tempe staff, and ASU Foundation staff. The restaurateur believes that the relatively high price of drinks accounts for the lack of younger clientele. Restaurant D is located on ASU-owned property, has a capacity of 40, and describes itself as a coffee bar and café that serves breakfast, lunch, pastries, and other desserts to a blend of executives and ASU faculty and students. Restaurant D opened in 2006, and the flow of business is highly dependent on when ASU is in session. Restaurant E describes itself as a

full-service, fine-dining restaurant serving eclectic, contemporary-American food with a twist. Restaurant E opened in 1987 and serves mostly professionals, local business people, and ASU faculty and staff.

While the majority of restaurants are considered small businesses, the restaurant industry has a large impact on the U.S. economy. Overall, restaurants contribute to four percent of the U.S. gross domestic product, with the overall economic impact of the restaurant industry expected to exceed $1.5 trillion (National Restaurant Association, 2010). In 2010, the restaurant industry posted sales of $577 billion (NRA, 2010). The U.S.'s 945,000 restaurant and foodservice outlets employ approximately 13 million individuals, and are projected to create 1.8 million new employment opportunities in the next decade (NRA, 2010).

Restaurants have a major impact on the US economy; they also have an important social function. The high frequency with which people in America eat at restaurants is responsible for the industry's success. The average American eats a meal or snack at a restaurant 265 times per year: that equates to American adults buying a meal or a snack from a restaurant 5.8 times per week on average (NRA, 2010). The National Restaurant Association (2010) found that 78 percent of adults agree that going out to a restaurant allows them an opportunity to socialize, and 40 percent feel that visiting restaurants makes them more productive in their day-to-day lives. Neglecting such a major industry and its impact on community in the discussion of sustainability is detrimental to our future well-being.

REVIEW OF LITERATURE

Sustainability

The complexity created by a globalized economy is compounded by rapid population growth that propels energy, natural resource, and food consumption to unprecedented levels. Increasing consumption and population growth stress the environment, and consumers are becoming aware of their collective impacts. These conditions created the context from which sustainability emerged.

The definition of sustainability varies according to the arena in which it is applied. Academics define and redefine sustainability across varied temporal and spatial scales (Kates et al., 2005). Sustainability literature agrees on the presence and interconnectedness of environmental, social, and economic domains (Dasgupta, 2000; National Science Board, 1999; World Bank, 1992; Kaiser et al., 1995; Neuman, 1999). Sustainability developed as a response to quantitative environmental and economic data that indicated that current trends in economic growth were not viable in the long run (Gibson, 2006). Problems in any of the three domains would directly affect the other two domains for current and future generations (Sadalla et al., 2005). For example, a breakdown in the environment, on any scale, would directly impact social and economic realms of activity. Thus, authentically sustainable practices must involve all three domains of activity (Berke, 2002).

Definitions of sustainability focus on four areas: education, process (as opposed to product), community participation, and future conditions

(see Table 1). These four areas are common to different definitions of sustainability, and together suggest a direction for effective sustainability practice. The literature reviewed here reveals that while each author employs a unique definition of sustainability or sustainable development, there are crosscutting themes that suggest how sustainability can be put into practice. The four focal areas of sustainability can be applied to the restaurant industry. For example, owners must be *educated* on the collective impacts of their businesses and take responsibility to *educate* consumers. Owners must be aware that sustainability is not a product that can be achieved overnight, but a dynamic, long-term *process*. The industry stresses the environment and the food system; therefore, restaurateurs should be proactive to avoid creating negative *future conditions*.

Table 1
Four Common Sustainability Definition Themes

Themes	Definitions
Education	Constituting the capacity
	Becoming increasingly aware
	Lack of knowledge is a barrier
Process-based	Social practice
	Cumulatively producing
	Is a process
	Defined in practice and action
	Implies a process
Future Conditions	Long-term vitality of all generations
	Communities anticipate
	The needs of current & future generations
	Viable in the long run
	Sustained life over time
	Vision of the future
Community Participation	Share involvement & take collective responsibility
	Responsibility for their actions
	Active participation & participatory engagement
	Requires stakeholder participation
	Requires joint proactive effort
	Public involvement
	Guiding our actions

I propose that we need to distinguish between sustainability and sustainable development to create a framework for applying sustainability practices in the restaurant industry. Sustainability refers to an achieved desired *state* or set of conditions that persist over time (Maclaren, 1996). Sustainable development refers to the *process* by which an entity attains sustainability. In business, sustainable development is the means by which a company progresses to achieving the set of conditions that it has identified as sustainability goals. Sustainability goals adapt to changing physical, social, and economic conditions, and steps taken to reach goals must respond to the dynamic complexity of the systems within which the business exists. Increased efficiency in natural resource

use and decreased production of waste and pollution are measureable markers of progress towards sustainability. These markers can be used for large and small businesses alike, including restaurants.

Competitive Advantage

Small and medium enterprises (SME's) comprise the majority of businesses in the restaurant industry. Seventy percent of all restaurants are classified as small businesses; 91 percent of all restaurants have fewer than 50 employees (National Restaurant Association, 2010). SME's have not traditionally engaged in sustainable business practices because of owner and employee attitudes, varied opinions on environmental matters, cost barriers to implementing environmental management, and lack of financial incentives to purchase high-efficiency appliances (Bubna-Litic & de Leeuw, 1999). SMEs identify environmental management as important to their businesses, but struggle with implementation. Waste management, water efficiency, and energy efficiency are important environmental areas related to sustainability in the restaurant industry (Bubna-Litic & de Leeuw, 1999). Many SME owners state that financial incentives would motivate them to increase their environmental-management efforts. SME owners state that the major barriers to environmental management are time, cost, and government policies.

People affect business practices. Therefore, the social domain is as significant to businesses as the economic and environmental domains (Pfeffer, 1995). Effective management can promote similar environmental values among

employees. Clear communication of the company values and mission statement is essential to the success of the company. A clearly defined business model conveys the company's principles to employees and the public.

Competitive advantage is dynamic. To maintain an advantage, a business must continually evaluate, adapt, and respond to outside pressures while ensuring that any changes are explained to employees. Communicating the sustainability goals of the business to employees is key to unhindered application of sustainability practices.

Competitive advantage is tied to public perception of an industry's positive and negative impacts. Public awareness of environmental impacts has increased as the risks posed by industrial activities have been increasingly publicized. "NIMBY" (not in my backyard) entered the general public's vocabulary when the media began tapping into people's concerns about the environmental and health impacts of industrial activity. The public "no longer accepts major environmental damage as the price for economic opportunity" (Post & Altman, 1994, p. 66). Companies that do not implement environmental or 'green' initiatives may feel pressure from the public to make changes. Seventh Generation, Patagonia, and Smith and Hawkins are companies that have embraced environmental values and produced environmentally friendly goods, experiencing increased profits as a result (Post & Altman, 1994). The public's demand for environmentally friendly products is the main reason companies produce them. By meeting the demand, companies achieve higher profit margins.

‘Green’ companies have gained a competitive advantage. Competitive advantage is a business principle that allows companies to adapt to environmental issues confronting a business (Welford, 1998). The advantage depends on the internal culture of the company and the social influences that define the acceptability of the company’s economic and environmental behavior (Oliver, 1997). The choices made about materials efficiency, employee commitment, and the predictions made about future regulations all affect a company’s competitive advantage. Good choices and accurate predictions increase the efficiency and long-term sustainability of the business. A company can rise above others in the same industry by using strategies and structures (Oliver, 1997) that increase economic profitability and create a *sustainable* competitive advantage.

Competitive advantage also requires owners and upper management to allocate resources and distribute products more efficiently than their competitors (Reed & DeFillippi, 1990). Streamlining resources creates a closed-loop production process that produces an additional advantage. Being the first to provide a product gives a company a capital advantage. Staying ahead of technology regulations saves money in development, increases profit margins, and establishes the company as an original, trusted provider. Thus, the pursuit of competitive advantage can motivate sustainable development.

A business can increase its competitive advantage by engaging in education and community outreach. For example, research studies have shown that consumers prefer ‘green’ products to conventional ones (Laroche et al.,

2001). Therefore, companies that make consumers aware of the 'green' aspects of their products or production processes are likely to increase their competitive advantage. Restaurants can gain competitive advantage by requiring staff not only to prepare and serve food, but also engage patrons in the restaurant's environmental efforts. By responding to public demand for 'green' products and services, restaurants will not only enjoy a competitive advantage, but also contribute to sustainable development of the restaurant industry.

Progress Towards Business Sustainability

Simply changing a company's mission statement will not help the company become environmentally friendly (Frederick, 1992). Industrial and organizational barriers, as shown in Table 2, need to be addressed before progress towards sustainability is possible.

Table 2
Industrial and Organizational Barriers

Industrial Barriers	Organizational Barriers
Capital costs	Attitudes of personnel
Community concern	Upper management adaptability
Regulatory constraints	Quality of communication
Information and technical knowledge	

Source: Post & Altman, 1994

Each company has unique issues. Owners and upper-level managers must be flexible enough to try out different ways of doing things if barriers are to be overcome. But flexibility alone is not enough. A company must develop a coherent business plan to address the barriers. The plan should outline specific steps for surmounting barriers and include ways to measure progress towards

becoming a sustainable company. Macnaughten and Jacobs (1997) focus on public identification and cultural barriers to participation. Public identification emphasizes participation and relates to "whether the public [identifies] with the concept of sustainable development" (Macnaughten and Jacobs, 1997, 5). Involving ordinary citizens in the decision-making and implementation processes directly impacts social and economic drivers (Rio Earth Summit, 1992; Macnaughten and Jacobs, 1997). The influence of the group may determine one's own personal values. Minimizing industrial and organizational barriers (Table 2) gives a company the potential to be a sustainable business.

Creating a plan to address actual and perceived barriers to sustainable practices helps companies overcome the industrial and organizational barriers. The five steps in the Nidumolu el al. (2009) sustainable business development theory help create a business plan that measures a company's progress towards becoming sustainable. If no plan existed, leadership could be questioned and progress would be unclear. General Electric, Hewlett-Packard, and Wal-Mart have demonstrated how, by following the steps outlined below, companies can become environmentally friendly, while lowering costs and increasing revenues.

Step 1: View Compliance as Opportunity

Voluntary compliance provides opportunity because anticipating regulatory changes saves companies money and creates a competitive advantage. Companies should focus on meeting and exceeding current national regulation standards.

Step 2: Make Value Chains Sustainable

Businesses must reduce pre- and post-consumer waste by using eco-friendly materials, minimizing or eliminating packaging, and creating closed-loop systems with suppliers. To accomplish this step, businesses must analyze their supply chains and streamline product sources.

Step 3: Design Sustainable Products and Services

Designing a sustainable product line or service is one of many start-up expenses. Successful development depends on understanding the environmental concerns of consumers and examining the inputs and outputs of the product or service.

Step 4: Develop New Business Models

As progress towards becoming a sustainable business continues, a business must rethink and reinvent traditional business relationships. Streamlining traditional business practices by combining separate functions into a single process increases efficiency and decreases raw material consumption. It can also make access to the business's product or service more convenient for the consumer. Executives must question existing models and act entrepreneurially to develop a more successful business model.

Step 5: Create Next-Practice Platforms

By changing business and management paradigms, businesses influence profitability, the environment, and the values of the consumer.

By following these five steps, businesses put the philosophy of sustainability into practice. Each company adopts each step at its own pace. The steps incorporate the four areas of sustainability as a function of progress towards becoming a sustainable business.

Nidumolu et al. (2009) used the five-step sustainable business development theory to analyze the progress of large multi-national corporations toward sustainable practices. To apply the theory to SMEs (70 percent of restaurants are SMEs), it must be adapted. For SMEs, Step 1 may not include expanding to a larger market. The tenet of 'compliance as opportunity' refers to the adoption of environmentally efficient practices at all scales. SMEs should consider the regulations passed by larger industries and surrounding states as predictive of future regulations in their local area. Staying ahead of compliance regulations provides a competitive advantage over businesses not anticipating future trends, and a marketing advantage with consumers concerned with local environmental impacts. Gaining a loyal customer base before competitors arrive can lead to financial stability in the future. In the restaurant industry, Step 2 can be accomplished through increased communication with suppliers and local food providers. Step 3 is applicable to restaurants that develop seasonal menus to reflect local food availability. Eating locally increases food quality and consumer awareness of the connection between source and consumption. Step 4 suggests that restaurants should annually review their sustainability goals and measure progress within each of the restaurant sustainability indicators. The assessment

matrix developed as part of this study is a tool that can be applied in Step 4. Step 5 is a future-oriented step. Once a restaurant has met its initial goals for sustainability, it may add new indicators to the original set. To remain sustainable, restaurateurs will need to keep up with trends in sustainability and remain flexible to adapt to the changing environment.

Indicators

Indicators are characteristics that we can measure to assess progress towards a goal (Kates et al., 2005). Businesses need to develop standardized indicators to measure progress towards achieving sustainability goals (Maclaren, 1996). The progress towards these goals is what we call sustainable development. Restaurant industry literature describes indicator sets to measure the progress of individual restaurants (Legrand et al., 2010; JingJing, et al., 2008). Legrand et al. (2010) developed a set of restaurant indicators that includes all of the aspects of a single restaurant. A standardized indicator set would provide restaurants with the same way of measuring sustainable practices. The top four restaurant sustainability indicators, proposed by numerous authors (see Figure 1), are energy, water, waste, and food source. Focusing only on food source and building-design indicators, such as LEED, is insufficient because food storage and preparation, dining room components, and waste production have intensive environmental impacts. I propose that greater weight should be given to energy, water, waste, and food-source indicators because they have the most impact on the environment, and across the literature, a majority of authors agree that these

four indicators should be included. The other indicators mentioned in the literature, such as site choice, construction and design (C & D), furniture and fittings, and corporate social responsibility (CSR), all need to be analyzed as well. However, these indicators have not been universally recognized in the literature, and they do not have as great an environmental impact as the top four indicators do. Figure 1 shows the restaurant indicators mentioned in the restaurant sustainability literature; energy, water, waste, and food are the most prevalent. Therefore, the assessment matrix created for this study includes only these four indicators. These are the indicators restaurants should focus on first.

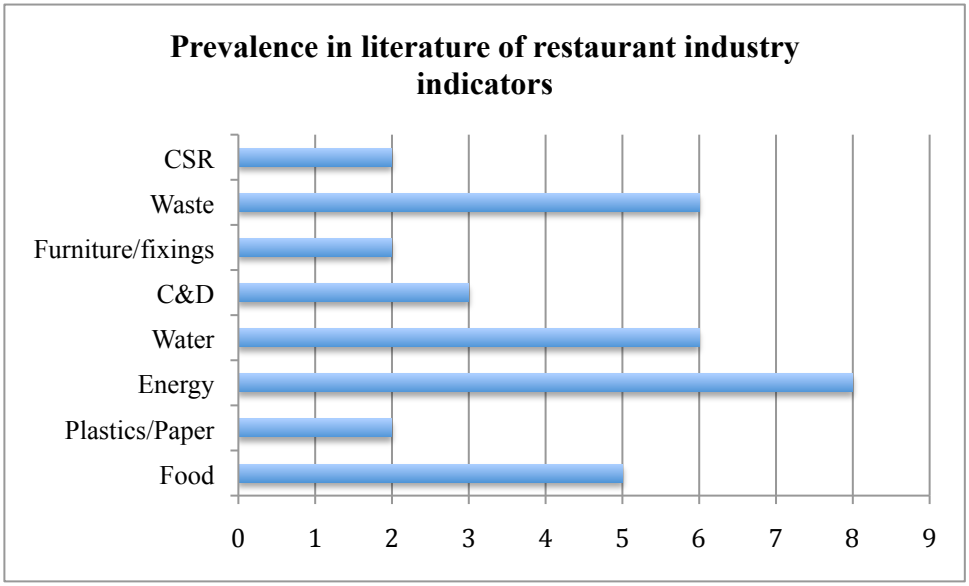


Figure 1. Restaurant Industry Indicator Prevalence.

Sustainable development is a *process* that focuses on providing for *future needs*. Therefore, indicators are necessary but not sufficient to assess a restaurant's progress in sustainable development because they can only measure current states. The assessment matrix created provides a framework for restaurants to assess current practices, identify gaps in these practices, and

anticipate what kinds of practices will be necessary to operate sustainably in the future.

The future-oriented nature of sustainable development involves *education*, and requires *community participation*. Restaurants are more than material inputs and outputs. Restaurants are a people-oriented industry. The restaurant sustainability indicators noted, in Figure 1, do not address the social impacts or the role of consumers because the metrics focus on practices and not on the sense of identification and importance restaurants play in culture and community building. The barriers to sustainable practices that have been identified by restaurateurs and are captured in the assessment matrix demonstrate the role restaurant patrons play in a restaurant's sustainability efforts. The public can identify the impacts of energy, water, waste, and food sources on the environment. Therefore, a restaurant should find ways to educate diners about its sustainability practices during the dining experience. This opportunity to shape future demands through *education* and thus provide for *future needs* has not yet been examined in the literature on restaurant sustainability. The current set of indicators does not capture the importance of education and community participation in sustainability assessment.

The restaurant industry is in the process of achieving sustainability. However, most restaurants, including those that are trying to reduce energy and water consumption, have not achieved full sustainability. Therefore, all restaurants are situated at some point on a continuum of sustainable development.

Energy

The restaurant industry is the number-one electricity consumer in the retail sector (Green Restaurant Association, 2005). Energy use in commercial and industrial buildings in the U.S. contributes 45 percent of national emissions of greenhouse gases (GHG) linked to global climate change. Electricity use is responsible for roughly three-quarters of the GHGs (Energy Star, 2010). In Florida, restaurants emit more than 30 billion pounds of CO_2 and 84 million pounds of SO_2 into the air (Hu, 2010). Increasing restaurants' energy and water efficiency can save restaurant owners an estimated 10 to 20 percent on utility bills and reduce GHG emissions (Energy Star, 2010).

Energy costs represent 30 percent of a typical commercial building's annual budget, and increase at an average rate of 6 - 8 percent per year. Restaurants use five times more energy per square foot than other commercial buildings and five times more energy in the kitchen than in the rest of the building (Johnson, 2010). These figures make the case for using energy-efficient equipment in the kitchen. Figure 2 represents the energy intensity of use in different areas of a restaurant. Increased efficiency in natural-resource use, and decreased production of waste and pollution are measureable markers of progress towards sustainability. These markers can be used be large and small businesses alike, including restaurants.

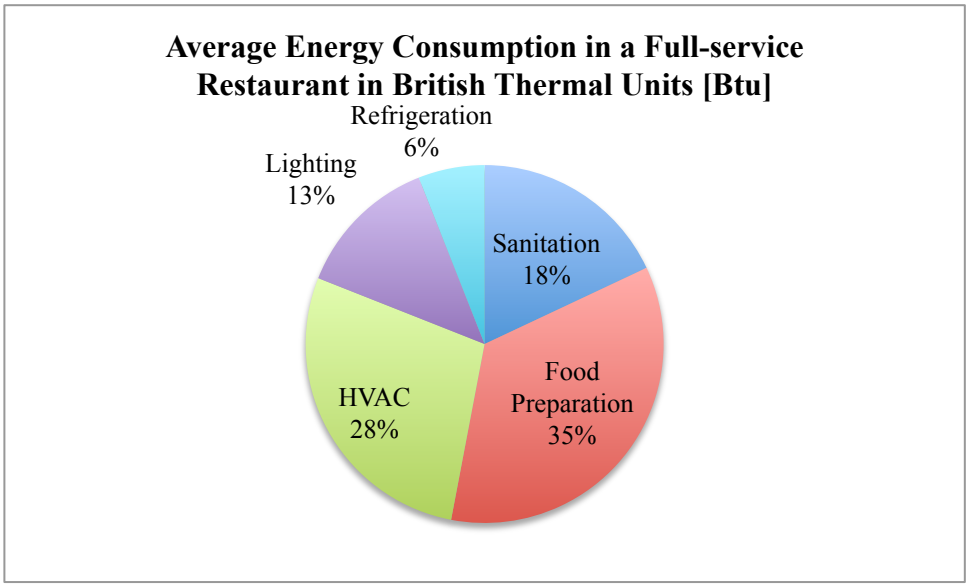


Figure 2. Energy use in a restaurant.

Source: (Energy Star, 2010)

This thesis focuses on Energy Star® appliances for the energy and water sectors of the sustainability assessment, because Energy Star® is the national standard for efficiency. Energy Star® is certified by the U.S. EPA to provide appliances that are energy and water efficient.

Restaurants that use appliances with the ENERGY STAR® label consume about 40 percent less energy than typical commercial buildings. A federal tax deduction of up to $1.80 per square foot is available to owners of new or existing commercial buildings that cut at least 50 percent of their energy costs, thus meeting ASHRAE Standard 90.1-2001. Partial federal tax deductions of up to $.60 per square foot are available for "green" measures affecting any one of three building systems: the building envelope, lighting, or heating and cooling systems.

Building construction and design (C & D) is not included in the selected

restaurant sustainability indicator areas. Heating ventilation and air conditioning (HVAC) is one component of C & D. HVAC consumption comprises 28 percent of the total energy use in restaurants (Energy Star, 2010); however, most restaurant owners do not have control over the C & D of the building that the restaurant is in. The restaurant owners and managers interviewed stated that they believe about 90-95 percent of all restaurants are leased or rented spaces. Three out of the five restaurants in this thesis rent or lease the restaurant space. The two restaurant owners included in this thesis, stated their situation was unique and that most restaurateurs lease. One of the owners started with a lease of the building and then bought the building and the adjoining property to expand. It is important to note that this owner started by leasing the location because like the three other restaurants, this owner did not have control of the building HVAC or C & D until he purchased the property. Therefore, restaurant owner who do not own their premises should not be held accountable for a lack of energy-efficient HVAC or building C & D. As noted by the CEE (2010) and Energy Star (2010), lighting and HVAC are typically the dominant energy consumers in commercial buildings. Restaurants are unique commercial buildings that allow innovative, energy-efficient technologies to address food preparation, sanitation, and refrigeration consumption. These areas comprise 59 percent of a full-service restaurant's energy consumption.

Energy indicators (Legrand et al., 2010; JingJing et al., 2008) in the assessment matrix are:

1. Electrical or gas equipment (refrigeration, boilers, fryers, etc.) are certified energy-efficient.

The current energy indicators focus on energy-efficient equipment. Energy Star® certified kitchen equipment include refrigerators, freezers, fryers, holding cabinets, pre-rinse spray valves, steamers, griddles, ice machines, and ovens. Electrical and natural gas versions of the equipment exist. I focus primarily on gas models because, in Arizona, the only rebates available for Energy Star® equipment are from Southwest Gas Corporation. Table 3 shows the annual energy savings potential for commercial restaurant equipment.

Table 3
Energy Savings Potential for Energy Star® Kitchen Equipment

Equipment Type	Actual Savings	Savings Potential (%)
Refrigerator (solid door)	55 – 554 (kwh/yr)	26 – 38%
Refrigerator (glass door)	326 – 608 (kwh/yr)	23 – 47%
Freezer (solid door)	458 – 3713 (kwh/yr)	29 – 39%
Freezer (glass door)	1562 – 7063 (kwh/yr)	38 – 44%
Fryer	360 (therms/yr)	25 – 35%

Source: CEE, 2010

For refrigerators and freezers, the solid door models use less total energy (kwh/yr) per unit than glass door models. The variation in actual savings and savings potential (%) relates to the range of different volumes depending on the model. The percentage of savings potential between standard and Energy Star equipment decreases for glass door refrigerators and freezers the larger volume the unit is.

Water

Installing low-flow fixtures in a restaurant's kitchen and restrooms reduces the monthly water bill (Johnson, 2010). Restaurants use an average of 5,800 gallons per day (gpd) of water (Tampa, 2010). Aerators are fixtures that reduce water consumption by introducing air into the water stream, thereby substantially reducing water flow and consumption. Pre-rinse spray valves help dishwashing staff rinse food particles off dirty dishes before placing the dishes in the dishwasher (Reed, 2005). Pre-rinse spray valves are water efficient if they use 1.6 gallons per minute (gpm) or less. Installing a water-efficient pre-rinse spray valve reduces a restaurant's daily water consumption from 470 gpd to 290 gpd; the equivalent of 66,000 gallons of water per year (Reed, 2005). Data regarding potential water waste is provided in Table 4.

Table 4
Wasted-Water Data

Kitchen Consumption	Restroom Consumption
Running faucet (5 minutes) equals energy to use one 60-watt light bulb for 14 hours	Standard toilet: 4.5 gallons/flush Low-flow toilet: 1.6 gallons/flush
Leaky faucet (1 drip per second) equals 3000 gallons/year	Leaky toilet wastes 200 gallons/day
Pre-rinse spray valve (1.6 gpm) saves 290 gallons/day (66,000 gallons/year)	

Nearly three in ten quick-service restaurant operators, and about four in ten full-service restaurant operators have installed water-saving washers and toilet fixtures. Tracking water data alongside energy data provides validation of their relationship, helps restaurant owners make more informed decisions, and verifies the savings from improvement projects in both streams (Energy Star, 2010).

Figure 3 represents the percentage of water consumption in different areas of a restaurant.

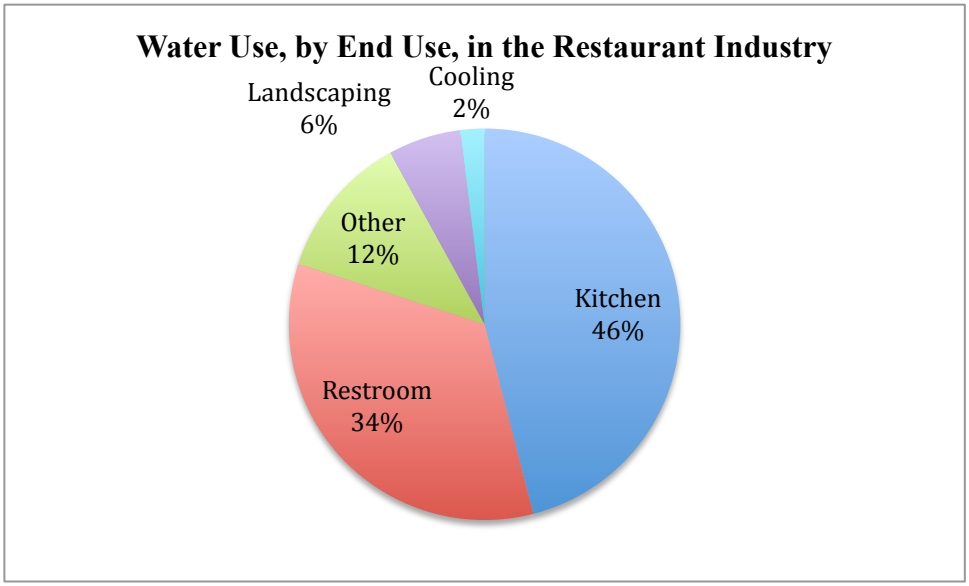


Figure 3. Water use in a restaurant.

Source: Calculated from MWD audit data of 89 restaurants (MWD, 2002) & (Pacific Institute, 2010)

Water indicators (Legrand et al., 2010; JingJing et al. 2008) in the assessment matrix are:

1. Equipment (pre-rinse spray valves, aerators, etc.) is certified water-efficient.
2. Low-flow toilets are installed in the restrooms.
3. Waterless urinals are installed in the men's restrooms.

Energy Star® certified equipment for kitchen appliances that use water, also consume energy. Table 5 reflects the equipment that use both water and energy, and the potential savings per unit if an Energy Star® appliance is used in place of a standard appliance.

Table 5

Water and Energy Savings Potential for Energy Star® Kitchen Equipment

	Annual Consumption			Savings Potential (%)		
Equipment type	Gas saved (therms)	H_2O saved (gal)	Electric saved (kwh)	Gas	Water	Electric
Dishwasher (low-temp)	55 – 554	6750 - 67,536	-	30 – 50	30 – 50	-
Dishwasher (high-temp)	326 – 608	26,460 - 49,392	-	30 – 50	30 – 50	-
Pre-rinse spray valve	432	51,840	-	30 – 60	30 – 60	-
Steamer	3112		-	30 – 40	90	-
Ice maker	-	150 - 200	4000 - 8000	-	20 – 40	15 – 30

Source: CEE, 2010

Table 5 assumes a natural gas cost of $1.00 per therm, water costs of $2.00 per ccf, and sewer costs of $3.00 per ccf (CEE, 2010).

Waste

Food waste is the third largest stream of waste in the U.S. According to a study by the University of Arizona Garbage Project, each American throws away, on average, 1.3 pounds of food a day, which amounts to 474.5 pounds per year per person (Rathje, 1992). The social, economic, and environmental impacts of food waste are enormous, and include increased generation of GHGs, negative impacts on sanitation and health, and the loss of potential improvements in soil health and food production (Oklahoma Composting Council, 2010). In 2005, 14.1 percent of total municipal solid waste came from food scraps (US EPA, 2009). Food-scrap waste in landfills produces methane gas, a GHG, and is the second largest source of human-related methane emissions in the U.S. (US EPA, 2009). Methane, carbon dioxide, nitrous oxide, and halocarbons are long-term

GHGs (IPCC, 2007). It takes 7 to 10 years for methane to break down in the biosphere, while carbon dioxide cycles through the system and turns over in the biosphere every three years. Methane accounts for 20 percent of total greenhouse effects. Methane has a 21 times greater impact per unit mass basis on climate than carbon dioxide (UNEP, 2001).

An average restaurant in the U.S. produces approximately 50,000 pounds of waste every year (Nielsen, 2004). At least 50 percent of the waste generated at a restaurant is food (Sonoma County WMA, n.d.). Food waste takes the form of pre- and post-consumer waste. Restaurants can reduce pre-consumer waste by tracking spoilage. Spoilage includes all the food in the kitchen that expires before it can be used. Tracking spoilage is useful in adjusting purchases, thereby cutting food costs.

Americans throw away more than 25 percent of all the food served to them in restaurants. Restaurants can reduce post-consumer waste by tracking the post-consumer waste. Food waste tracking is a source reduction technique. Automated scales and tracking programs such as the ValuWaste® Tracker (Lean Path, 2010) provide a simple and quick means of tracking the type of food not consumed by customers. Restaurants can use this information to make changes to their menu, adjust portion sizes, and inform food purchasing. These are all additional ways that restaurants can further reduce their direct food costs.

Besides source reduction through food waste tracking, composting is one of the end-of-the-pipe possibilities for managing food scrap waste. Depending on

logistics, opportunities exist for composting in restaurants (Minnesota Solid Waste Management Coordinating Board, 2000). Some states regulate food-scrap composting. Most successful food-scrap composting is done in the kitchen with pre-consumer food waste. Restaurateurs who compost their pre-consumer organics typically must seek out partnerships with local food composters. Organics primarily include animal and vegetative products, but also includes other manufactured compostable materials such as soiled paper products, or compostable utensils and cups. Some restaurants, like the Rockfish in Annapolis, MD and Elevation Burger in Falls Church, VA, have found contacts within their local community and are able to process food waste and recyclables at no cost. However, making these connections is a challenge as is hauling compost waste to the processer are prohibitive measures for restaurants. SMEs that implement a composting or recycling program may incur a higher disposal cost. Using recycling and composting bins, sustainable take-out containers, and "green" signage are all ways to minimize waste, highlight a restaurant's environmental practices, and educate consumers about their personal dining impacts (US EPA, 2009). Benefits from composting include an end-product that can be used to help improve soils, grow the next generation of crops, and improve water quality.

Restaurants must consider not only food waste, but also other products that can be recycled. Glass, clean paper, cardboard, plastic wastes are usually able to recycle through municipal recycling programs. Comingled recycling programs allow commercial businesses to divert more products from the landfill and

harness downstream reuse values.

Waste indicators (Legrand et al., 2010) in the assessment matrix are:

1. The approach "reduce, reuse, and recycle" is followed; staff as well as suppliers are trained and encouraged accordingly.
2. Sorting and collecting systems for waste with separate bins exist.
3. Paper products contain recycled content.
4. The use of plastic, aluminum, and polystyrene foam is discouraged.
5. Organic waste is reused or composted.
6. Grease and oil waste is collected and properly disposed or reused.

Food

Restaurateurs view food as something they prepare, serve and throw out. They do not necessarily consider how the food they serve affects the food system as a whole. Restaurants can affect what food is produced, farming profitability, food waste, and the environmental intensity of food production. Indirect effects impacts include resource origin, agricultural and harvesting practices, and the packaging and distribution of goods (Heller & Keoleian, 2003). Offering a seasonal menu is one way restaurants communicate high quality of food and decreased Enforcing seasonality in the menu is restaurants communicate the value they place on high-quality of food and environmental stewardship (Sundkvist et al., 2005). Restaurants need a reliable supply of high quality foods to provide consistent service to consumers. The chef and those involved in the restaurant's food procurement can influence and communicate with local farmers

about quality, taste, and demand for local and/or organic foods in the restaurant.

Food costs are one of the most important line items for a restaurateur. Food and beverage costs represent about 33 cents of every dollar in restaurant sales (NRA, 2009). Food is the most integral part of the restaurant experience. The National Restaurant Association (NRA) found that the following trends are popular in today's restaurants: locally grown, sustainable and organic food and beverage items; nutritionally balanced children's dishes and healthy children's side items; half portions or smaller portion for a smaller price; and gluten-free and food-allergy conscious menu items (NRA, 2010).

Local food is defined as food that is grown within 50 to 250 miles of where it is consumed (Johnson, 2010). Restaurant B's produce is 90 percent locally sourced according to the restaurant's executive chef. That means that the produce comes from within 100 miles of Restaurant B. Restaurant B partners with twelve farms in and around the Phoenix area to meet its produce needs. Labeling and promoting local foods in the restaurant raise public awareness of the environmental and quality that accrue from local food. This awareness by can subsequently stimulate the local economy by creating a higher demand for local food (Kirby, 2006). Integrating local foods into the menu helps restaurants increases return visits from customers and appeals to new customers. It also helps local farmers. The cost of food typically represents 33 percent of the budget for a full-service restaurant. Produce purchases likely represent 9 percent of food costs to restaurants (NRA, 2010).

When a restaurant uses food from national providers, it looses its connection with growers and the seasons while grossly inflating food miles traveled (Sundkvist et al., 2005). Restaurant B's chef noted that it is the chef's responsibility to understand and be able to explain to the staff and consumers why a piece of produce grown in a particular manner, from a particular type of farming practice, tastes better than the same produce that has travelled over a thousand of miles from where it has grow. Most food items travel an average of 1500 miles on the journey from the farm to the distributor to the consumer (American Dietetic Association, 2004). This distance is on average 50 percent further than the food miles traveled in 1979 (Sudkvist et al., 2005). Conventional food travels 27 times further than locally sourced food. Food miles are important to consider in environmental impact because the transportation, including from producer to retail, accounts for 15 percent of the GHG emissions from the food system (Weber and Matthews, 2008). It is the chef, who verbally, and through the composition of dishes can tell a story about the food. Sundkvist et al. (2005) support the strengthening of communication links along the food chain as a means to promote sustainable development in food systems. Restaurant B's chef recommends taking responsibility to communicate with farmers and educate consumers, which aligns with the education and community participation themes I present in this thesis.

The frequency with which a restaurant provides food highlights the major role restaurants play in the economic makeup of the U.S. The average American

spends $910 per person per year on food consumed outside the home (NRA, 2009). Consumers spend an average 4.2 percent of their income on restaurant food. Restaurants comprise 10 percent of the U.S. economy (GRA, 2009) making restaurants as an important player in society.

Food indicators (Legrand et al., 2010) in the assessment matrix are:

1. Purchase a percentage of organically certified food products used for food preparation.
2. Purchase a percentage of locally sourced food products used for food preparation.
3. Adjust menu to use seasonal food products.
4. Purchase a percentage of sustainably source seafood.
5. Options of vegetarian, meat, and fish dishes offered on the menu.
6. Presence of organic wines offered on the wine list.
7. Use “Fairtrade” certified products.
8. Purchase a percentage of food products purchased directly at the local farm with attention being paid to pay fair prices.
9. Options of meals that cater to specific dietary needs and food-allergies (gluten-free/lactose-free choices are available).
10. Kitchen staff is trained on methods that enhance the dietary goals and guidelines of the country (low fat, reduced salt, etc.).
11. The menu is labeled in regards to menu choices such “low fat,” “vegetarian,” “gluten-free,” “vegan,” etc.

12. The menu communicates sustainable practices and initiatives of the restaurant.

Education & Access to Knowledge

Customer awareness of sustainability practices may prompt them to look for such practices in the restaurants they patronize, which in turn may prompt restaurants to adopt such practices. In 2010, 56 percent of adults are more likely to frequent a restaurant that offers organically grown or raised, or environmentally friendly food (NRA, 2010). To understand patron motivations it is important to understand patron demographics. Some patrons are willing to pay more to purchase products with a lower environmental impact; others are not (Laroche, Bergeron & Barbaro-Forteo, 2001; Hu et al., 2010). Both willing and unwilling groups would choose to patronize an environmentally conscious restaurant over a traditional restaurant (Hu et al., 2010).

Information cards, menu notes, and window displays help inform patrons about a restaurant's environmental efforts (Hu, 2010). Greater market opportunities encourage business owners to participate in more environmentally friendly activities. Hu (2010) notes the growing prevalence of certifications, such as that provided by the Green Restaurant Association, as a means to tie sustainability to business practices. Certifications are emerging as a response to growing public concern about environmental and social impacts of the restaurant industry. However, the lack of government standards and enforcement in the certification process leads to confusion and decreased credibility when a

restaurant lays claim to being a sustainable business. Indicators fill the gap in standards by providing a valid basis for certification.

METHODS

There are many definitions of sustainability and sustainable development. I reviewed the definitions and identified four common themes of sustainability: education, process (as opposed to product), community participation, and future conditions. I identified energy, water, waste, and food as the most commonly discussed areas in restaurant sustainability literature that had the greatest environmental impact. I applied the indicator metrics developed by Legrand et al. (2010) to each of the four selected indicator areas. Then I interviewed five Tempe, Arizona restaurateurs to discover their current practices. Using the information from these interviews, I identified common barrier to the four indicator areas. I used statistics from the National Restaurant Association, Energy Star® for Restaurants and Small Businesses, the Green Restaurant Association, and Green Seal for Businesses confirmed the environmental and economic impacts of restaurants.

I developed a set of semi-structured interview questions. The questions were intended to get at the culture of the restaurant, its perceived impacts on environment, economic feasibility, costs, and business strategy, and social impacts of restaurants. The complete survey is in Appendix A. The answers to the questions sometimes determined the follow-up question. The flow of the interview allowed restaurateurs to attend to business matters, ask questions of

their own, and allowed the interviewer to modify and ask additional questions as needed. In the semi-structured interviews, the SME restaurateurs identified barriers to different sustainable business practices in the areas of energy, water, waste, and food. Additionally, the interviews helped identify a restaurant's current stage in the business development theory proposed by Nidumolu et al. (2009).

I developed the assessment matrix to help restaurants identify whether the standards set by the metrics were attained, not attained or not applicable. If the standard is not applicable, it does not detract from the overall performance target. If a restaurant does not meet the standard, the matrix leads the restaurant to a list of different possible barriers. The barriers are based on information the Tempe restaurateurs provided during the interviews. The final step is to consult with the restaurants to overcome the barriers and find potential solutions. The assessment matrix is a vision of sustainable development for the restaurant industry and can be used to help restaurants identify areas of sustainable business practice. See Appendix B for the full assessment matrix that was created for this thesis.

RESULTS

Five Tempe restaurant owners and mangers participated in the interviews. I divided their responses by restaurant type: restaurants that market themselves as sustainable, and restaurants that do not. I refer to the former as sustainability-marketed restaurants and to the latter as traditional restaurants. All of the restaurants are primarily concerned with staying in business and connecting more with the local community, including ASU. All have interacted with the Tempe

community through different events. The restaurants have their waste-hauling fees incorporated into their Common Area Maintenance (CAM) fees for commercial properties as part of their monthly lease or site contract, and all stated they do not have a way of tracking their waste. All of the restaurants except for one recycled. The types of materials that were recycled depended on what the waste contractor accepts. The two waste companies that serviced the participating restaurants are Waste Management, Inc. and the City of Tempe. All of the restaurants emphasized that it was important for the restaurant to create an inviting, welcoming, and comfortable place for people to gather with friends. In regards to sustainable practices, none of the restaurants track their costs and or results of sustainable practices. Restaurant managers sometimes implement sustainable business practices because they believe it is the right thing to do, not because it is a stated goal or trying to meet a regulation.

To determine if efficiency rated appliances could save restaurants money, I used data from the U.S. Department of Energy (2011), Energy Star (2010), and the Consortium for Energy Efficiency (2011) to calculate the payback period for using an Energy Star® appliance versus a standard appliance. The data is presented in Table 6. The prices in Table 6 are at 50% off the list price. This price is the cost to a restaurant at wholesale. The incremental cost difference between a standard and Energy Star® appliance was calculated. Using data from the Department of Energy (2011), I found the savings per year on a utility bill for using an Energy Star® appliance. The simple payback period was calculated by

determining the number of years it would take for the savings per year to exceed the incremental cost difference. The discounted payback period was calculated because the value of the dollar tomorrow is less than the value of today's dollar. The discounted payback period reflects the real time it would take for a restaurant to earn back the incremental cost difference using the annual utility bill savings gained by using an Energy Star® appliance. The discount rate used was 5 percent.

Table 6
Energy Star® Price Savings and Discounted Payback

Appliance	Est. Standard price	Est. Energy Star® price	Incremental cost difference	Utility bill savings (yr)	Simple pay-back (yr)	Discounted pay-back (yr)
Refrigerator	$4300	$5000	$700	$60	11.3	17.9
Freezer	$6200	$7800	$1600	$40	40	Never
Fryer	$1000	$4100	$3400	$360	9.4	13.1
Holding cabinet	$2900	$6900	$4000	$430	9.3	12.8
Pre-rinse spray valve	$2600*	$1300**	(-$1300)	$1300	Instant	Instant
Steamer	$5500	$5100	(-$400)	$2700	Instant	Instant
Griddle	$1900	$5600	$3700	$70	52.8	Never
Ice machine	$2000	$2700	$700	$320	2.1	2.4
Oven	$6100	$6800	$700	$290	2.4	2.6

* Estimated price for 2.6 gpm pre-rinse spray valve

** Estimated price for 1.6 gmp pre-rinse spray valve

Source A: CEE, 2011

Source B: U.S. Department of Energy, 2011

Source C: www.centralrestaruant.com, 2011

The typical lifespan of a commercial kitchen appliance is ten years (CEE, 2011). Using the discounted payback period, only Energy Star® ice machines and ovens earn back the incremental cost difference during the typical lifespan of an

appliance. Both the Energy Star® steamer and the Energy Star® pre-rinse spray valve cost less than the standard appliances and result in immediate savings. Additionally, the Energy Star® steamer has the potential to save a restaurant $2700 annually in combined electric and water utility bills. The Energy Star® pre-rinse spray valve has the potential to save a restaurant $1300 annually. Economic motivation is one way to open conversations about sustainable practices, but alone does not fully address sustainability. Calculating the carbon emissions for each appliance could further expand a discussion about the cumulative influence of restaurants on the environment.

Traditional Restaurants

The long-term goals for traditional restaurants were focused on gaining and retaining customers while providing a quality product. When questioned about their sustainable practices, these restaurants did not claim they are taking environmentally conscious actions. Only one mentioned without prompting that it recycled and encouraged their customers to reuse their products. A second recycles but did not initially volunteer this information and did not mention it as being a sustainable business practice. The restaurants agreed that it is difficult to set environmental goals that are financially feasible in this industry. Financial stability is the primary concern; sustainable practices are secondary.

The traditional restaurants saw their biggest environmental impacts as being food and glass waste. Other impacts included linens laundering and electricity consumption for air conditioning and heating. Other than waste

production, the restaurants did not believe they had a large impact on the environment because each is an SME. None of the restaurants mentioned the electricity used for food storage and preparation as having an environmental impact. Each restaurant only mentioned having one Energy Star® appliance, and each restaurant had a different energy-efficient device. The three appliances are a refrigerator (Beverage Air), a dishwasher (EcoLab), and a tankless water heater. Cost is the primary reason all three restaurants gave for not having more energy- or water-efficient equipment. Restaurant C stated, "We would not buy energy-efficient equipment unless [it was] less expensive" (2011). None of the restaurants were aware of any financial incentives available for businesses to purchase energy-efficient equipment. Two of the restaurants believe there is a real financial advantage to having energy-efficient appliances, but initial cost remains a barrier. An additional barrier was the lack of direct need. All three restaurants noted that they have not had to purchase any new appliances; therefore they continue to use what they have and have not gone out of their way to purchase new energy-efficient appliances.

Two of the traditional restaurants had low-flow water toilets in the restrooms. Universally, there was concern that "low flow [i.e. aerated faucets and pre-rinse spray valves] doesn't always do what it needs to do" in terms of sanitation in the kitchen (Restaurant E, 2011). However, Energy Star (2010) requires all new pre-rinse spray valves in commercial kitchens to be water-efficient, using 1.6 gpm. Restaurant C is aware of the regulation change and is in

the process of changing its spray valves to low gpm devices.

Restaurant waste disposal can include compost and recycling. None of the restaurants compost its food scraps. Restaurant D allows a customer to collect its used coffee grounds, and the customer takes the coffee grounds home for use in the garden. This restaurant also allowed an employee to collect the food scraps and donate them to the Tempe City Garden. This action ended when the employee left the restaurant. The primary barriers to composting are space, volume, and nuisance. Other barriers mentioned by restaurants include logistics and no direct benefit to the restaurant. Logistics refers to having no commercial collection available for compost. Possible stated benefits of composting include creating a competitive advantage, strengthening ties to the community, and providing a reason for a restaurant to have their own garden. Restaurant E (2011) thought their customers "would think it was pretty cool" to compost and stated that their customers "think about things like that." Restaurant D (2011) thought that composting would be helpful only "if [its] customers cared about it." Customer support and buy-in appears to be a concern for these restaurants in the practices they considering implementing.

Two of the traditional restaurants recycle, but only recycle cardboard. They have different collection providers: the City of Tempe and Waste Management, Inc. The restaurant that is serviced by Waste Management is located on ASU property. Originally the restaurant did not have recycling, but the owner talked to a person in ASU's Facilities Department and it was agreed that

the restaurant could recycle its cardboard[1]. None of the other restaurants in the strip located on ASU property participate in recycling. The other restaurant is serviced by the City of Tempe and they only recycle cardboard. The restaurant owner stated that "the City of Tempe doesn't communicate their services" and that "no good system for collecting glass exists" for restaurants, so they do not recycle glass (Restaurant E, 2011)[2]. This restaurant is very interested in recycling glass and said it would be easy to recycle glass uncontaminated if the City of Tempe would collect it. The two restaurants that currently recycle cardboard stated the barriers to recycling more materials include: lack of collection, extra time for separation, space for extra storage bins, training of employees (high employee turnover), lack of communication with the waste company, and lack of transparency relating to accepted items. Both of these restaurants purchase products that have recycled content. The Restaurant E purchases only recyclable and compostable to-go containers. Restaurant D offers free drink refills during the same visit, discounts for reusing cups during the day, and discounts for bringing your own cup. It also collects the coffee sleeves next to the trash bin for reuse.

The third traditional restaurant does not recycle. The manager stated that the "City of Tempe doesn't provide and will not provide recycling bins for businesses" (Restaurant C, 2011). This restaurant noted that financial costs and

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[1] In fact, the property manager's records reflect that the tenants on this property can recycle more than just cardboard (see Appendix C)

[2] The City of Tempe does offer commingled recycling to commercial businesses, including restaurants.

responsibility were barriers to recycling. The restaurant manager stated there is no financial benefit to recycling and you are doing the city's job for it; it is not the responsibility of the restaurant to recycle. The manager also stated the restaurant does not have a way to track what percentage of its purchases contains recycled content.

The restaurants estimate that they use between 15 and 30 percent local and/or organic food. The primary barrier to using local or organic food is cost. None of these restaurants have seasonal menus. Only Restaurant E communicates with a local farmer. Its chef communicates with the local farmer about products, such as tomatoes, whose flavor varies according to growing conditions. Restaurant D stays local by only serving pastries and gelato that are sourced from local vendors. Its owner confused 'local vendor' with local food product, stating that a local company provided all of their produce. I contacted the company and was informed that it is a "full-scale produce company, so to meet the needs of the restaurants, we source [our produce] from around the world" (personal communication, 2011). This company does not source its produce from local providers.

The traditional restaurants identified their biggest social impacts as giving back to the community and creating a comfortable atmosphere. They said their customers wanted to receive good service, quality food, and be served in a nice atmosphere. Their economic impacts focused on costs; food and energy costs, and investment in employees.

Each of the three traditional restaurants had a different view of how sustainability applies to restaurants. Each of the restaurants also defined sustainability differently. Restaurant C's manager was unable to define sustainability and stated, "I have no idea what the hell it means" (2011). The manager subsequently stated that sustainability does not apply to restaurants because she does not understand what it means. A lack of understanding and how to translate the concept to practice appears to be a barrier in this restaurant's practices. The Restaurant E defined sustainability as "doing and practicing systems that will not harm the environment or have the least impact on the environment" (2011). The owner of this restaurant said, "sustainability *should* apply to restaurants." The word choice indicates that this owner believes sustainability has a role in restaurants but that it is not yet practiced. This aligns with statements alluding to the fact that the owners feel they are taking some steps towards sustainability in recycling and locally sourced foods, but do not believe they are doing enough to be considered sustainable at this time. Restaurant D defined sustainability as being, "If I care enough or am able to recycle everything possible and waste as little as possible. You have to care to do it and be able to do it" (2011). This definition focuses on the personal level and does not touch on the influence restaurants have on the greater community.

These restaurants noted difficulties with implementing sustainable practices. Restaurant A's manager, one of the sustainability-marketed restaurants, said sustainability "takes extra steps and extra costs" which "in today's economy

a lot of people skip and some just don't care." This holds true to the traditional restaurant listing cost and convenience as their primary barriers.

Sustainability-Marketed Restaurants

The long-term goals of the sustainability-marketed restaurants want to improve environmental initiatives and host more community events. Both of these restaurants market themselves as sustainable and highlight different ways they implement sustainable practices. Initial responses to questions about how they are implementing sustainable practices include using low-impact products, local/organic food sources, recycling, and environmental goals matching the philosophy of the owner and mission statement. These restaurants' environmental goals were closely linked to community participation and educating tenants and customers about environmental stewardship. Both restaurants mentioned the company's desire to implement environmental goals.

Neither of the two restaurants compost their food scraps; each gave a different reason why not. Restaurant B participated in a few pilot compost projects that have not continued. It identified the following barriers to continuum composting, logistics, space, volume, and legal issues. Restaurant A's barrier was a lack of awareness. The manager at this restaurant stated, "we are not aware of barriers" and "I don't know why we don't compost" (Restaurant A, 2011). This statement was based on the ease with which the restaurant donates and recycles food. Restaurant A's manager believes it would be easy to track food wastes, although the restaurant does not have a system in place to do so. While this

restaurant has never considered composting as an option for its food waste, it does donate to the neighboring church and shelter.

Both of the sustainability-marketed restaurants have comingled recycling provided by Waste Management. Neither has encountered barriers to recycling. The managers' stated that time might be a barrier because restaurants can be chaotic environments, but they have already overcome the barrier. These restaurants do not have a problem with limited space for recycling bins. Both agreed that education, convenience, promotion, and good training are key to the success of a restaurants recycling program.

Both of these restaurants focus on local and organic foods. Both stated that 80 to 90 percent or more of their food comes from local and/or organic sources. The owners encourage their chefs and managers to stay in communication with, and even visit, local farms to understand the food product, gather information for the restaurant, and to be able to answer customer questions. The Monterey Bay Aquarium's Seafood Watch program and Clean Fish are programs the chefs use to choose sustainable seafood. The connection to local food and farmers also is the biggest economic impact of these restaurants.

The sustainability-marketed restaurants stated their biggest social impacts as getting their name out and educating the public about the restaurants' sustainable practices, and to increase public awareness of sustainability issues. They said their customers want to receive good service, quality food, and to know their food source and the environmental practices of the restaurant.

Both restaurants agree that sustainability applies to restaurants because of the impact on everyone and the high consumption of energy, water, and output of waste. The sustainability-marketed restaurants did not believe they had any difficulty implementing sustainable practices. The Restaurant A defined sustainability as "just being able to keep the earth and the human species going; everything is just working together" (2011). Restaurant B's manager felt that sustainability is easy to implement because it is at the core of the restaurant's mission and the restaurant is already practicing sustainability. Restaurant B defined sustainability as "looking at the social, environmental, and economic impacts of our business and understanding how we can use resources responsibly to have an impact on future generations" (2011). Restaurant B educates diners and the public about its sustainability practices. It aims to reduce its environmental footprint by educating and supporting patrons to make sustainability a part of their daily lives. Both managers thought that recycling and energy and water conservation practices are easy to implement. They noted that each restaurant will encounter different barriers and their different customers influence how easy it is to implement sustainable practices. The barriers I extracted from the interviews varied by location. Restaurant A lacked knowledge on water-efficient equipment an additional food waste reduction techniques. Restaurant B stated they faced concerns about legal barriers to low-flow appliances for kitchen sanitation and food donation. Despite the current barriers, both sustainability-marketed restaurants are open to suggestions and making changes to their practices.

DISCUSSION

Traditional and sustainably marketed restaurants have different barriers to sustainable practices. The sustainability-marketed restaurants interviewed have a mission statement and management supporting their sustainable business practices, but have more institutional barriers. The traditional restaurants interviewed lacked stated sustainability goals, had varied support from management, and lacked clarity on the benefits of sustainable practices and how to access these practices. Traditional restaurants' most common barriers are cost, lack of awareness, and space. Sustainability-marketed restaurants barriers varied by location. Restaurant A struggled with lack of knowledge relating to water-efficiency and alternative food waste reduction techniques. Restaurant B has legal barriers barring further water efficiency and food scrap diversion efforts.

Energy and Water Savings Potential

State-level incentives can help decrease the payback period for purchasing efficiency-rated equipment. They also create differing contexts for appliance purchasing decisions. The payback period for restaurants purchasing energy- and water-efficient equipment is based on the direct purchasing cost and utility savings per year. Depending on varying market conditions and incentive programs, not all of the Energy Star® rated appliances have a payback period that is equivalent to the operative life of the equipment. In this case, it may be necessary to purchase a new piece of that same equipment before the savings from purchasing the Energy Star® appliance were realized by the restaurant.

Thus, analysis is required to understand when "incentives" actually create purchasing incentive.

This study looked at restaurants in Tempe, Arizona; Arizona incentives are used. The Energy Star® website has a list of the incentives, by state, that are available for commercial restaurants, by searching for the Commercial Food Service Equipment Incentive Finder. In Arizona, Southwest Gas provides three incentives that restaurants can use in purchasing energy-efficient, natural gas equipment. Table 7 lists the eligible equipment, requirements and rebate levels for the restaurant equipment.

Table 7
Eligible Equipment, Requirements, and Rebate Levels

Natural Gas Equipment	Equipment Requirements	Available Rebate
Storage water heater	Thermal efficiency 90% and greater; 125,000 btu / hr input and greater	50% of purchase price up to $1,200
Tankless water heater	Thermal efficiency 80% and greater; 200,000 btu / hr input and greater	50% of purchase price up to $300
Griddle	Energy Star® qualified	50% of purchase price up to $1,500
Steamer	Energy Star® qualified	50% of purchase price up to $1,100
Fryer	Energy Star® qualified	50% of purchase price up to $1,800
Oven	Combustion efficiency 40% and greater	50% of purchase price up to $3,000

Source: Southwest Gas Corporation, 2011

Only Energy Star® rated equipment is used for comparison in this thesis. Using the available rebates from Southwest Gas Corporation, I recalculated the incremental cost difference between the estimated standard equipment price and the estimated Energy Star® equipment price, for equipment using natural gas.

Table 8 shows the changes in price differential and payback period for the Energy Star® appliances that qualify for the Southwest Gas rebates in Arizona.

Table 8
Energy Star® Price Savings with Southwest Gas Corp. Rebate and Payback

Appliance	Est. Standard price	Energy Star® price with rebate	Incremental cost difference	Simple payback (yr)	Discounted payback (yr)
Griddle	$1,900	$4,100	$2,200	31.4	Never
Steamer	$5,500	$4,000	(-$1,500)	Instant	Instant
Fryer	$1,000	$2,300	$1,300	3.7	4.1
Oven	$6,100	$3,800	(-$2,300)	Instant	Instant

Restaurants that use Energy Star® appliances benefit from lower utility bills. Steamers, pre-rinse spray valves, and combination ovens are instantly less expensive in the initial purchase cost with the help from incentives from Southwest Gas. The other appliances with payback period within the operational lifespan are holding cabinets and ice machines. In economic terms, purchasing an Energy Star® griddle will not earn back the investment over its normal operational life. Therefore, if the only concern is the cost difference, restaurants should purchase Energy Star® fryers, ovens, pre-rinse spray valves, and steamers to benefit from instant savings in purchasing and utility bill savings. Restaurants should invest the money saved from the utility bill towards purchasing Energy Star® ice machines and holding cabinets which each have a payback period of less than three years.

Converting all appliances to Energy Star® equipment does not necessarily save restaurants money. Good business practices dictate that when an appliance needs to be replaced, restaurants should purchase equipment with the lowest cost.

As mentioned above, certain Energy Star® equipment is less expensive than standard equipment. Sustainable business practices must ensure financial viability, but also include considerations for the environmental and social domains. Therefore, cost savings alone should not dictate whether or not a restaurant purchases energy- or water-efficient equipment.

The collective environmental and social impact of restaurants is immense. These domains typically fall outside of a simple 'dollars and cents' business case analysis. As social stewards, restaurants need to take actions that reduce negative environmental impacts and educate customers on the restaurant's environmental efforts. Since restaurants are the highest energy consumers in the commercial sector, plans to eventually purchase all equipment with Energy Star® devices should exist. Since Energy Star® does not rate all appliances used in commercial kitchens, when an Energy Star® appliance is not available, the restaurant should purchase the most energy efficient model available. This practice complies with the sustainability principle of lowered consumption. Given SMEs cost barriers and in an effort to minimize consumption, restaurants should replace kitchen appliances only when replacement is required. When purchasing the new appliance, priority needs to be placed on certified energy- and water-efficient equipment.

Food Waste Reduction

In terms of organic waste practices, the indicators described by Legrand et al. (2010) and JingJing et al. (2008) indicate restaurants primary alternative to

direct disposal is to compost and recycle. However, the U.S. EPA's (2010) food waste recovery hierarchy (see Figure 4) prioritizes options to manage food waste. The hierarchy suggests source reduction or other waste mitigation strategies before composting and other disposal practices such as landfill or incineration.

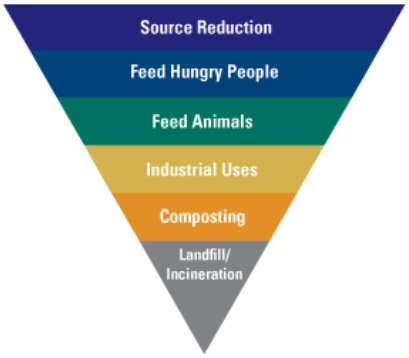


Figure 4. U.S. EPA food waste recovery hierarchy.

Waste audits and reducing pre- and post-consumer food waste are two techniques of source reduction. Restaurant B is the only restaurant in this study that uses waste audits. A number of leading national restaurant chains also use waste audits as a means to reduce purchasing costs and waste production. Waste audits are a technique that more restaurants should use to save money and lessen their environmental impacts.

Restaurants have increasing access to source reduction tools and techniques. For example, a company called Lean Path has two products that help track pre- and post-consumer food waste. The ValueWaste® Tracker is an automated food waste tracking scale that makes it possible to record all the information about a wasted food item in less than 10 seconds (Lean Path, 2010). The ValueWaste® Advantage 4 software system imports the data from the scale

to provide summary information and detailed subsets of a restaurant's waste stream. The ValueWaste® products can be leased to allow a restaurant to complete a short-term waste audit. Automated, computerized scales allow restaurants the ability to quickly track their pre- and post-consumer food waste. Tracking waste is a source reduction technique that directly reduces food costs. Tabulated waste information allows management to know what and the reason why food is being discarded. This information can be used to adjust a restaurant's menu items according to what is left on the plate and even adjust portion sizes. Smarter purchasing decreases the restaurant's direct food costs.

After source reduction has been maximized, food donation is the next step in the food hierarchy. Restaurants can achieve this step by donating food to those in need in their community. Restaurant E and Restaurant A both donate food to the Tempe community. Restaurant B has a food donation pilot program and is working with the ASU health inspector to navigate the legalities of food donation. Many restaurants have food, that is not spoiled or used, that is thrown away at the end of the shift. Feeding the hungry minimizes organic input into landfills, and increases community participation and corporate social responsibility (CSR).

Clarifying Recycling Challenges and Opportunities

The principal barriers to recycling identified by the restaurants in this study are cost, space, and concerns of convenience. Restaurants that do not have comingled recycling believe that it would be easy to add a glass-recycling program. As discussed above, cost can be a barrier to purchasing new energy- or

water-efficient appliances, and the initial purchasing of devices for source reduction and to increase recycling. In actuality, recycling costs are negligible beyond the initial fee for the collection bin, which includes delivery costs. Most waste companies do not charge an extra fee for recycling collection if there is a contract for waste collection. Compost is not a large-scale viable option for Tempe restaurants. The creation of a commercial hauler that accepts food waste would be necessary before composting of food scraps and other organics would be possible for restaurants. Therefore, it is best to focus on source reduction and food donation tactics to reduce food and other organic input to landfills.

Misunderstanding plays a role in some restaurants recycling practices. Waste Management, Inc. provides waste and recycling services to three restaurants in this thesis. Waste Management provides commingled recycling to commercial businesses. Two of these three restaurants participate in the commingled program, while one stated during the interview that they are only allowed to recycle cardboard. I called Lincoln Property Company that manages the restaurants in the ASU Foundation/Fulton Center. It was confirmed that Waste Management services this restaurant and that Lincoln Property Company has informed the tenants of the recycling options. Lincoln Property Company provided the document that lists recyclable and non-recyclable items for this restaurant (see Appendix C). Miscommunication or misunderstanding between the property management company and implementation at the restaurants may be a primary factor in why this restaurant only believes that it can recycle cardboard.

The interviews also revealed a number of discrepancies relating to commercial recycling service. One of the restaurants serviced by the City of Tempe stated they could only recycle cardboard and the other restaurant stated the City of Tempe does not have recycling for commercial businesses, in particular restaurants. According to the City of Tempe's website and recycling coordinator, Tempe offers commingled recycling to commercial businesses, including restaurants. Tempe offers collection for commingled materials and for cardboard only. Restaurants can purchase the commingled container and start comingled recycling collection. Information regarding the containers and acceptable comingled materials is provided in Appendix D. Once a week recycling collection is free if the restaurant already pays for Tempe's commercial trash pick-up. The restaurants serviced by the City of Tempe did not know of the change to commingled collection programs.

Benefits and Challenges for a Broader Sustainability Perspective

The benefits of sustainable development in restaurants extend beyond direct environmental and cost savings. Other benefits, such as social ones, are typically overlooked. Restaurants can market their efforts to use as a selling point. Environmentally conscious consumers are likely to use the information to decide where to dine. Utilizing this market strategy may give restaurants a wider customer base and allow them to "build a business case" for their sustainability efforts as a means to increase the restaurant's competitive advantage. Competitive advantage is not only a marketing advantage. As governments increase

regulations and apply stricter standards, restaurants could be affected. Those who have begun changes will be less affected by future government regulations. The restaurant industry is highly competitive. Any advantage and additional selling point should be harnessed. Yet, restaurants are economically vulnerable. Many restaurants fail in their first year of operations. Therefore, sustainable practices must be financially feasible, as to not disrupt the delicate and often fluctuating income of restaurants until they become better established. Thus, even given a broad group of benefits, decisions about actions and sustainable practices will not be adopted unless a direct or understandable indirect financial benefit is available.

While market advantages may be available from a sustainability perspective, they may not be realized without being integrated into a restaurants' mission. The mission statement outlines the core operational values of a business. Currently, most restaurants do not reflect values and goals that embody sustainability. Traditional restaurants are aware of general environmental issues and may take some steps to mitigate their impacts at the restaurant. However, these restaurants are not focused on environmental impacts. The cumulative impact of U.S. restaurants can no longer be ignored. Restaurants need to be held accountable for the harmful impacts they contribute to the U.S. environment. Traditional restaurants are often impeded in their progress towards more sustainable practices by a lack of transparency and misinformation. These types of restaurants do not know what actions directly link to the system-wide sustainability of restaurants. Many restaurants also rely on outdated or incorrect

information. Often restaurateurs are so focused on internal business matters and meeting customer needs that they lack the resources to become more informed. Higher-level intervention, which could be realized as a national standard or regulation, would focus the attention of restaurants on their actions and impacts. The sustainability-marketed restaurants have the same general concerns of staying in business and generating a profit as traditional restaurants. Yet, the presence of stated sustainable practices and goals in daily operations and core values distinguishes the sustainability-marketed restaurants from traditional restaurants and enables cohesive and strategic action. These restaurants are an example of the direction the restaurant industry needs to take to successfully integrate sustainability into the industry.

Indicators and Sustainable Restaurants

This thesis focused on environmental efficiency, areas that restaurateurs have direct control over, and analyzing the current state of assessment tools from restaurant sustainability literature by having restaurants identify barriers. Therefore this thesis does not cover all points of that could be considered in a restaurants sustainability assessment. The thesis did not have restaurants identify what indicator areas they thought were applicable or have the restaurants provide direct input on the relevance of the metrics. The restaurant literature indicators lacked specific percentages and made it difficult to understand at what level the metric is considered achieved.

Indicators and metrics are one way to quantify actions and impact. The indicators proposed by Legrand et al. (2010) and JingJing et al. (2008) are strong in some areas, but not all are relevant. The indicators attempt to measure various aspects of restaurants to view the system as a whole. The metrics account for food source, locality, end-of-life uses and disposal, and energy consumption. Each metric touches on the major environmental impacts of restaurants. The major weakness of the current indicator set is a lack of benchmarks. The indicators state that a percentage must be met, but fail to say at what level the measured action is sustainable. This situation leaves the indicators open to interpretation and the application as a measure of sustainability ambiguous. Setting benchmarks standardizes the level of action for all restaurants and moves towards being able to set a nationally recognizable and accepted standard. Further development of restaurant sustainability indicators must occur before a set national standard can be achieved.

The U.S. EPA has began to standardize efficiency management and tracking for various commercial appliances. However, Energy Star® does not rate all kitchen and restaurant technologies. Energy Star® and the U.S. EPA need to work to certify more all kitchen equipment. The U.S. EPA does not offer any financial incentives to purchase Energy Star® appliances. Only certain individual states offer incentives for restaurants to incorporate Energy Star® equipment. The U.S. EPA should offer more incentives to purchase efficiency-rated appliances to offset the discounted payback period.

This thesis is a starting point that can open conversations about national standards for restaurants. The National Restaurant Association and the U.S. EPA should work cooperatively to set a national indicator standard for restaurant sustainability. Currently, only private organizations such as Green Seal for Businesses and the GRA offer measurements of sustainable restaurants. Green Seal and the GRA each have different methods of measuring sustainability in restaurants. The different methods and measures creates ambiguity and allows restaurants to claim to be sustainable, when their practices may only be sustainable in certain areas; thus neglecting the system as a whole. The measures that GRA and Green Seal developed are valid and applicable. I am advocating that a single, nationally accepted standard be developed, based on the findings of this thesis and the substantial work from the GRA and Green Seal.

The current list of indicators included in this study, and those proposed by Green Seal and the GRA, are not necessarily the best measure of systemic sustainability. The current indicator set looks at the practices of an individual restaurant. However it is the cumulative impact of restaurants on the environment, restaurants' influence on the community, and the importance of revenue streams to the U.S. economy that are why this industry must be examined through sustainable practices. The current indicators do not include the role of the community, considerations for labor and human rights, and product responsibility. The Global Reporting Initiative (GRI) is a framework of how to conduct a more complete sustainability report. Sustainability reports measure, disclose, and hold

businesses accountable to internal and external stakeholders for organizational performance towards the goal of sustainable development (Global Reporting Initiative, 2007). The G3.1 Guidelines (GRI, 2007) can be applied to organizations, and industry, of any size or type, as a basis for sustainability reporting. The restaurant, or food industry, sector has not been provided specific sector guidelines, but the general guidelines for a more inclusive sustainability report are available. The G3.1 Guidelines is a set of tools that should be incorporated to move beyond the individualistic approach of current restaurant sustainability indicators. Future studies of restaurant sustainability should consider the G3.1 guidelines as an important addition to a more complete sustainability reporting measure.

Applying the Nidumolu et al. (2009) sustainable business development theory to the restaurants was my attempt to think about restaurants beyond their individual practices; moving beyond practices to the progress made towards transforming the business model. My assessment concludes that the sustainability-marketed restaurants have progressed the furthest towards next-practice business models. Restaurant A is currently at Stage 4: Develop New Business Models, and Restaurant B is at Stage 5: Create Next-Practice Platforms, the final stage. Restaurant A has an owner and management who are committed to sustainable business practices, including expanding opportunities for environmentally conscious consumption. Restaurant A has integrated a recycling program, energy-efficient appliances and building design, community events, and recycled

products. A majority of its food is locally sourced. Restaurant A's management needs to start annually reviewing its actions, goals, and progress. A systematic annual review is a new concept for restaurants. Restaurant B has reached Step 5 because there are stated sustainable practices goals, numerous sustainable practices have already been implemented, the company's approach and goals are reviewed annually, the restaurant engages in community outreach, and is researching opportunities to further their sustainable efforts. Restaurant B has stated five-year goals and has developed plans to overcome current barriers. Future efforts include composting, food donation, and more waste reduction strategies.

The three traditional restaurants are at different stages of Nidumolu et al.'s (2009) step theory. The major concern for all three of the traditional restaurants was the initial cost in purchasing energy- or water-efficient equipment and the perception that sustainable business practices were inconvenient. Restaurant D and Restaurant E are currently at Step 1: View Compliance as Opportunity. Based on current practices, these restaurants are beginning Step 2: Make Supply Chains Sustainable. Restaurant D and Restaurant E have incorporated the cardboard recycling and are interested in commingled programs that are now available. Both restaurants were not aware they had energy-efficient equipment in their kitchens; while both had at least one energy-efficient appliance. By incorporating, and being willing to expand, recycling and recycled-products, and having some efficiency rated equipment, these restaurants view compliance as opportunity,

thus completing Step 1. Restaurant D and Restaurant E are both starting recycling programs and purchasing efficiency-rated equipment before compliance is mandated on a city or federal level.

Restaurant D and Restaurant E are beginning Step 2 by seeking local food providers, where it makes financial sense. Restaurant D's definition of 'local' differs from the one used in this thesis, i.e. within 250 miles. While Restaurant D purchases pastries from local bakeries, the breakfast and lunch items are sourced from a local vendor that sources its food from across the U.S; these food items are not local. Restaurant D also relied on customer and employee initiatives to decrease their waste production, but was unable to continue the programs when the support left. As a result of the transition between stages, and lacking transparency in waste reduction strategies, the restaurants' lack a cohesive sustainable business strategy. To further their efforts, senior management would need to develop specific sustainable practice goals.

Restaurant C has not embraced sustainable business practices. Restaurant C has struggled to understand the definition of sustainability and, therefore, struggles with understanding what this means for the restaurant and how it is applicable. The restaurant's management is very concerned with cost and remaining in business (i.e. near-term business survival). They list these issues as the reason they are not concerned with finding or practicing sustainability at their restaurant. Therefore, Restaurant C has not started progress towards becoming a sustainable company.

Future Study

Future restaurant sustainability studies need to focus on developing thresholds and benchmarks for the indicators, as well as creating a set of measures that reflects the cumulative impacts of the entire industry. I applied a qualitative assessment of where the restaurants fit into the Nidumolu et al. (2009) theory and research is needed to standardize the process of assigning restaurants to a particular step. While this study focused on the barriers that traditional and sustainably marketed restaurants faced, the sustainable development of restaurants requires that all restaurants be held to the same standard. Future studies into restaurant sustainability should focus on developing one standard of metrics to assess the sustainable practices within each restaurant. The differences I advocate are for restaurant properties and buildings that are leased versus owned. If they properties are owned, C & D, including HVAC design and efficiency need to be included in the sustainability assessment. The standard that is developed may look similar to the LEED certifications.

CONCLUSION

My thesis study applied sustainability themes to the restaurant industry. Businesses respond to measurements of progress; such measurements are obtained by analyzing indicators. Applying this type of measurement provides answers about what things or processes are present, but does not account for planning and values. Sustainable business practices must not only meet certain performance criteria, but also be part of the restaurateur's value structure.

Indicators are useful as measurements of performance, but fail to fully integrate the core concerns of sustainability and sustainable development. Sustainability does not imply an end state, nor is there a clear demarcation between what is sustainable and what is unsustainable. Sustainable development involves qualitative assessment of the values that guide the decision-making process and are communicated to staff and the public.

My work focused on the current measurement techniques that are used to evaluate sustainable business practices in the restaurant industry. Simply meeting the indicator requirements for energy, water, waste, and food does not necessarily imply that sustainability has been accomplished. Applying Nidumolu et al.'s (2009) step theory is one way to instate a broad discussion of sustainable development in a business context. The step theory emphasizes the importance of spreading the values of sustainability philosophy and changing systems throughout the entire organizational structure. Indicators play a role in the initial assessment and iterative evaluations to monitor continued progress towards sustainable practice. Indicators respond to the need for compliance but do not necessarily drive changes towards sustainability nor instigate a process of setting goals for sustainable practice.. Indicator assessment is a key component of steps one and two of Nidumolu et al.'s (2009) framework for sustainable businesses, and indicators should play an ongoing role in the quantitative analysis of the business practice. Yet, meeting indicator levels alone speaks only to 'green'ing practices and does not embody the principles of sustainability.

The key components of sustainability—education, community participation, future-focused, and process—are not fully integrated into indicators. Environmental indicators for restaurants usually account only for purchasing and use practices, showing whether or not the metric is present at the restaurant. The metrics that do aim at the education component of sustainability are: menus that communicate the restaurants' sustainable practices, kitchen staff trained in methods of healthy cooking, and staff and suppliers trained and encouraged to 'reduce, reuse, and recycle.' To move beyond the current limited set of environmental indicators, a holistic assessment of restaurant sustainability must include qualitative assessments of the role that education and community participation play, and of the degree to which the restaurant is focused on the future. The assessment matrix created for this study allows restaurants to move past the limitations of current indicators and into the future-focused phase of sustainable business development. Capturing these components, as well as restaurants' environmental impacts, will provide a more complete picture of sustainability in restaurants.

The operational measures of environmental sustainability are present in the current indicators. However, the current list does not include internal operational measures. Internal operational measures include upper management support and employee connectedness. The integration of a value structure throughout the entire business is essential to true sustainability. Sustainability is not an end state, but a group of practices and values that need to be reviewed at

least annually. The review of practices and progress constitutes the process-based aspect of sustainable development in businesses. Re-evaluation is an opportunity for owners and managers to consider their progress, integration of new practices, and provide a time to reflect on future goals. Restaurants are making progress towards sustainability, but the industry must look beyond indicator analysis and incorporate qualitative measures to address the key components of sustainability.

The restaurant industry is not alone in having cumulative impacts on the environment, economy, and society. Every industry sector has cumulative impacts. Most, if not all, businesses could increase their sustainability by integrating measurements of value systems and goals with quantifiable metrics. Businesses that want to be responsible, ethical community players will need to participate in community education and outreach about sustainable practice. Furthermore, sustainability in business is a process focused on the future. Sharing knowledge and practices is one technique that helps bolster industry-wide advancements in sustainable practices and reaches to the core of corporate social responsibility (CSR). CSR is part of the social domain of sustainability and implies that restaurants (and all businesses) have the responsibility to educate their employees and the public, in order to help reduce the negative environmental impacts of their industry. Sharing practices and information with similar businesses may seem at odds with increasing competitive advantage. However, knowledge sharing and CSR heightens the public's perception of a business as an industry leader, and creates an environment for the business to develop new

sustainable business practices. Sharing marketing strategies and business practices lessens the gap between information and practice, increases transparency, and makes the business a leader in solutions. Helping businesses increase sustainability drives further innovation and enhances cumulative, industry-wide sustainable business practice.

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APPENDIX A

SEMI-STRUCTURED INTERVIEW QUESTIONS

General Interest

1. What motivated you to get into the restaurant business?

What is your role/title at the restaurant and how long have you been here?

What is the seating capacity of the restaurant?

How long have you been in business?

What meals are served?

What type of restaurant do you describe the restaurant? (full-service restaurant? Etc.)

What is your cuisine?

Describe the demographics of your clientele?

2. What are the restaurants' short and long-term goals?

Beyond profitability, does the restaurant have any other goals or objectives you would like to highlight?

How would you like the restaurant to be perceived by the public?

Does the restaurant have any environmental goals or aspirations?

Over the long term do you see your restaurant moving more towards other environmental goals?

What motivates you to have the environmental goals?

What do you think about some of the restaurants in the area's environmental efforts at their restaurants?

What do you think were the reasons these restaurants made these efforts?

Have you heard about any problems these restaurants have experienced?

What steps have and has the restaurant taken to reach its environmental goals?

Do you market the restaurant as sustainable or environmentally friendly?

In what ways do you do this?

Do you feel this effort has paid off for the restaurant?

Do you have any social goals for how the restaurant interacts with the local community?

What community are you talking about?

Who is your target audience?

3. What do you think are areas of future growth and new initiatives that can help the restaurant meet its goals?

Goals and Barriers – be specific to the restaurants own goals

4. Can you describe the successes and hardships the restaurant has experienced in achieving progress towards its goals?

What steps are you taking to overcome any hardships?

Is there anything you can think of that would help you?

Now I'd like to ask you about a few different types of specific practices.

5. Do know you if the restaurant composts its food waste?

What do you feel or know are the barriers to composting at a restaurant?

Do you have any way of monitoring or measuring how much stuff is landfilled?

Are you aware of any ways to track food waste?

(If so…) Can you describe how your restaurant tracks its food waste?

Putting aside any barriers, what do you think are some of the ways composting could help the restaurant?

6. Do know you if the restaurant recycles?

(If so…) Who collects your recycling?

What do you feel or know are the barriers to recycling at a restaurant?

Do you have any way of monitoring or measuring how much stuff is recycled?

Putting aside any barriers, what do you think are some of the ways recycling could help the restaurant?

Environmental

7. What do you feel are the biggest environmental impacts of the restaurant?

Has the restaurant purchased energy efficient appliances at the restaurant?

(If so…) What brands of appliances are you currently using?

If you do not have energy or water efficient appliances and fixtures, what is the reason?

What brands of appliances are you currently using?

Are you aware of any incentives for purchasing energy efficient appliances?

Do you know if the restaurant has any specific goals about purchasing energy efficient appliances? For example, if an appliance breaks down how important is it to you to purchase an energy efficient appliance as a replacement?

8. Do you know if the restaurant has a waste reduction program?

What are your tonnage/tipping fees per ton?

What city or private provider collects your trash?

9. Do you know what percent of your purchases are for local/organic food?

Does the restaurant encourage staff and the chefs to communicate with any local suppliers?

10. Has the restaurant installed low-flow water fixtures in the kitchen and bathrooms?

When you are replacing devices that use water, what is the priority for purchasing water efficient appliances?

11. Do you know how much food waste is produced per day/per week/per month?

Do you have any data that you can share?

Economic

12. In general, what do you feel are your biggest costs and investment requirements?

Does the restaurant track the costs (energy costs, food procurement and waste removal)?

How do you track it? Are you able to share the information with me?

Do you have a way of tracking what percentage of your budget is dedicated to products with recycled-content? Local/organic food?

13. What types of changes in operations have occurred in the recent years?

Social

14. What do you feel are the biggest social impacts of the restaurant?

What do you think are the primary interests and concerns of your restaurant patrons?

Have you engaged your customers to get their opinion?

Do you have formal ways of assessing their interests and needs? What do they want to see?

If so, is there anything they have communicated that is surprising to you? Have you noticed that they are interested in something beyond good food, cleanliness, at a decent price?

15. Do you think that restaurants have a role to play in community development and outreach?

If the restaurant has done any community events, can you describe the involvement?

Sustainability

16. In your own words define "sustainability."

Do you think "sustainability" applies to restaurants?

17. Are there aspects of what you consider "sustainable" that you think are particularly difficult to implement in a restaurant? Why?

Do you think there are aspects of sustainability that are easy to implement in a restaurant that would provide a demonstrable benefit?

APPENDIX B

ASSESSMENT MATRIX

Indicator Area	Metric	Presence	Barrier
Energy	Electrical or gas equipment (refrigeration, air-conditioning, boilers, fryers, etc.) are certified energy-efficient	Yes No N/A	- Cost
Water	Water-efficient pre-rinse spray valves at 1.6 gpm and aerators are used	Yes No N/A	- Cost - Health concern
	Low-flow toilets are installed in the restrooms	Yes No N/A	
	Waterless urinals are installed in the men's restrooms	Yes No N/A	
Waste	The approach "reduce, reuse, and recycle" is followed; staff and suppliers are trained accordingly	Yes No N/A	- Cost - Spatial - Collection service
	Sorting and collecting systems for waste with separate bins exist	Yes No N/A	
	Paper products contain recycled content	Yes No N/A	
	No plastic, aluminum, and polystyrene foam is used	Yes No N/A	
	Organic waste is reused or composted	Yes No N/A	
	Grease and oil waste is collected and properly disposed or reused	Yes No N/A	

Indicaor Area	Metric	Presence	Barrier
Food	Purchase organically certified food products used for food preparation	Yes	- Cost - Vendor - Contract obligation
		No	
		N/A	
	Purchase locally sourced food products used for food preparation	Yes	
		No	
		N/A	
	Adjust menu to use seasonal food products	Yes	
		No	
		N/A	
	Purchase a percentage of sustainably source seafood	Yes	
		No	
		N/A	
	Options exist for vegetarian, meat, and fish dishes offered on the menu	Yes	
		No	
		N/A	
	Presence of organic wines offered on the wine list	Yes	
		No	
		N/A	
	Use “Fairtrade” certified products	Yes	
		No	
		N/A	
	Purchase of food products purchased directly at the local farm with attention being paid to pay fair prices	Yes	
		No	
		N/A	
	Options of meals that cater to specific dietary needs and food-allergies (gluten-free/lactose-free choices are available)	Yes	
		No	
		N/A	
	Kitchen staff is trained on methods that enhance the dietary goals and guidelines of the country (low fat, reduced salt, etc.)	Yes	
		No	
		N/A	
	The menu is labeled with choices such “low fat,” “vegetarian,” “gluten-free,” “vegan,” etc.	Yes	
		No	
		N/A	
	The menu communicates sustainable practices and initiatives of the restaurant	Yes	
		No	
		N/A	

APPENDIX C

LINCOLN PROPERTY MANAGEMENT COMINGLED RECYCLING FLYER FOR TENANTS

ASU TEMPE CAMPUS RECYCLING UPDATE – 5/27/10 (PLEASE FORWARD!)

You can now recycle a whole host of additional items in your commingled recycling bins thanks to Waste Management's brand new expansion of its program! Check out the below details & stay tuned for the updated website & signage which will make their debut this summer!

FORMER FOES BECOME FRIENDS TO COMMINGLED RECYCLING BINS

Greasy pizza boxes, glass, soft plastic bags/wrap, liquid-free paper cups, vinyl banners, corrugated plastic signs, metal odds 'n' ends, & non-hazardous aerosol cans can join the looooong list of items that you can now toss in your outdoor commingled recycling bins.

GREASY PIZZA BOXES

We looked into this one thoroughly because we couldn't believe it either but greasy pizza boxes are okay to put in the hamper for cardboard or in the larger commingled recycling bins! Just no cheese, sauce or crust please as food is still forbidden & trash the wax paper!

GLASS

No more having to walk to a designated glass bin to recycle your glass bottle! Just place it in any commingled bin whether it's inside or outside. If you have broken glass or Pyrex (broken or unbroken), contact temperecycling@asu.edu for a pickup.

SOFT PLASTIC

So after hearing repeatedly that placing plastic bags/wrap in the commingled recycling bins is a huge no-no, we can now accept them in commingled recycling bins! This includes all clean pieces of plastic bags, zip lock bags, shrink wrap, freezer bags, bread bags, etc. Either put bags within bags (the best option) or place the bags as is in the recycling bins. Just make sure they don't contain other recyclables or trash.

Please continue to opt for reusable bags or packaging-free options as waste reduction is still the most magical of the 3 Rs.

PAPER CUPS

All paper cups, as long as they are free from polystyrene/Styrofoam™, can now be recycled on the ASU Tempe campus! This includes paper cups made from plants like corn & potato starch. Just make sure that they are liquid-free.

VINYL BANNERS

Please remove the metal grommets from the banners before recycling both the grommets & the banners in one of the larger commingled recycling bins, recycling compactors or outdoor commingled recycling bins. Better yet, here's a waste reduction tip…when designing banners, consider creating them in a more generic way so that they can be used repeatedly.

CORRUGATED PLASTIC SIGNS (THINK ELECTION SIGNS!)

Please remove the metal stakes from the corrugated signs before recycling both the metal & the signs in one of the larger commingled recycling bins, recycling compactors or outdoor commingled recycling bins.

METAL ODDS'N'ENDS

Have a broken metal shelf or a whatchamacallit widget you don't need any more but you don't have enough to justify a special metal pickup? Then simply place them in any commingled recycling bin on campus.

NON-HAZARDOUS AEROSOL CANS

Speaking of metal, empty, non-hazardous aerosol cans (think whipped cream & other food-containing cans) can now be placed in commingled recycling bins.

NOT ACCEPTABLE IN COMMINGLED RECYCLING BINS

A big **NO** to Styrofoam™ (chunks, cups or trays), packaging peanuts, candy bar or granola bar wrappers, food, liquids, wax paper, & napkins in commingled recycling bins. However, if you have clean Styrofoam™ chunks, they can be recycled: http://uabf.asu.edu/recycling_styrofoam. Packaging peanuts & other packaging materials can be taken to UPS for reuse: http://uabf.asu.edu/recycling_packaging.

APPENDIX D

CITY OF TEMPE COMMERCIAL COMINGLED RECYCLING LIST

City of Tempe Recycling Program

Tempe provides recycling services to businesses through its municipal recycling program. Recyclables are collected once a week. Informational recycling flyers and containers will be delivered to your location. If you receive City of Tempe trash service there is no charge for recycling collection service. A one time maintenance and replacement set-up cost will be charged for the recycling container. You may also purchase a desk recycling container. For businesses that do not receive Tempe's trash service we offer recycling collection for a monthly fee. For additional information call or email: (480) 350 8224 or email: lucy_morales@tempe.gov

To obtain a list of what is recyclable please refer to: www.tempe.gov/recycling

Tempe offers two types of plastic recycling containers, a 95 gallon container with wheels and a 300 gallon container with no wheels.
$70.00 one time set-up cost for a 95 gallon recycling container. Size: 3.7' w x 2.8 h'
$200.00 one time set-up cost for a 300 gallon recycling container. Size: 4.1' w x 4.1 h'



95 gallon container
Wheels
$70.00



300 gallon container
No wheels
$200.00



Desk Size
$4.00 each

To set up recycling collection service contact:
Lucy Morales | Solid Waste | Recycling | (480) 350 8224 or lucy_morales@tempe.gov

The items/substances listed below may not be placed in the recycling container

Unacceptable Materials

Please do not place the following items/substances in the City of Tempe Municipal Recycling Containers

- Styrofoam (packaging and peanuts)
- Plastic utensils (forks, knives, etc.)
- Paper towels, napkins, facial and toilet tissue
- Six pack plastic beverage rings
- Stained glass, light blubs, mirrors, porcelain and ceramics
- Chemical containers
- Plastic bags, shrink, and bubble wrap
- Food waste or liquids of any kind
- Waxed coated fast food beverage cups
- Self-sealing or cardboard mailing envelopes with padding or bubble wrap
- Cereal box inserts
- Dog or cat food bags