Carbon Neutral Food Menu for Restaurants

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Energy Policy and Climate,
April 28, 2018

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Executive Summary

An individual's carbon footprint consists of all the greenhouse gases from the meals produced as they wind their way through the food system. Shrinking this individual carbon footprint can help improve environmental and social conditions in near and distant places touched by our food system. Apart from the food manufacturing industry and the food retail industry (e.g., grocery stores), the restaurant industry, has a large impact on the environment. Much of information is available on the carbon footprint on individual food ingredients and associated processes such as their cultivation, harvesting, transport, processing, consumption, and wastage. However, there are limited comprehensive studies on Food Menus incorporating the full Life-cycle Assessment (LCA) of food dishes including the preparation and serving of meals. The aim of this study is to design a carbon neutral food menu for a restaurant for three meal types (brunch, lunch, and dinner) by performing LCA for food ingredients, incorporating their respective origin, transport, processing, cooking, and the volume of food items (number of dishes) produced. The greenhouse gas (GHG) impacts of food are complex and far-reaching (Nemecek et al., 2016, Canals et al., 2007). Understanding how individual eating habits affect global warming could help mitigate those impacts through conscious daily living. The LCA based on 1 month's data indicates that an average sized restaurant emits about 35.63 metric tonnes of carbon dioxide equivalent (t CO_2e) per month, when considering the entire full scope of the restaurant's supply chain activities.

Introduction

The environmental consequences of food production and consumption have gained a lot of attention in recent years (Foley et al. 2011, Nemecek et al., 2016). With agricultural production accounting for 19-29% of global anthropogenic greenhouse gas emissions (GHG), consumption of food contributes to a significant proportion of an individual's overall GHG impact (Vermeulen et al., 2012). Life cycle assessments (LCAs) of food ingredients and products provide a primary means of understanding a food item's environmental impact. With growing public concern about climate change, information and opportunities for consumers to lower their carbon footprint, have become increasingly available (Weber and Matthews et al., 2008, Masih et al., 2012, Grunert et al., 2014).

The field of sustainable consumption studies provide information to consumers on climate and environmental impacts of their consumptive choices (Hertwich et al., 2005, Tukker et al., 2006, Weber et al., 2007). In general, these studies conclude that a large share of most consumers' personal impacts come from food, home, energy, and transportation. However, considering this impact, high degree of personal choice, and a lack of long term "lock-in" effects which limit consumers' choices, food represents a unique opportunity for consumers to minimize their individual impacts (Hertwich et al., 2005, Tukker et al., 2006).

Food constitutes about an average 21% of an American's total annual carbon footprint of 28.6 tons CO_2e (Kling and Hough et al.,2010). However, individual carbon footprints also depend on other factors such as the kind of food eaten (vegetarian or non-vegetarian), the quantity of food, the location from which the food was resourced, how the food is produced, processed, prepared (cooked) and what was done with the leftover food.

In recent years, several trends associated with environmental sustainability have emerged within the field of consumer food choice. The growing penetration of both organic and locally grown food in the United States and around the world, demonstrates consumer awareness towards, how food is produced and where it comes from. However, the issue of food-miles (a measure of how far food travels between its production and the final consumer), has been a subject of debate in food sustainability (Paxton et al., 1994, Pirog et al.,2001, Smith et al., 2005, Sim et al., 2007, Canals et al., 2007). Due to its relative importance for many environmental problems, food has held a prominent place in LCA literature (Eshel et al., 2003, Carlsson-Kanyama et al., 2003, Jungbluth et al., 2000). There are vast quanties and varieties of foods available for consumers, however, most analyses have been limited to detailed case studies of individual food items (Canals et al., 2007, Jones et al., 2002) or a limited set of items (Sim et al., 2007, Jungbluth et l.,2000) with low focus on large groups of food products. There are a few studies which look at overall diet but even these studies have been limited by the lack of availability of life-cycle inventory data for all the products (Eshel et al., 2006, Jungbluth et al., 2000).

LCA studies by Heller et al., (2013), show the environmental impacts of different type of diets or meals based on the production and a consumption (demand-restraint). In a similar study by Auestad and Fulgoni (2015), reviews the economic and environmental impacts based on dietary patterns, concluding that a more complete assessment of environmental, social and economic impacts is required, which could be achieved through a strong inter-disciplinary collaboration. MacDiarmid et al., (2012) through their inter-disciplinary study, show how process of meeting dietary requirements influences the GHG emissions. This study concluded that a diet with lower GHG emissions would be possible without increasing costs to consumers.

In recent years, more and more research has also been carried out to investigate complex products such as ready-to-eat meals (Büsser and Jungbluth 2009, 2011; Davis et al. 2010) and newly developed food products with improved food processing (Aiking 2011; Smetana et al. 2015). Masset et al. (2014) analyzed the most commonly consumed products in France. According to his study meat, fish, eggs, and dairy products had higher environmental impacts, while starchy products, legumes, fruits, and vegetables had the lowest impact. Additionally, it was found that high nutritional quality was correlated to lower GHG emissions and lower prices.

Although there are plenty of studies (Büsser and Jungbluth 2009, Sim et al., 2007) available for individual food ingredients, there are limited studies on food menus that combine multiple ingredients into a complete dish. Considering the origin, transport, processing, energy use (cooking), storage of individual food ingredients, LCA analysis of food menus involving multiple food ingredients is a complex process. One such study by Ribal et al. (2015), describes an optimization model (goal programming), which was used to design meals for school cafeterias by considering nutritional, climate change, and economic aspects allowing school cafeterias to improve the sustainability of their meals. Considering the limited studies available on food menus and understanding the complexity involved in LCA analysis, working with the restaurant industry which is a major part of the food sector, will not only help in identifying the factors responsible for a restaurant's impact on climate change, but will also help lower the carbon footprint from food consumption.

LCA Methodology:

There are well recognized carbon accounting standards to calculate carbon footprints. Among these standards, the GHG Protocol developed the World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD)[1] is the best recognized in the global voluntary market. The methodology used in the LCA analysis of this capstone project is aligned with the following GHG Protocol standards:

Product Life Cycle Standard -- The Product Life Cycle Standard instructs users on accounting for the emissions of a product's full life cycle; users can learn to focus efforts on the greatest GHG reduction opportunities in order to develop more sustainable products.

Corporate Value Chain (Scope 3) Standard -- This standard provides instruction on how a company should perform a scope 3 GHG inventory, which includes emissions from throughout a company's value chain.

Corporate Accounting and Reporting Standard - The Corporate Standard provides instruction on how a company should perform a GHG inventory; it covers scopes 1 and 2.

To perform a complete LCA analysis, data such as the transportation itinerary of food and the energy used to cook it, will be obtained from the Pisticci restaurant, in the New York City, where this case study will be conducted. The database collected for this case study will include: food items for different meal types (brunch, lunch, and dinner), raw food ingredients (used for cooking), origin and transport of food ingredients, processing of food, energy use (cooking and storing). This data will be used to perform a Life-cycle Assessment with

[1] http://pdf.wri.org/ghg_protocol_2004.pdf

boundaries from the individual ingredient points of origin, through consumption at the restaurant ("cradle-to-gate") to determine the GHG emissions for selected food items on the restaurant's menu.

The "cradle-to-gate" boundary includes:

- Material Acquisition & Pre-processing
    - Extraction/production and Pre-processing of raw materials
    - Transportation of raw materials to restaurant
- Manufacturing
    - Emissions from energy usage (cooking and storing)
    - Emissions from waste disposal
- Distribution & Storage
    - Emissions from energy usage in storage

The LCA is a product-based approach that evaluates all stages of a product's life. These analyses include environmental impacts from each stage i.e., from raw material food ingredients, their processing, distribution, use, and disposal. These analyses consider not only the flow of materials, but also the outputs and environmental impacts of these inputs. The Carbon Neutral Checkout™ tool designed by Carbon Credit Capital (https://www.carboncreditcapital.com) will be calculate the carbon footprint of the selected ingredients within the specified boundary. The Carbon Neutral Checkout™ tool allows the user to calculate the upstream carbon footprint of products from the extraction of raw materials to the arrival of a product at the location of final sale (meals consumed at a restaurant). The tool covers carbon emissions embedded in the supply chain of products, as determined by the GHG Protocol. The tool requires information like the materials (ingredients) from which a product is made, and the location from which the materials are sourced.

1. Using an LCA framework, carbon footprint of food menu items for different meal types will be determined. These calculations will include the carbon footprint of raw ingredients including their origin, transport, processing, energy use, etc.
2. These calculations will be further extended to calculate the total carbon footprint for the selected food items from the food Menu, that are produced and sold at the restaurant over a period of one month.

Data Types: Two types of data are necessary to calculate a carbon footprint

Activity Data: that accounts for the material and energy use involved in the product's life cycle (material inputs and outputs, their transport, energy used, etc.)

Emission Factors: which acts as a link that converts activity data into the resulting GHG emissions. It is expressed as the amount of GHG's emitted per 'unit' of activity data (for example, kilograms of CO_2e emitted per kilogram of ingredient)

Data Information: This LCA is based on one-month of data collected from Pisticci Restaurant, based in New York City and an average sized restaurant with an area of about 5000 Sq feet. Pisticci sells an estimated 250 entrée and 150 appetizers per day and approximately about 6000 customers visit Pisticci restaurant every month. Raw food used in Pisticci's menu (for all meal types) are procured from two locations. The food ingredients such as dairy, meat, spices, bakery items (breads etc), fruits and vegetables, are procured from the New York Green Market which is an estimated 16 Miles away from the restaurant's location. Pisticci also sources vegetables (lattice, carrots, tomatoes etc) from its own farms which are located about 25 miles from the restaurant's location. The raw food ingredients are transported to the restaurant through the means of truck transportation. Note that the LCA analysis of this Food menu does not include raw ingredients that represent less than 5% in a recipe since they are considered negligible and are excluded from the LCA calculations. Based on the three meal types the table below provides information on the total number meals and meal courses (Appetizers and Entrée) that was served at Pisticci restaurant a period of 1 month. Note that the carbon contribution (footprint) through food waste is are not included in these calculations since most of the food waste generated at Pisticci restaurant is used as manure at the Pisticci farms.

Meal Type	Dish Type	Per Day	1 Month
Brunch	Appetizer	50	1500
	Entrée	83	2490
Lunch	Appetizer	50	1500
	Entrée	83	2490
Dinner	Appetizer	50	1500
	Entrée	83	2490

Table 1: Data represents the food served at Pisticci restaurant based on three meal types (brunch, lunch, dinner) and the number of the number of entrée and appetizer served

RESULTS

While performing the LCA analysis on each item on the Menu the carbon content of raw-material used in cooking the recipe (item on the menu), and the transportation of the raw material was calculated. The LCA calculations are performed based on the course type and the meal type (Brunch, Lunch, Dinner). The carbon coefficient values are obtained from literature (Clune et al., 2017). The below given tables 2, table 3, and table 4 summarize the carbon content of the raw materials used and the transport of the raw materials for each item (recipe) from each meal type (brunch, lunch, dinner) and course type (appetizer or entrée). The appendix described a few examples on LCA calculations for Entrée and Appetizer dishes across all three menu types.

Brunch Menu based on course type			
Meal Type	**Menu**	**Raw-material CO_2 e (kg/kg)**	**Transport CO_2 e (kg/kg)**
Appetizer	THE "PERFECT MEAL" SALAD	3.63905	0.00455
Appetizer	CHICKPEA AVOCADO SALAD	0.61230	0.00339
Appetizer	GRILLED SALMON SALAD	0.25203	0.00260
Entrée	PANE E NUTELLA	0.62970	0.00070
Entrée	GRANOLA FRUIT BOWL	0.80600	0.00090
Entrée	LEMON RICOTTA PANCAKES	4.18294	0.00231
Entrée	FRENCH TOAST	1.59477	0.00101
Entrée	PISTICCI FIORENTINO	1.28944	0.00313
Entrée	SPINACH GOAT CHEESE OMELET	1.66308	0.00611
Entrée	UOVA CONTADINE	1.74966	0.00516
Entrée	STEAK AND EGGS	23.8758	0.00579
Entrée (Pasta)	LA SPAGHETTATA	0.79298	0.00133
Entrée (Pasta)	FETTUCINE AI FUNGHI	0.97460	0.00159
Entrée (Pasta)	PENNE PISTICCI	1.20408	0.00158
Sides	BACON	1.80000	0.00077
Sides	SAUSAGE	2.12500	0.00129
Sides	ORGANIC PROBIOTIC YOGURT	0.50000	0.00065
Sides	ROASTED POTATOES	1.32600	0.00077
Sides	MIXED GREEN SALAD	1.29000	0.00129

Table 2: Carbon Content per Brunch Menu Item

Lunch Menu based on course type			
Meal Type	**Menu**	**Raw-material CO_2 e (kg/kg)**	**Transport CO_2 e (kg/kg)**
Appetizer	INSALATA MISTA	0.44362	0.00217
Appetizer	SHAVED FENNEL & GREENS	1.09318	0.00331
Appetizer	INSALATA CAPRESE	1.00826	0.00299
Appetizer	INSALATA PISTICCI	0.67796	0.00305
Appetizer	THE "PERFECT MEAL" SALAD	1.74374	0.00242
Appetizer	CHICKPEA AVOCADO SALAD	1.04930	0.00339
Appetizer	GRILLED SALMON SALAD	1.08852	0.00260
Appetizer (Soup)	MINESTRONE	0.5964	0.00209
Appetizer	ROASTED GARLIC BREAD	0.37290	0.00137
Appetizer	FRESH STEAMING MUSSELS	3.52580	0.00152
Appetizer	STEAMED ARTICHOKE	0.33500	0.00137
Appetizer	GRILLED EGGPLANT	1.05050	0.00195
Appetizer	VEGETABLE CECI	0.59346	0.00068
Entrée	VEGETABLE CECI with grilled Portobello	0.66096	0.00133
Entrée	PROVOLONE & MORTADELLA	1.48700	0.00162
Entrée	GRILLED VEGGIES & SPINACH	0.96568	0.00200
Entrée	IMPORTED MOZZARELLA DI BUFALA & RIPE RED TOMATOES	0.76248	0.00096
Entrée	GRILLED CHICKEN	1.02078	0.00113
Entrée	PROSCIUTTO & MOZZARELLA	1.48842	0.00148
Entrée	LA SPAGHETTATA	0.79298	0.00133
Entrée	LA SPAGHETTATA with meat balls	8.60698	0.00236
Entrée	PENNE PISTICCI	1.20408	0.00158
Entrée	PROSCIUTTO E SPINACI	1.51150	0.00224
Entrée	ORECCHIETTE BROCCOLI RABE	0.79660	0.00108
Entrée	ORECCHIETTE BROCCOLI RABE with spicy sauage	1.7326	0.00147
Entrée	FREE RANGE CHICKEN IN SAGE	1.58234	0.00102

Table 3: Carbon Content per Lunch Menu Item

Dinner Menu based on course type			
Meal Type	**Menu**	**Raw-material CO_2 e (kg/kg)**	**Transport CO_2 e (kg/kg)**
Appetizer	INSALATA MISTA	0.44362	0.00217
Appetizer	SHAVED FENNEL & GREENS	1.09318	0.00331
Appetizer	INSALATA CAPRESE	1.00826	0.00299
Appetizer	INSALATA PISTICCI	0.67796	0.00305
Appetizer	ROASTED GARLIC BREAD	0.37290	0.00137
Appetizer	STEAMED ARTICHOKE	0.33500	0.00137
Appetizer	OLIVE AND CHEESE BOWL	0.61960	0.00083
Appetizer	GRILLED EGGPLANT	1.05050	0.00195
Appetizer	VEGETABLE CECI	0.98092	0.00084
Appetizer	FRESH STEAMING MUSSELS	3.52580	0.00152
Appetizer	MINESTRONE	0.59640	0.00209
Entrée	VEGETABLE CECI with grilled Portobello	0.66096	0.00149
Entrée	LA SPAGHETTATA	0.79298	0.00133
Entrée	PROSCIUTTO E SPINACI	1.51150	0.00224
Entrée	ORECCHIETTE BROCCOLI RABE	0.79660	0.00108
Entrée	ORECCHIETTE BROCCOLI RABE add spicy sausage	1.7326	0.00147
Entrée	PENNE PISTICCI	1.20408	0.00158
Entrée	TUSCAN BEAN RAVIOLI	0.9146	0.00184
Entrée	FETTUCINE AI FUNGHI	0.9746	0.00159
Entrée	MALTAGLIATI WITH RICOTTA, SPINACH AND LAMB	4.2256	0.00208
Entrée	MICHAEL'S PASTA	0.9816	0.00272
Entrée	MEATBALLS w/POLENTA	7.91260	0.00142
Entrée	VEGETARIAN'S DELIGHT	0.83310	0.00154
Entrée	FREE RANGE CHICKEN BREAST GRILLED IN SAGE	1.58234	0.00102
Entrée	GRILLED SALMON FILET	1.22100	0.00307
Entrée	BLACK ANGUS SKIRT STEAK	7.75206	0.00235
Entrée	CREAMY POLENTA	1.25350	0.00168
Entrée	BRAISED GREENS	0.11100	0.00121
Entrée	ROSEMARY POTATOES	0.17830	0.00126

Table 4: Carbon Content per Dinner Menu Item

The below given table 5 summarizes the overall carbon contribution from the Raw-materials (used in preparing the menu items) based on the meal type (Brunch, Lunch, Dinner) and course type (appetizer and entrée) and the transportation of the raw materials to Pisticci.

Meal Type	**Course Type**	**No of Dishes**	**Raw material CO_2 e (Kg/Kg)**	**Transport CO_2 e (Kg/Kg)**
Brunch	Appetizer	1500	2251.68	5.26970
	Entrée	2490	7128.26	5.35184
Lunch	Appetizer	1500	1566.76	3.33503
	Entrée	2490	4331.14	3.75358
Dinner	Appetizer	1500	1459.65	2.92939
	Entrée	2490	4791.73	4.28314

Table 5: Total Carbon Footprint Across Meal Type

Energy Use: Even after being procured form the Market, raw food ingredients are processed before they become a part of a recipe and end up on a plate, served to a customer at a restaurant. The processing of the raw food ingredients such as storage, cooking, blending, pureeing, etc. contribute to the total carbon emissions embodied in a given menu item. The carbon footprint from cooking, and overall processing of the raw materials (food ingredients) are calculated from the energy used in the cooking and the processing of food items. Figure 1 from the US Energy Information Administration (EIA) below showcases average electricity consumption at a restaurant.

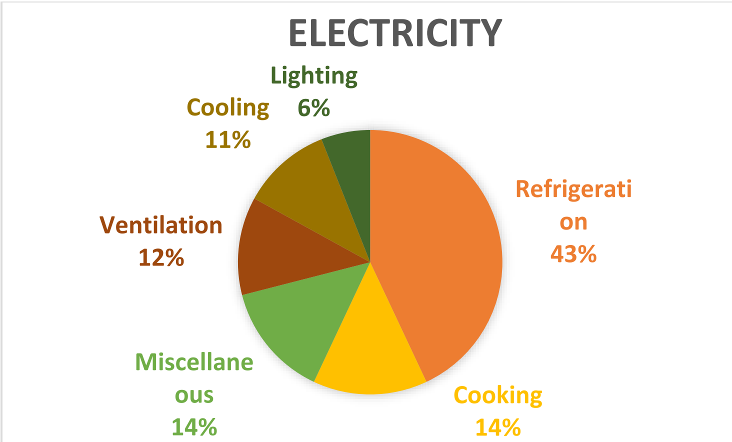

Figure 1: Electricity Consumption at a Restaurant (EIA, https://www.eia.gov/)

The carbon footprint (contribution) from cooking and processing of the raw materials (food ingredients) for all meal type (Brunch, Lunch, Dinner) are accounted for by considering electricity and natural gas consumption at Pisticci. The information on the actual electricity and natural gas consumption at Pisticci restaurant for March 2018 was obtained from the utility bill for the period of (February 22,2018 to March 23, 2018). Table 6 below, gives the electricity consumption at Pisticci for March 2018. Note that the computer, office area, heating, and water heating each account less than 5 % of electricity consumption, included under the Miscellaneous electricity use. Figure 2 below shows information from the U.S. Energy Information about the average natural gas consumption at a restaurant.

Type	Energy (kWh)
Refrigeration (43%)	3474.4
Cooking (14%)	1131.2
Miscellaneous (14%)	1131.2
Ventilation (12%)	969.6
Cooling (11%)	888.8

Lighting (6%)	484.8
Total	8080

Table 6: Electricity consumption at Pisticci March 2018

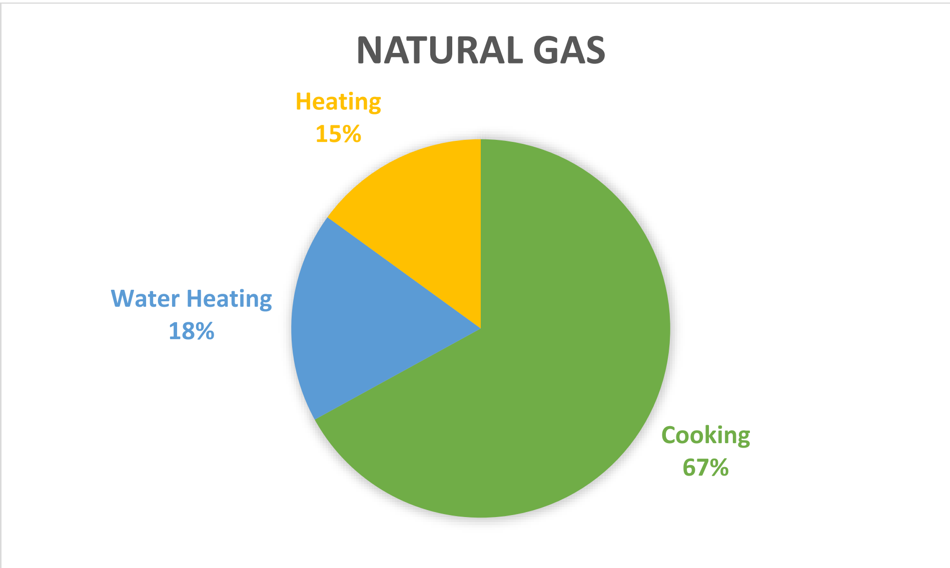

Figure 2: Natural Gas Consumption Composition at a Restaurant (https://www.eia.gov/)

Table 7 gives the natural gas consumption at Pisticci based on their utility bill for Mach, 2018. Note that the computer, office area, heating, and water heating each account less than 5 % of electricity consumption, included under the Miscellaneous electricity use. Cooling and miscellaneous (computer, office, water heating) each represent less than 5% of natural gas consumption and hence considered as negligible and not shown in this figure and are excluded from the calculations.

Type	**Energy (kWh)**
Cooking (43%)	1112.2
Water Heating (18%)	298.8

Heating (15%)	249
Total	1660

Table 7: Natural Gas Consumption at Pisticci Based on March 2018, Utility Bill

Meal Type	Raw material CO_2 e (Kg/Kg)	Transport CO_2 e (Kg/Kg)	Raw material (t CO_2e)	Transport (t CO_2e)	Total (Meal Type) (t CO_2e)
Brunch	9379.95	10.62	9.38	0.01	9.39
Lunch	5897.91	7.09	5.89	0.007	5.90
Dinner	6251.39	7.21	6.25	0.007	6.26
Total (LCA segment)	21529.25	24.92	21.53	0.02	21.55

Table 8: Total Carbon Footprint per Meal Type Across Raw Ingredients and Transport

Table 8 summarizes the total carbon footprint (t CO2 e) throughout all the menu items served at Pisticci restaurant over one-month period. The table summarizes the carbon content of the raw-materials, energy use and the transportation of the raw materials based on the Meal type (Brunch, Lunch, Dinner) across a full LCA segment.

	Raw material (t CO_2e)	Transport (t CO_2e)	Energy (t CO_2e)	Total (Meal Type) (t CO_2e)
Emission/Month (t CO_2e)	21.5	0.02	14.11	35.63

Table 9: Total Carbon Emissions in Metric Tonnes Generated by Pisticci

Table 9 summarizes the total carbon footprint in metric tonnes (t CO_2e) based on the full LCA segment for 1 month of data incorporating the carbon content of the raw materials, their transportation, energy use for cooking, and processing the raw food ingredients into recipes served at Pisticci. Pisticci generates about 35.63 (t CO_2e) metric tonnes of carbon dioxide equivalent (t CO_2e) over one month.

DICUSSIONS

The restaurant industry is one of the top-ranking energy-intensive entities within the commercial sector, using as much as three times more energy per square foot than most other commercial building infrastructure (Masih et al., 2012). The energy use may differ depending on fuel type used at the restaurent. There are many cost-effective energy efficiencies upgrades that are easy for restaurants to implement to lower the energy use significantly. Many utility companies across the US offer services such as energy audits and financial incentives (such as rebates or low-cost financing). These programs not only help the restaurants in identifying energy saving options and implement energy-saving measures but also act as a great option towards lowering carbon footprint from the restaurant's business activities. One good example is the Energy Star program initiated by the U.S. Department of Energy, which performs the quality checks of the appliances, to determine whether the appliances and consumer goods items are energy efficient by measuring their energy consumption.

In general, restaurant owners can reduce the carbon output from their business (supply chain) by reducing the food miles (transportation of the food ingredients) and procuring their raw materials locally. This not only supports the local farmers and the regional economy, but also provides financial benefits to the restaurant, by lowering the cost and risks (food contamination and spoilage) involved in long-distance transport of raw materials. While the distance food travels (food miles) can affect the carbon footprint of a dish (in the supply chain of the restaurant), so also can the food ingredients themselves. The vegetables sourced locally contribute less to the carbon footprint of a restaurant and, meat and dairy products can have a tremendous impact of carbon footprint of a restaurant. Using fruits and vegetables creatively and offering menu items with an ample use of fruits and vegetables, will not only reduce the use of and dependence on meat and dairy ingredients but could also contribute towards lowering the carbon footprint of the restaurant supply chain. Another option is to lower a restaurant's carbon footprint is to reduce food wastage. By choosing to reduce and recycle food waste restaurants can lower the carbon footprint of their supply chain activities of the restaurant.

The increasing government regulations, consumer demand, and corporate social responsibility, are some of the driving factors for companies to actively quantify, lower and offset the greenhouse gas (GHG) emissions within the supply chain activities of their business. With the growing demand of eco-friendly products, the concept of carbon accounting is getting more attention, and is serving as a knowledge tool for the consumer to make better product choices.

CONCULSIONS

This LCA analysis was performed for food items across three meal types (brunch, lunch, dinner) in the food menu offered at Pisticci. This LCA is based on one-month's data collected from Pisticci Restaurant which is based in New York city. On an average Pisticci restaurant sells around 250 Entrée and 150 appetizers per day. The data for calculating carbon footprint ($kgCO_2e$) of individual raw ingredients (their transport), processing, and energy use (in cooking), are included in the report. The final analysis represents the total carbon footprint of the food menu that was served by the restaurant period over a period of one-month. Over the course of the studied interval, Pisticci generates about 35.63 (t CO_2e) total carbon. In general, restaurants owners could use the information on carbon footprint to incorporate carbon emissions impacts (carbon footprint), while making supply chain related decisions (materials, manufacturing processes, etc.). This will not only demonstrate their CSR commitments but also make their products/services more appealing and help in fulfilling the demands of sustainability consensus consumers.

ACKNOWLEDGEMENT

I would like to thank Ms. Olivia Fussell and Mr. Reed Shapiro from Carbon Credit Capital for guiding me through this Capstone work. Special thanks to Mr. Michael Forte from Pisticci Restaurant for giving me a chance to work with them.

APPENDIX

Examples of LCA analysis

Lemon Ricotta Pancakes (Entrée)					
Ingredients	**Weight (kg)**	**Carbon Coefficient**	**Total Carbon CO_2 e (kg/kg)**	**Distance (miles)**	**Transportation CO_2 e (kg/kg)**
All-purpose flour	0.1920	0.95	0.1824	16	0.00050
Granulated sugar	0.0501	2.87	0.14364	16	0.00013
Milk	0.2270	4.55	1.03285	16	0.00059
Ricotta	0.0960	13.12	1.25952	16	0.00025
Large eggs	0.1920	6.18	1.18656	16	0.00050
Lemon juice	0.0570	0.245	0.01396	16	0.00015
Butter	0.0286	12.5	0.35750	16	0.00007
Berries	0.0500	0.13	0.00650	16	0.00013
Total			4.18293		0.00231

FRENCH TOAST (Entrée)					
Ingredients	**Weight (kg)**	**Carbon Coefficient**	**Total Carbon CO_2 e (kg/kg)**	**Distance (miles)**	**Transportation CO_2 e (kg/kg)**
Egg	0.1280	3.39	0.43392	16	0.000331
Milk	0.0570	4.55	0.25935	16	0.000147
Bread	0.1000	2.39	0.23900	16	0.000258
Mascarpone	0.0500	13.12	0.65600	16	0.000129
Seasonal berries	0.0500	0.13	0.00650	16	0.000129
Total			1.59477		0.001013

PISTICCI FIORENTINO (Entrée)					
Ingredients	**Weight (kg)**	**Carbon Coefficient**	**Total Carbon CO_2 e (kg/kg)**	**Distance (miles)**	**Transportation CO_2 e (kg/kg)**
Egg	0.2560	3.39	0.86784	16	0.00066
Spinach	0.5000	0.54	0.27000	25	0.00202
Prosciutto	0.0200	4.23	0.08460	16	0.00005
Tomato Medallions	0.1000	0.67	0.06700	25	0.00040
Total			1.28944		0.00313

SPINACH GOAT CHEESE OMELET (Entrée)					
Ingredients	**Weight (kg)**	**Carbon Coefficient**	**Total Carbon CO_2 e (kg/kg)**	**Distance (miles)**	**Transportation CO_2 e (kg/kg)**
Egg	0.2560	3.39	0.86784	16	0.00066
Spinach	0.5000	0.54	0.27000	25	0.00202
Onion	0.0200	0.18	0.00360	16	0.00005
Heavy Cream	0.0280	0.53	0.01484	16	0.00007
Goat Cheese	0.0300	8.86	0.26580	16	0.00008
Roasted Potatoes	0.5000	0.2	0.10000	25	0.00202
Side Greens	0.3000	0.47	0.14100	25	0.00121
Total			1.66308		0.00611

UOVA CONTADINE (Entrée)					
Ingredients	**Weight (kg)**	**Carbon Coefficient**	**Total Carbon CO_2 e (kg/kg)**	**Distance (miles)**	**Transportation CO_2 e (kg/kg)**
Egg	0.3840	3.39	1.30176	16	0.00099
Tomatoes sauce	0.2250	0.46	0.10350	16	0.00058
Onion	0.0400	0.18	0.00720	16	0.00010
Tomatoes	0.0500	0.46	0.02300	25	0.00020
Roasted Potatoes	0.5000	0.2	0.10000	25	0.00202
Side Greens	0.3000	0.47	0.14100	25	0.00121
Olive Oil	0.0200	3.66	0.07320	16	0.00005
Total			1.74966		0.00516

STEAK AND EGGS (Entrée)					
Ingredients	**Weight (kg)**	**Carbon Coefficient**	**Total Carbon CO_2 e (kg/kg)**	**Distance (miles)**	**Transportation CO_2 e (kg/kg)**
Egg	0.1920	3.39	0.65088	16	0.00050
Beef	0.8000	28.73	22.98400	16	0.00207
Roasted Potatoes	0.5000	0.2	0.10000	25	0.00202
Side Greens	0.3000	0.47	0.14100	25	0.00121
			23.87588		0.00579

THE "PERFECT MEAL" SALAD (Appetizer)					
Ingredients	**Weight (kg)**	**Carbon Coefficient**	**Total Carbon CO_2 e (kg/kg)**	**Distance (miles)**	**Transportation CO_2 e (kg/kg)**
Chicken	0.8000	4.12	3.29600	16	0.00207
Portobello (Mushroom)	0.0650	0.27	0.01755	16	0.00017
Avocado	0.0650	1.3	0.08450	16	0.00017
Mozzarella	0.0500	0.12	0.00600	16	0.00013
Greens	0.5000	0.47	0.23500	25	0.00202
Total			3.63905		0.00455

CHICKPEA AVOCADO SALAD (Appetizer)					
Ingredients	**Weight (kg)**	**Carbon Coefficient**	**Total Carbon CO_2 e (kg/kg)**	**Distance (miles)**	**Transportation CO_2 e (kg/kg)**
Chickpeas	0.1000	0.67	0.06700	16	0.000258
Carrots	0.0650	0.22	0.01430	25	0.000262
Avocado	0.2000	1.3	0.26000	16	0.000517

red peppers	0.0500	0.6	0.03000	25	0.000202
Mozzarella	0.0500	8.86	0.44300	16	0.000129
Greens	0.5000	0.47	0.23500	25	0.002018
Total			1.04930		0.003386

MINESTRONE SOUP(Appetizer)					
Ingredients	**Weight (kg)**	**Carbon Coefficient**	**Total Carbon CO_2 e (kg/kg)**	**Distance (miles)**	**Transportation CO_2 e (kg/kg)**
Onion	0.0500	0.21	0.01050	16	0.000129
Celery	0.0200	0.18	0.00360	16	0.000052
Green Beans	0.0500	0.26	0.01300	25	0.000202
tomatoes	0.1000	0.46	0.04600	25	0.000404
crushed tomatoes	0.1700	0.67	0.11390	25	0.000686
kidney beans	0.1700	1.06	0.18020	16	0.000439
elbow pasta	0.0500	1.04	0.05200	16	0.000129
Parmesan cheese	0.0200	8.86	0.17720	16	0.000052
			0.59640		0.002092

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