

BATTLE OF THE BUILDINGS

CITY OF YONKERS, NEW YORK

Client

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FOREWORD

This report was prepared by a team of graduate students from the Columbia University Masters of Science in Sustainability Management (MSSM) Program, which is co-sponsored by the Earth Institute and the School of Continuing Education. This workshop is a client-based consulting project that allows students to address realistic sustainability management issues.

Through research, analysis, and strategic planning, this report was written for Mayor Mike Spano, Mayor of the City of Yonkers and Brad Tito, Director of Sustainability of the City of Yonkers. The purpose of this report is to create a friendly and informative competition among existing buildings in Yonkers. The goal is to improve the environmental impact of the buildings by modifying the occupants' behavior.



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ACKNOWLEDGMENTS

The members of this team would like to thank the Mayor's Office and the City of Yonkers for allowing us the opportunity to research and present this report. A special thanks to Brad Tito, the Director of Sustainability, for his time and patience in providing us the necessary information needed to put together an informed report.

We would also like to thank our faculty advisor, Thomas Abdallah, for his enthusiasm and thoughtful insight that helped us consider all possible perspectives throughout our research.

Lastly, we would like to thank all the individuals and building occupants who shared their thoughts and comments, and who took the time out of their busy schedule to partake in our interviews and surveys.

We are exceptionally grateful for all the parties involved in this process; without their contributions we would not have been able to achieve the full potential and success of this project.



EXECUTIVE SUMMARY

In 2013, Mayor Mike Spano and the City of Yonkers introduced the Yonkers' Green Buildings Ordinance, a commitment to make Yonkers a leader in sustainability. By 2014, the City of Yonkers requires that all new public developments in the Downtown area to incorporate sustainable initiatives into their design, construction and operation. With new structures addressing energy efficiencies the question arose how to address efficiencies within existing buildings. As a result, Brad Tito, the Director of Sustainability for the City of Yonkers, approached Columbia University Sustainability Management Program with the task to develop a Battle of the Buildings Competition. The goal of the competition is to promote sustainable practices through behavioral modification among building occupants.

This project is being created to help Yonkers municipal buildings reduce resource consumption while tracking and monitoring their own results. The parameters of this project are as follows:

1. Each initiative must be a simple task to accomplish, and may not hinder the productivity of a work day.
2. Each initiative must be easily measurable and can be tracked by each user.
3. All tasks are to be accomplished with no additional investment.
4. Tracking methods must take into account seasonal climate and be adjustable according to weather.
5. The competition must be adaptable for various buildings outside the initial scope (i.e. school buildings, industrial buildings, private commercial).

For the purpose of this project, we were asked to initially focus on three specific municipal buildings: the City Hall, City Hall Annex, and The Cacace Justice Center. To begin, we analyzed the context of Yonkers and studied the occupants' current behavior through a brief survey. City employees were asked to rate their opinions toward current sustainability efforts in the office. This allowed us to evaluate which initiatives would have more potential to be successfully implemented. The results of this survey allowed us to develop achievable sustainability actions for the competition.

The competition actions were categorized into these seven main areas: Energy, Water, Waste, Procurement, Outreach and Education, Health, and Transportation. We developed a rubric that shows in real-time how much each building is contributing to its efforts. Results can be recorded and then compared to reveal each building's strengths and weaknesses. The goal is to stimulate a sense of competition between the buildings and their occupants through gamification. This will also allow for an evaluator to be able to identify the gaps where behavioral improvements can be made.

The intent of this competition is to encourage building occupants to adopt sustainability initiatives in their workplace. This project is developed as a pilot program that will be monitored and adapted for the best end results. The competition is designed to ultimately roll out to school district and commercial buildings. This in conjunction with Yonkers' existing sustainable initiatives will build the City's position as a leader in sustainability.

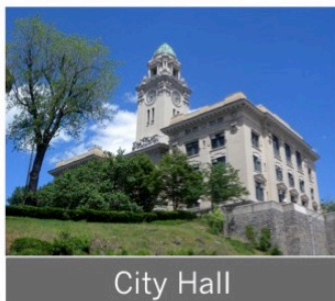


INTRODUCTION

In May of 2013, the Mayor's office introduced the Yonkers' Green Buildings Ordinance, which established a policy requiring implementation of sustainable design and construction practices for all new municipal development projects. In June 2013, the Commissioner of Planning and Development formally adopted the Yonkers Green Development Workbook including a checklist and standards to guide this policy. The City's Green Building Program expanded in 2014 requiring all construction projects in downtown Yonkers to follow the guidelines of Yonkers' Green Buildings Ordinance. This policy was executed with the hope that commercial and residential developments in all of Yonkers would follow suit.

In an effort to continue the momentum of this new sustainable initiative, the City of Yonkers requested that our team create a friendly competition called the "Battle of the Buildings Competition" or "BotB." The primary purpose of the competition is to influence occupants' behavior to impact the buildings' sustainability profiles. No major infrastructure modifications could be included in the scope of this project.

Phase One of the Battle of the Buildings Competition focuses on three municipal buildings in Yonkers: City Hall, the City Hall Annex, and the Cacace Justice Center. Our team studied each buildings' occupants' patterns to determine their current behaviors. We then analyzed data collected through the research phase to determine how best to modify occupants' behavior to achieve desired results. Finally, we developed a marketing strategy to educate and create awareness. The aim is to apply this methodology to other municipal buildings, public schools, and private commercial and industrial developments.



BACKGROUND

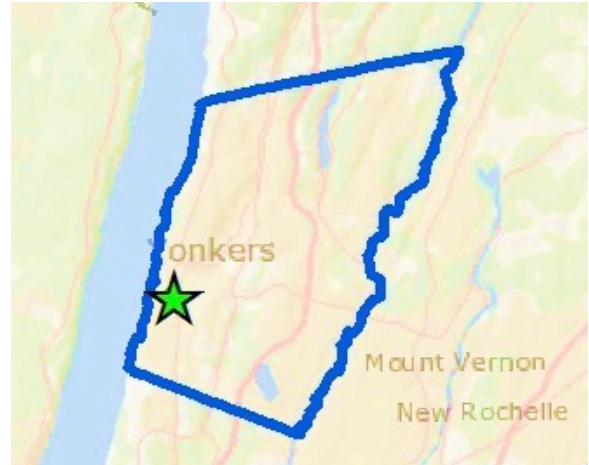
Client

This project is prepared for the City of Yonkers. Our team worked and coordinated primarily with Brad Tito, Director of Sustainability for the City of Yonkers. Mr. Tito took office as Director of Sustainability in 2012. He works with several departments of the City's government and community stakeholders to help conserve energy and improve Yonkers' environmental impact. Since taking office, he has instituted a number of initiatives in the areas of energy, water, solid waste, buildings, and transportation. These targeted actions are projected to save Yonkers' taxpayers millions of dollars over the next decade.

City of Yonkers

Bordered by White Plains to its north, New Rochelle and Mount Vernon to its east, the Bronx to its south, and the Hudson River to its west, the City of Yonkers is located about 20 miles outside of the heart of Manhattan in Westchester County, NY. Yonkers covers a land area of 18 square miles and has a population of approximately 200,000 residents. This makes Yonkers New York's fourth most populous city, and the most populous city in Westchester County, comprising about 20% of the county's population. With a population density of 11,090 people per square mile of land area, Yonkers also ranks as the 16th densest city of U.S. incorporated cities with a population of at least 100,000. Yonkers' also has a thriving commercial sector, with over 17,500 businesses calling it home.¹

¹ US Department of Commerce (March 2015) Population Trends in Incorporated Places: 2000 to 2013. United States Census Bureau. Retrieved on April 10, 2015 from <https://www.census.gov/content/dam/Census/library/publications/2015/demo/p25-1142.pdf>



Yonkers' Sustainability Initiatives

Since 2012, Yonkers has instituted a number of sustainability initiatives and programs, and has committed itself to becoming a leader in this area. Below are brief descriptions of just some of the city's most notable sustainability initiatives.

•Five Cities Energy Plan

Yonkers, along with Albany, Buffalo, Rochester and Syracuse, participates in the Five Cities Energy Plan program developed by the New York Power Authority. The program is a comprehensive plan that aims to reduce energy costs and consumption, strengthen the reliability of each city's energy infrastructure, create jobs in local clean energy industries, and contribute to a cleaner environment. The program addresses four key action areas: (1) Energy Planning & Coordination which includes initiatives designed to improve energy procurement and management processes while fostering public-private partnerships around clean energy deployment; (2) Energy Efficiency in Buildings which addresses improvements to building performance in municipal and private buildings; (3) Transportation Energy Efficiency which focuses on compact and transit-oriented development, congestion reduction strategies, alternative transportation

infrastructure, and clean vehicles; and (4) Energy Distribution & Supply which focuses on clean, distributed energy generation infrastructure.²

•Saw Mill River Daylighting Project

In the early years of the City's development, the Saw Mill River flowed openly into the Hudson River. In the 1920's, the river was dammed and diverted in order to help manage sanitation and floods in downtown Yonkers. As the river became more polluted it was eventually covered. Between the 1890's and 1920's, the Army Corps of Engineers constructed the concrete flume, which carried the river under much of downtown before its confluence with the Hudson River.

The Saw Mill River Daylighting Project broke ground in 2010 to expose the Saw Mill River at Larkin Plaza.³ Working with the local community and the Saw Mill River Coalition, Yonkers successfully exposed a portion of the Saw Mill River, creating an environmentally friendly recreational area for the residents of Yonkers. The first phase, a national award-winning success, transformed a surface parking lot known as Larkin Plaza into a 1.8 acre river-themed park. It was renamed Van Der Donck Park in honor of Yonkers' Dutch founder, Adrian Van Der Donck. The newly exposed river improved water quality and a series of other ecological benefits including river species native to the area, most notably the American Eel. After the success of the first phase, in 2014, the city added two new phases to the project to daylight more sections of the river. The proposed phase three of the Daylighting will create a park running along New Main Street

2 New York Power Authority (2015) Five Cities Energy Plan. Retrieved on March 31, 2015 from <http://www.nypa.gov/YonkersEnergyPlan.html>.

3 "Daylight Yonkers A River within a Park within a City Help Bring the River Back to Your Community!" Home Comments. Daylight Yonkers, n.d. Retrieved on April 26, 2015 from <http://daylightyonkers.com/>.

from Ann Street to the Nepperhan Avenue arterial.⁴

•LED Street Light Project

In 2014, Yonkers retrofitted all of its 11,300 street lights with LED technology. The project is expected to save taxpayers \$18 million in energy costs over a ten year period and reduce the City's carbon footprint by 3,000 tons annually. Yonkers is the first city in New York State to complete such a project.⁵

•Revised Recycling Guide

The City's Recycling Guide was completely revised in 2014 making it more user-friendly. Realizing the cluttered and confusing nature of the previous guides, Yonkers rolled out a new design that is being viewed as a model for municipal recycling guides throughout the region.⁶

•Styrofoam Recycling

Yonkers expanded its recycling program to allow residents to drop-off and recycle any foam or rigid plastic product bearing the #6 plastic designation, which includes take-out containers, foam-block packaging, polystyrene foam cups, becoming the first city in New York State to recycle Styrofoam.⁷

4 B. Tito (personal communication, April 24, 2015)

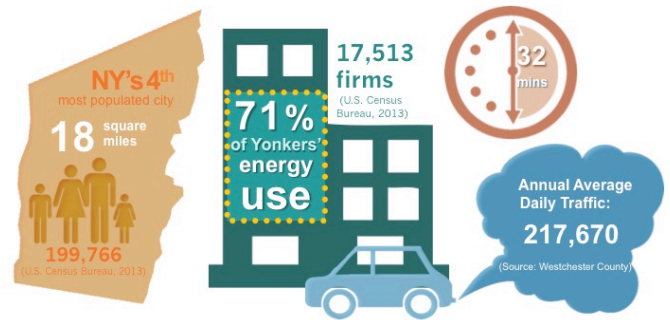
5 Ibid

6 Ibid

7 City of Yonkers (2014). Yonkers Mayor Mike Spano Announces Addition of Foam Cups and Packaging to City's Recycling Program. Retrieved on April 23, 2015 from <http://www.cityofyonkers.com/Home/Components/News/News/2177/3218>

METRICS

The following energy, water, waste and transportation data for the City of Yonkers and the targeted three municipal buildings (where data is applicable and available), will demonstrate not only the need, but the opportunities to reduce consumption and greenhouse gas emissions while improving quality of life.



Energy: Current Usages Trends

The aging building infrastructure in Yonkers has been a major contributor to the City's high energy consumption and greenhouse gas emissions. Even though residential, commercial retail, industrial and public buildings account for only 23% of the City of Yonkers' land use, they account for 71% of overall energy use. Public buildings consist of 50 municipal buildings and 45 school district buildings, making up 5% of the land use. These buildings contributed to nearly 78% of overall 600,000 mmBtu of the City's energy consumption, a cost of \$12.1 million in 2010.⁸ School district buildings are responsible for 54% of the public buildings' energy use.⁹

Water: Current Usage Trends

The Water Bureau is responsible for providing the City and all its residents, commercial and industrial users with potable water. In 2013, per capita water consumption in the City was 133 gallons per day, which is comparable to New York City's consumption. As part of Mayor Mike Spano's "Yonkers Green City" sustainable initiatives, more than 30,000 traditional water meters are scheduled to be replaced with smart meters that will be more accurate, reliable and allows users to be better informed about their water usage.¹⁰

8 Ibid 2

9 Ibid 2

10 City of Yonkers, 2015, Yonkers Water Quality Report, Retrieved on April 13, 2015 from <http://www.yonkersny.gov/government/departments/public-works/yonkers-water-quality-report>

Waste: Current Generation Trends

The Environmental Services Division of Yonkers collects, transports and disposes nearly 156,000 tons (313 million pounds) of garbage per year. Through aggressive recycling initiatives, in 2012, Yonkers' overall amount of material recycled has improved by 6% to 69,490 tons.¹¹ Approximately 8,000 tons of pulp (e.g. newspaper), 3,000 tons of mixed recyclables (metals, plastic and glass) and 9,500 tons of organic yard waste are recycled every year at a recycling facility in Yonkers.¹²

According to Mr. Tito, public buildings, including school district buildings, consume 70 million sheets of paper per year. Municipal buildings use 7 million sheets (10%) while the school district uses 63 million sheets (90%) per year. Although a recycling program is in place in all buildings, no data or baseline assessment has been collected to determine the amount of waste that is being recycled within municipal and school district buildings.¹³

Building Occupants: Usage

The table below represents metrics, related to the mentioned parameters, available for our three initial targeted buildings.

PARAMETERS	City Hall	City Hall Annex	Cacace Justice Center
Full time employees	50	50	300
Visitors per day	Unknown	Unknown	1000
Energy (mmBtu)	8.61	7.23	14.41
Electric Load Factor (%)	0.27	0.3	0.33
Annual Energy Cost (\$/sqft)	\$2.90	\$3.04	\$3.92
Carbon Per Worker (tons)	18.44	20.8	6.94
Water Per Worker (Gallons)*	549.33	549.33	1003.76
Waste Per Building (Bags)**	14750	14750	182355

Existing Buildings

As the energy data above indicates, the existing 95 publicly-owned buildings are exceedingly resource intensive. Since the Green Building Ordinance applies solely to construction of new public buildings in Yonkers and any new development in downtown Yonkers, measures must be taken to reduce environmental impact of existing buildings. Upgrading or replacing equipment requires large investment capital. An alternative option is to improve a building's efficiency by modification of occupants' behavior which requires no or minimal investment.

11 City of Yonkers, 2015, GARBAGE & RECYCLING, from <http://www.yonkersny.gov/live/garbage-recycling>

12 City of Yonkers, 2015, ENVIRONMENTAL SERVICES DIVISION, Retrieved on April 13, 2015 from <http://www.cityofyonkers.com/live/garbage-recycling/environmental-services-division>

13 B.Tito (personal communication, March 19, 2015)

Transportation: Context and Trends

Transportation accounts for 29% of Yonkers' energy consumption.¹⁴ On a daily basis, an average of 200,000 vehicles are on the road with a commute time of approximately 32 minutes.¹⁵ Single-occupancy vehicles are the main contributors to transportation energy consumption. In 2014, the City conducted a survey of its employees that revealed that 80% of employees drive five days per week to work with an average round-trip commute of 22 miles [Appendix 3]. Through vigorous campaigning, the City of Yonkers is encouraging transportation alternatives to single-occupancy vehicles such as: carpooling, biking, walking and use of mass transit.

Achieve Change

This paper explores reducing resource use by modifying occupants' behavior. An "energy efficient building" is not necessarily a new building that is constructed using energy efficient materials and equipment but rather a building in which resource use is managed effectively by its occupants. Building occupants play a major role in a building's resource use. According to a study by Energy Trust of Oregon for Oregon's Washington County, about one-third of energy consumption in a building is attributed to people's behavior.¹⁶ Through behavioral modification, resource reduction can be achieved by engaging occupants to become more accountable for their resource use. A relevant example that demonstrates the importance of occupants' behavior is "plug load". Plug load controlled by occupants is increasingly contributing to a building's electricity consumption. Behavioral changes related to equipment turned off at nights and weekends can dramatically reduce electricity consumption and cost.

There are a number of ways to motivate occupants to change their behavior which will be discussed in detail in the marketing strategy section. One strategy is creating a healthy competition that prompts the human desire to do better than the next guy. A competition such as "Battle of the Buildings" (BotB) can be an effective tool in promoting environmentally responsible behavior.

14 Ibid I

15 U. S. Census Bureau (2013) State and County Quick Facts. Retrieved on March 7, 2015 from <http://quickfacts.census.gov/qfd/states/36/3684000.html>

16 Energy trust of Oregon, (2014), Washington County, Retrieved April 18, 2014, from <https://vimeo.com/88482444>

GOOD PRACTICES: EXAMPLES

One of the first actions our team took to create Yonkers' BotB Competition was to research and analyze successful examples of sustainable building challenges and certification programs around the country. Our team found many sustainability certifications and challenges throughout the country. However, many of the challenges we found also included building design initiatives and operations not permitted in the scope of this project that would require substantial structural changes to the buildings or investment.

In order to narrow down the search, our team focused primarily on challenges and certification programs that (1) focus on human behavior of the occupants as a substantial element of the program, (2) require low investment capital, (3) tailors to buildings both at the beginning of their sustainability initiatives and those further along in their efforts, and (4) contain a user-friendly and easy-to-follow scoring system. Initially we started by analyzing the LEED certification program since it is the most recognizable program in this area. Our team found LEED's initiatives focused heavily on design and operations of buildings, and required some level of capital investment in structural and equipment upgrades, instead of human behavior of occupants.

We found college, university, and city green building certification programs fit the objectives of this project the best. After analyzing a number of sustainable building challenges, we looked for commonalities among the programs including: overall categories used, action items within each category and scoring methodologies. In the following subsection we highlight a few of the programs that our team analyzed.



BATTLE OF THE BUILDINGS

EPA'S NATIONAL BUILDING COMPETITION

WATCH US WORK OFF OUR WASTE AT
energystar.gov/BattleOfTheBuildings



•EPA Energy Star Battle of the Buildings Challenge

The largest Battle of the Building challenge is hosted by the United States Environmental Protection Agency (EPA). The EPA building competition is set up to inspire participants to save money and shrink their environmental footprint by challenging them to improve their property's energy efficiency. The challenge suggests implementation methods, and benefits for participating including cost saving, positive publicity, media exposure, and networking opportunities.

The competition is open to trade associations, commercial businesses, manufacturing plants, utility companies, local and state governments, schools and congregations. To enter the competition the organization must be: an ENERGY STAR partner, headquartered in the United States, data must actually be measured, and ENERGY STAR must be able to verify data. ENERGY STAR's 2013 Battle of the Buildings Challenge winner was Claiborne Elementary School. The school reduced energy use by 45.9%, saving an estimated \$294,300 and preventing 490 metric tons of greenhouse gases.¹⁷

•West Michigan's Battle of the Building

West Michigan's Battle of the Building partners with Consumers Energy, DTE Energy and the Michigan USGBC Battle of the Building program to reduce energy. The program encourages energy-efficient practices. The statewide challenge recognizes and awards energy reduction by giving tax credits for commercial and industrial buildings. More than 100 buildings, with over 21 million square feet, throughout Michigan currently participate.¹⁸

•Chicago Green Office Challenge

Catalyzes environmental sustainability and economic development throughout the Great Lake region. It partnered with the City of Chicago and Office Depot to reduce environmental impact through reduction of energy, waste and water. The 4th Annual Green Office Challenge ran from September 2014 through Earth Day, April 22, 2015. Participants earned points for completing activities, such as tracking energy use, conducting a waste audit and recruiting peer businesses to participate. On the third annual challenge, 1,000 individuals from 250 Chicago based businesses participated, completing 4,800 activities total.¹⁹

•Illinois Green Office Challenge

The Illinois Green Office Challenge encourages competition among public and private office buildings to achieve energy and water conservation, carbon emissions and waste reduction. In the 2013, this challenge reported an average of 11% reduction in participants' energy usage. The challenge is a pilot program for office buildings located in the cities of Peoria, Bloomington-Normal or Urbana-Champaign. The plan is for this challenge to be rolled out in additional cities.²⁰

17 Energy Star, 2015, Host an Energy Star battle of the Buildings Competition, Retrieved (April 19, 2015), from <http://www.energystar.gov/buildings/about-us/how-can-we-help-you/communicate/energy-star-communications-toolkit/motivate-competition-7>

18Michigan Battle of The Building, 2015, Welcome to Michigan Battle of The Buildings, Retrieved (April 19, 2015), from <http://www.michiganbattleofthebuildings.org/>

19 Delta Institute, (September 9, 2014), Delta Institute Launches 4th Chicago Green Office Challenge, Retrieved (April 19, 2015) from <http://delta-institute.org/2014/09/delta-institute-launches-4th-chicago-green-office-challenge/>

20 University of Illinois, 2014, Illinois Green Office Challenge, Retrieved (April 19, 2015), from <https://www.illinoisgoc.com/index.cfm>

PROJECT OVERVIEW: Battle of the Buildings (BotB)

Introduction

The Battle of the Buildings (BotB) is a competition among various buildings in the City of Yonkers. The goal of the competition is to influence human behavior of building occupants to implement sustainable practice into their daily routine. The competition promotes the conservation of resources (i.e. electricity, paper, water and reducing waste). Recognition and competition is used to motivate occupants to take simple effective actions to reduce their use of resources. Collectively occupants actions create measurable impact.

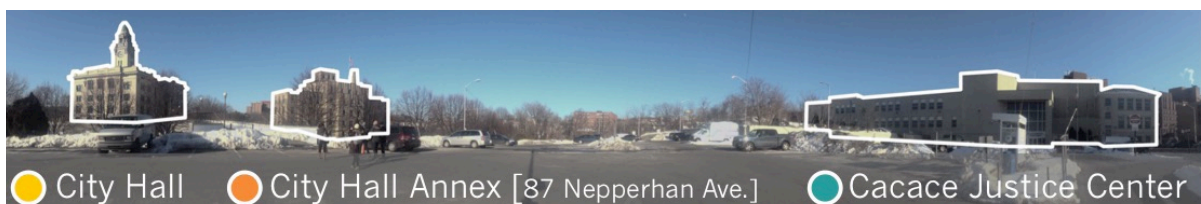
The BotB provides two sets of initiatives for building occupants: one for building users, and the other for the buildings' operations and maintenance staff, such as facility managers and custodians. Building occupants are requested to make specific efforts that will not affect their workload and productivity, but will significantly impact the reduction in resource usage. Building operators are also asked to take proactive steps in monitoring, regulating and adjusting equipment to save resources. It is important that all steps be simplistic and that all occupants participate.

Phase One of the BotB will start in three municipal buildings. In Phase Two, the remaining City municipal buildings and school buildings will join the program. Phase Three incorporates privately owned commercial and industrial developments into the competition.

Project purpose

The project's goal is to improve the use of resources and reduce waste within commercial and industrial buildings in Yonkers. Tapping the behavior of building occupants is a low cost and effective way to create a significant impact in resource reduction.

Investing in technology and improved systems can reduce resource consumption. However, such upgrades generally require large capital investments, months to years for project completion, plus training for proper operation and maintenance to ensure effectiveness. Behavior modifications can be implemented almost immediately, requires minimal economic commitment, and the scope of benefits can prove much broader than a single initiative. Utilizing modification in behavior to manage resources more effectively can benefit not just the workplace but all buildings the users occupy beyond their workday.



Participants

Participation of many individuals is required to achieve the desired outcome for the BotB competition. This competition includes building occupants, a volunteer Green Team, and an evaluator, introduced below.

•Building Occupants

First and foremost the buildings' occupants are most instrumental in the success of the competition. Buildings' occupants include daily office workers, staff and building visitors as well as facility managers and custodians who play an essential role in the daily operations of each building.

•Green Team

Another vital part of the competition is the creation of a Green Team. The Green Team consists of individuals from each building who have shown considerable desire to make sustainable changes to their work environment. The Green Team will be responsible for motivating their peers and act as a liaison between building occupants and the management.

•Evaluator

An evaluator should be designated to ensure accuracy and validity of the collected data. The evaluator can be an unbiased internal position or a third party. In Phase One of this project, the process of evaluation will be managed by the City of Yonkers' Office of Sustainability.



Selection of categories

The competition is focused on the selection of the areas and initiatives that create the greatest impact, easiest to do, and meet the least resistance with the user base. The selection includes initiatives from several existing competitions plus new initiatives our team believes is suitable for building occupants in Yonkers. All initiatives are categorized under: Energy, Water, Waste and Materials, Health, Procurement, Education and Outreach, and Transportation. Since our goal is to create a competition that involves only modification in user's behavior, capital improvement projects, such as installing low flow faucets, are not included.



•Energy

Energy is an area where the greatest impact for conservation can be realized. Taking small action can add up to great savings. To conserve energy, the competition requires building occupants to engage in a number of initiatives within: individual workspaces, the department and the overall building.

In individual workspaces the competition requests building occupants to: power off computers and monitors when leaving the office, shut off lights when there is adequate daylight, remove space heaters, set computers to enter sleep mode after 15 minutes of inactivity, reduce the number of electronics plugged in at workstations, power off power strips when leaving their workstation.

Within departments, building occupants should: turn off lights when leaving the room, ensure windows are closed when heating or cooling is active, have a designated person for turning the lights off at the end of the day, place office equipment and small appliances (including computers, monitors, fax machines, etc.) on power strips so they can be easily powered down when not in use, dim lighting or shut off lights when daylight is sufficient.

In a building, the building facility managers and maintenance staff should: set building temperature to 68 degrees when heating and 72 degrees when cooling, ensure window A/C units are turned off at the end of the workday, monitor for lights in bathroom/ kitchen/ conference rooms to ensure lights are off when not in use, disconnect lights from the vending machine, ensure workstations do not have personal appliances (i.e. mini-fridges, fans, space heaters).

•Water

Water reduction initiatives include: building or facilities manager conduct a water fixture inventory and monitor flow rates, create a time-frame in which water leaks are required to be fixed, have a process in place for building users to report water leaks to facilities personnel quickly and easily. These simple steps can help to identify wasteful leaks that otherwise may go unfixed for long periods.

•Waste

In order to reduce waste and conserve materials, the competition includes actions that discourage waste generation and promotes recycling. Waste reduction actions are: separate waste from recycling, reduce paper by printing on both sides, use reusable dishes and utensils, encourage drinking tap water by removing bottled water and water coolers, when possible distribute documents electronically in lieu of printing, eliminate the use of Styrofoam containers and plastic utensils, and order the proper amount of food for meetings.

Actions that promote recycling are: have trays available to collect scrap paper, print informal documents on scrap paper, designate recycling areas in each office. By avoiding wasteful behaviors and adapting practical behaviors, a significant amount of waste can be repurposed and prevented. Conducting a waste stream audit and setting waste reduction goals is an important step necessary to reduce waste. A waste stream audit will identify key sources of waste. This information can be used to develop waste mitigation strategies. Measuring is key in reduction, this project recommends measuring and monitoring both waste and recycling.

•Health

Creating a more sustainable work environment benefits the environment as well as employees and the organization. Carbon reduction and health initiatives include: promoting Meatless Mondays, have and care for office plants and within the office building, take the stairs instead of the elevator. The benefits of healthier employees are vast including fewer sick days and increased productivity²¹.

•Procurement

Purchasing power has an impact on business and outside industry. Making smart sustainable purchases can save money, change industry behaviors, and impact an office environment. Actions to promote sustainable procurement include state purchase of: green cleaning supplies, recycled materials when possible, green products when feasible, and paper towel and napkins made from post consumer content. Before purchasing new products, the office staff should check for surplus supplies and or equipment to avoid unnecessary purchases.

21 Centers for Disease Control and Prevention(CDP). (2012, April). Sustainable Workplace, Retrieved April 18, 2015, from <http://www.cdc.gov/sustainability/workplace/index.htm>

•Education and Outreach

Education and outreach is an integral part of behavior modification. The importance of education and outreach is to inform people about sustainability issues and reinforce sustainable behaviors in the building. To promote outreach and education about sustainable behaviors and practices, actions are: Green Team updates during office meetings, acknowledgment of individual efforts for outstanding sustainable practices, reminders including labels/signs/posters near light switches, printers, copiers, sinks, etc. to engage employees in sustainable practices, host “Sustainability 101” training for staff or provide external “Sustainability 101” information and externally communicate sustainability accomplishments. Positive recognition of participants is a key motivator to making the competition successful.

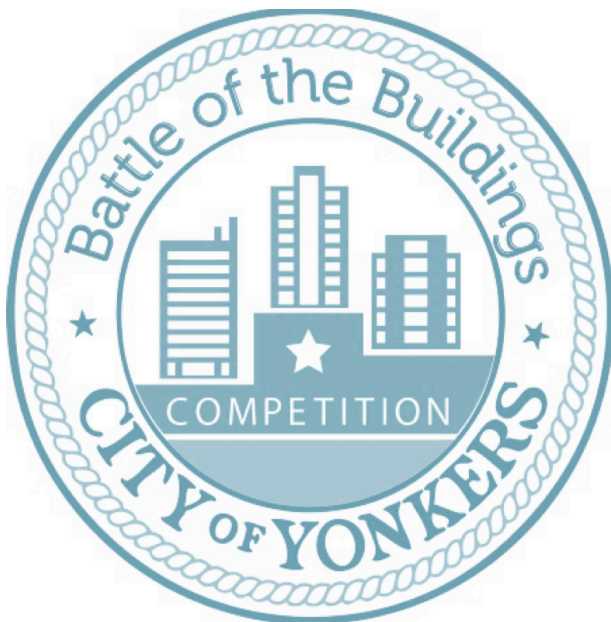
•Transportation

Transportation can play a large role in environmental sustainability and health. Recommendations for this project encourage the use of alternative forms of transportation and reduced use of personal vehicles. Initiatives include: when possible avoid business travel by utilizing video conference calling, encourage carpooling and ride shares and commute via a “green” form of transportation (bike, public transport, car share, walk, etc.). Alternative forms of transportation will reduce greenhouse gas emissions and reduce traffic congestion.

BATTLE OF THE BUILDINGS (BotB) COMPETITION

The Yonkers Battle of the Buildings Competition consists of a year long competition among various buildings in Yonkers. Initially, it will be rolled out between Yonkers' City Hall, City Hall Annex, and Cacace Justice Center. The winner of the competition is the building that scores the highest on a series of sustainability actions implemented by building occupants.

The competition is designed to include Yonkers three municipal buildings(Phase One), additional municipal and school district buildings(Phase Two), and privately owned commercial and industrial buildings(Phase Three). The main tracking and measuring system of the competition is a scoring rubric used to periodically measure the relative progress of the buildings and to ultimately determine a winner.



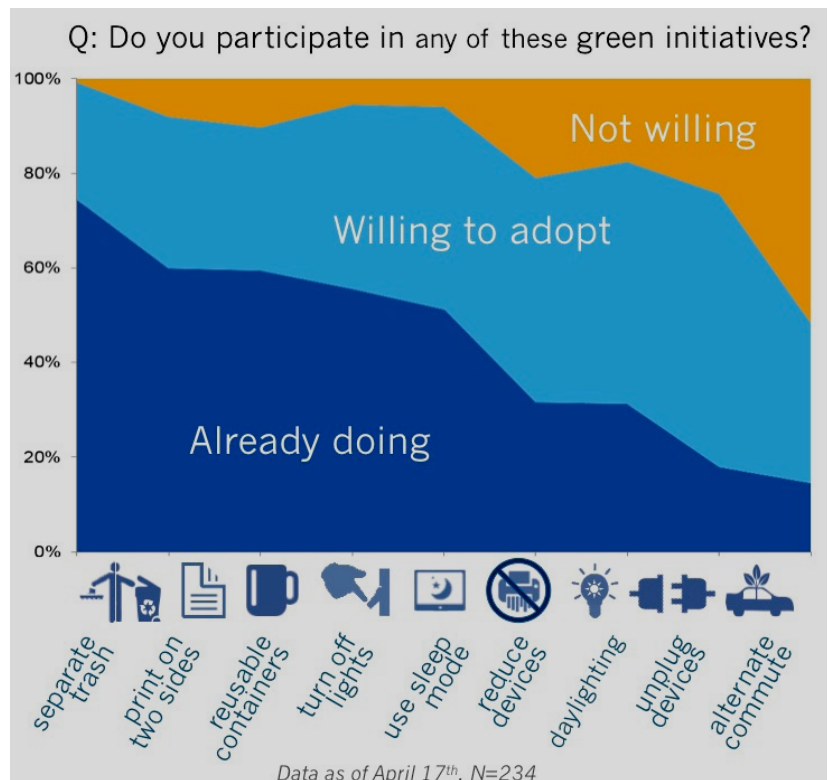
Competition Deliverables

•Baseline Survey

A baseline survey was conducted among the occupants of Yonkers municipal buildings to assess existing conditions related to energy, water, waste, outreach, procurement, health, and transportation. Our team developed survey questions derived from the above indicators to gain a better understanding of which sustainability measures are being performed and which measures occupants might be willing to adopt. The result of the survey assisted our team to develop a profile for each building and its occupants' current sustainability practices.

The survey consisted of a series of sustainability related questions where respondents selected the best answer that applied to their individual practices and/or work space. Each question asked participants to rate their response on a scale from "already doing", "willing to", to "not willing to". From 234 completed surveys, our findings indicate that a considerable number of occupants were already performing some sustainability practices and a significant percentage of people were willing to adopt more or new actions.

Based on findings from the conducted survey, approximately 74% of the population group responded: that they were recycling and an additional 25% answered they are willing to; 60% are already printing on double-sided paper plus another 39% are willing to; 59% bring their own coffee mugs to avoid usage of disposable ones and 30% more are willing to; 56% turn off lights when not in the room plus another 39% are willing to; 51% set computers to sleep mode and an additional 43% are willing to. Based on our findings in the area of energy saving, there is opportunity for raising awareness and modifying behavior. For example, only 32% of the respondents are currently powering off electronic equipment and just 18% are powering down electronic equipment at the end of the workday.





•The Scoring Rubric

The scoring rubric is the main metric used to evaluate progress. The rubric consists of 40 actions with a total possible scoring of 100 points. Each action can earn one to four points depending on the difficulty and effort required to implement. All actions fall into one of seven categories: Energy (11 actions), Water (4 actions), Waste (9 actions), Procurement (5 actions), Outreach (5 actions), Health (3 actions), and Transportation (3 actions). If a certain action does not apply in a building (e.g. "turning off window air conditioning units" in a building with central air), the total possible denominator will be adjusted to exclude the points associated with that action. Overall, the Energy category is weighted to account for 25% of the total possible points, while the six other categories together account for 50% of possible points.

The final 25% of the score is based on a five-question occupant survey. This survey will assist in verifying whether the building occupants are implementing these sustainability initiatives. A minimum sample size of 20 occupants per building is required to complete the survey for conclusive results. For each question, one to five points are awarded based on the percentage of "Yes" responses. This short survey can be sent out via SurveyMonkey or another anonymous polling system, and results should be collected concurrent with the remainder of the rubric scoring.

The rubric is accessible via a user-friendly Excel document which allows any evaluator to score and record the results for each of the three buildings. When completed, simply click on "Clear Scores" and the worksheet will reset for subsequent use.

	<i>Are computers set to enter sleep mode after 15 minutes of inactivity?</i>	YES				
		<table border="1"><tr><td>YES</td></tr><tr><td>SOMETIMES</td></tr><tr><td>NO</td></tr><tr><td>N/A</td></tr></table> 	YES	SOMETIMES	NO	N/A
YES						
SOMETIMES						
NO						
N/A						

Benchmarking

In addition to the 40 actions and the five question occupant survey, the rubric will feature four metrics that will assist in benchmarking and measuring the impacts of participation in the competition by buildings' occupants. The four metrics were selected to capture a cross section of the competition categories.

1. Energy Density (kBtu/sq.ft./year) is a standard metric used in benchmarking the energy performance of buildings throughout the US. It can be calculated by converting electricity use (kilowatt hours), and fuel use (therms of gas, or gallons of fuel oil) over a selected period of time (quarterly/seasonally), to British Thermal Units, and dividing by the area of each building in square feet. The seasonal profile of energy use requires that this metric be compared to a baseline of the previous years' energy density. Therefore, Fall 2015 energy density during the competition will need to be compared to Fall 2014 energy density, etc. in order to track energy use changes over the course of the competition.

2. Water use in gallons of water per building, per selected period of time (quarterly/seasonally). Yonkers is currently in the process of rolling out water meters in each of these buildings to provide real time data on gallons consumed per day. This data can be aggregated monthly and quarterly to track changes in water use over the course of the challenge. Given the lack of current data, our best estimate for current use was obtained using Kohler's online "commercial water calculator" from: <http://www.kohler.ca/savewater/calculators/commercial.htm>

3. Waste per building, measured in pounds of solid waste per quarter/season. Given that current solid waste is not measured, this metric will pose challenges in data collection. Waste will need to be weighed by municipal collection contractors or by cleaning staff. An alternative metric involves the counting of bags, which will need to be recorded daily and weekly to capture changes in solid waste generation over the course of the competition. Our initial calculation of this metric was made using an estimated weight of 0.59 tons of solid waste per government worker, per year, obtained here: <http://www.calrecycle.ca.gov/wastechar/wastegenrates/Institution.htm>. The estimate was then multiplied by the average number of workers currently occupying each building, City Hall (50), City Hall Annex (50), and Cacace Justice Center (300).

4. Sheets of paper, per building. Yonkers is currently implementing a system of tracking sheets of paper per worker. This data can be aggregated by building and quarter/season, to track changes to paper use over the course of the competition. Our current estimate was calculated by dividing the municipal building share of paper consumption per

year (7,000,000, as discussed during site visit), by the number of municipal workers (2879, obtained here: http://data.lohud.com/salary/salaries_yk_muni_10.php?start=15); to obtain an average number of sheets of paper per worker per year (2,431). This number can then be multiplied by the number of workers in each building, and divided by quarter/season to estimate the amount of paper use currently taking place, and to track changes in paper use over the course of the challenge.

Possible Outcomes

The 40 actions across seven areas, were selected to represent a cross section of sustainability challenges that many organizations face. Each action has the potential to affect positive change throughout the full range of operations in each of the buildings. For example: the EPA estimates that simply activating sleep mode settings on all computers and monitors saves on average \$35 per machine each year.²² During our site visit to Yonkers City Hall, the City's IT manager informed our team that there are 900 computers throughout municipal buildings. This one action could potentially save approximately \$31,500, and a corresponding reduction in carbon.

The water category of the scoring rubric mainly focuses on water leaks. Undetected water leaks waste millions of gallons of water per year. For example, a drip per second from a leaky faucet wastes 3,000 gallons of water per year, equivalent of 66 bathtubs of water. Constantly running toilet wastes 72,800 gallons of water, equivalent of 1,617 bathtubs of water.²³ Implementing actions to monitor for leaks can help prevent such waste.

There are several actions in the BotB scoring rubric that encourage a reduction in the use of paper. These include setting printers to print, by default, in duplex or double sided mode and encouraging electronic distribution of documents instead of printing. These actions have the potential to save up to 10 times the paper procurement costs through reducing the costs of storage, toner, printer, labor, postage, and disposal.²⁴

Monthly vs. Seasonally

It is our recommendation that the scoring rubric should take place every three months, or seasonally, rather than monthly. Monthly scoring can cause disappointment if there is no significant data change. Taking a monthly survey, even though short, can also annoy and irritate participants. Seasonal scoring will give ample time for Green Teams to communicate strategies for improvement in an under performing action area. Measuring seasonally also allows building occupants to be engaged in the process without being overwhelmed with too many updates and directives.



22 source: energystar, (2015), Computers, Retrieved April 19, 2015, from <http://www.energystar.gov/products/certified-products/detail/computers>
23 RT, (3/17/2015), EPA Plumbing New Depths to Save Water with 'Fix a Leak Week', Retrieved April 19, 2015, from: <http://rt.com/usa/241693-epa-fix-leak-week-programs/>

24 WWF Global, (2015), Reduce Paper Use at Home & the Office, Retrieved April 19, 2105, from http://wwf.panda.org/how_you_can_help/live_green/fsc/save_paper/office_paper/

MARKETING STRATEGY

Many factors contribute to the success of a competition. Effective communication is one of the most important and powerful factors. The first step toward effective communication is raising awareness. Information must be conveyed to all stakeholders in simple language, comprehensible by all. We must not assume that the goal of the competition or the way to achieve it is understood by all. Individuals assimilate information differently. Different methods of communication such as verbal, written, visual effects can be used to share information and to clearly define desired achievements. Raising awareness will help shift the behavior of occupants from habits of resource misuse to more sustainable behavior. The next step is to secure employees' commitments. Education and awareness does not guarantee employees' willingness to modify their behavior. Employees must commit to take action based on the learned knowledge. This makes the marketing aspect of the competition crucial for successful adoption.

Effective Communication

The following section explains how effective communication and marketing can contribute to achieve the desired outcome. Although effective communication strategies are generally the same within an organization, various approaches can be implemented at different levels to make the communication more effective:

1) Organizational Level

Successful communications will express the mission and the vision of the competition with



focus on targeted goals while identifying the internal and external stakeholders. An effective way to improve internal communications within an organization is to give employees access to a platform for communication. This organizational collaboration will: bring together people and data, increase employees' engagement in decision making processes, keep morale high, and make commitment to the initiative stronger.

2) Green Team Level

Green Teams are committed to overseeing the successful execution of the competition within their building. Green Teams hold a critical position as they function as the liaison between the evaluator and the building occupants. Consequently, effective communication between the Green Teams and the evaluator and the Green Teams to building occupants, are central to the success of the competition. Scheduling regular team meetings is a beneficial communications approach. Face-to-face meetings will offer the Green Team members an opportunity to discuss progress, challenges, and needs required to find solutions to issues and to share updates and accomplishments. The updated information is then communicated to the building occupants and the evaluator via emails or meetings.



3) Building Occupant Level

The best way to communicate with the building's occupants is to "engage and inspire". Building occupants should feel involved in the process of decision making. The more involved an individual is in a project, the more inspired they will be to take action. Face-to-face meetings,

online surveys, suggestion boxes and other means of communications should be used to gather opinions and feedback. Green Teams must respond to this feedback with sensitivity. In the end, it is occupant participation that is crucial for the competition to be successful.

To keep the enthusiasm level high, repetition of the competition goals and reinforcement of actions are necessary through the Green Teams' various communication outlets. Reinforcements and repetitions over a long period of time will lead to adoption.

Occupant Engagement - The Basic

Premise

The biggest challenge with this project is engaging stakeholders. The level of participation will define the success of the competition. In order to garner support for the competition we developed a marketing strategy that aligns with occupants' interests and concerns, instead of dictating what they should do or be concerned about.

Participants need to first understand the "why" before they can learn "how" they can help. The first step in engagement is to set and outline the specific and measurable goals of the project. The next step is to set the scope of the project, specifying the time frame, location, and participants. Each project needs to dedicate resources; in this specific project, we are focusing on human capital rather than financial or monetary capital. In order to keep occupants engaged it is important to maintain open communication where responsibilities are clearly defined.

The Green Team

It is our recommendation that prior to the start of the competition, each participating building recruits volunteers to serve on a "Green Team". The Green Team will be responsible for the execution of the marketing strategy in order to raise awareness of sustainability goals. The Green Team will meet with facility managers to review progress results and differentiate which areas of the rubric needs improvement. Likewise, if the occupants have complaints or suggestions, the Green Team is responsible for communicating these concerns to the facilities managers for feedback.

The Green Team will also be responsible for hosting a series of "Lunch & Learn" or "Brown Bag Lunch" events. A mandatory kick off event should occur at each of the buildings to introduce the competition and educate the occupants on the importance of the competition. These events should then continue to be offered on a monthly (or quarterly) basis, where each time the discussion is focused on seasonal-specific actions (i.e. dressing in layers in the winter rather than using a space heater, opening a window for natural ventilation in the spring rather than turning on the air conditioning unit, etc.). (See Appendix 11 for an example script to Lunch & Learn/Brown Bag events). The framework should be that of an open discussion, rather than a lecture. In addition, any progress should be shared to showcase the results of the competition and acknowledge top participants. After the occupants understand the "why", we can then further incentivize action by engaging them through individual competition.

Social Media

It is human nature to want to compete; to be better than the rest. We want to utilize this sense of healthy competition and natural drive to boost participation and motivate occupants. We have the opportunity to use social media as a necessary tool. For example, the JouleBug application is a free sustainability tracker that provides live progress reports to your phone or computer. Participation occurs on an individual basis, which for each action logged the participants earn points. Actions can be set up locally within the individual office, or can be widespread throughout Yonkers. The intent of utilizing this app in the competition is to get people to think about all the sustainability actions they can implement around the clock; from use of natural light, to making a conscious decision to taking the stairs, to unplugging your devices when you leave the room. The hope is that these actions are not just implemented within the work environment, but also incorporated into their daily routine within the community.

COMPETITION RESULTS

Phase One of the Yonkers Battle of the Buildings is not so much a competition between three different buildings with varying usage profiles and technical capacities, but instead a competition to see which building can reduce consumption in relation to their own individual baseline values.

Ranking of Phase One Buildings

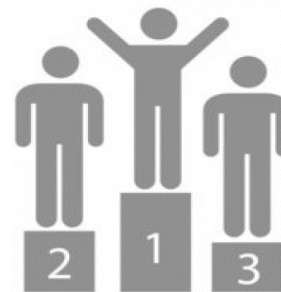
Arriving at a winner and activating the competitive spirit of building occupants will require establishing baseline values for the scoring rubric and four metric categories. The evaluator will thoroughly investigate site conditions in each building, and use the scoring rubric to provide an initial state of practices. Yonkers must also begin implementing data collection of energy, water, and waste to establish sustainability metrics. These four metrics: energy intensity/building, gallons/water/building, waste/building, and paper/building, can be used to track the progress and effectiveness of the competition in reducing resource consumption over time.

Achieving Reductions

Towards this effort, Yonkers is currently in the planning stages of installing water meters and real time Wi-Fi enabled plug load meters throughout its municipal building portfolio. A system for tracking real time paper usage is also in the works. There is no current tracking of solid waste among the City's municipal buildings, and implementing a method of measurement will remain a challenge in the near future. Our team recommends

establishing a weight measurement metric whether by proxy or by data collection via cleaning staff. Counting bags of solid waste may be another more accessible if not entirely standardized method of beginning to track waste amounts.

Once baselines are established participants should be informed via Green Teams and marketing outreach communications. Green Teams should then use the “indicators” section of the scoring rubric spreadsheet to identify areas of strength and weakness in their building. As areas most in need of improvement are identified, the informational links located in the rubric’s “Actions” tab can be utilized to help participants learn how to make their behaviors more environmentally friendly. New data is compared against the baseline metrics in the scoring rubric providing building occupants an opportunity to measure the effectiveness of their modified behavior. Progress should be regularly communicated to participants via Green Team updates and marketing. A winner may be chosen on a monthly, quarterly, or yearly basis. At the conclusion of the competition, the winning building occupants should be recognized for their achievements.



RECOMMENDATIONS

Alternative Metrics

Working in a sustainable building environment can result in healthier employees, happier staff, lower employee turnover and increased productivity. Beyond the standard metric comparison of energy, water and waste reduction or economic savings on these resources, the BotB competition can look at alternative metrics such as the wellness of employees or staff retention. Doing so could include a comparison of the number of sick days or turnover of employees year-over-year. Employee surveys, focus groups and exit interviews are other ways to measure and understand the benefits of a more sustainable environment for employees. An improved work environment will contribute to the health and happiness of employees, resulting in more than just environmental benefits.

Expanding the BotB Competition

This report outlines an actionable strategy for the City of Yonkers to implement a Battle of the Building Competition in Phase One for three of its government buildings. This project is the start of the larger goal of changing behaviors and the mindset of the occupants of all 50 of Yonkers' city-owned buildings, the occupants of Yonkers' public schools and ultimately occupants of commercial and industrial buildings. With successful implementation of Phase One, the Battle of the Building Competition, the City of Yonkers will benefit from: real financial savings, reduced emissions, and more engaged employees. Obtaining results and promoting the success of the challenge during Phase One will facilitate the roll out of the challenge to Phase Two and Phase Three buildings.



Government Buildings

Yonkers has 50 municipal buildings, which gives the city a vast potential to reduce environmental impact by implementing a BotB competition in its remaining municipal buildings. Some challenges will arise with expanding the competition to other buildings. The municipal buildings in Yonkers have several different purposes, and the working habits of the occupants within those buildings are very distinct from the occupants of the buildings analyzed in Phase One. In expanding the competition, differences may need to be addressed and the competition or marketing may need to be modified. It may be more effective to conduct the competition between buildings with similar functions, i.e. firehouses versus firehouses, or police precincts versus police precincts.

Public Schools

Yonkers' schools are the leading users of the City's energy, consuming approximately 248,000 mmBtu annually. The cost of the energy consumption is over 6 million dollars annually, producing 54 percent of total municipal buildings' greenhouse gas emissions.²⁵ School buildings in Yonkers are some of the oldest buildings in the city. Nine of 45 school buildings in the municipality are over 95 years old with the oldest building being 117 years old.²⁶ The quantity and age of these infrastructures creates a perfect opportunity to reduce resource use and cost by changing the behavior of occupants. It is important to mention that the schools' operations and education budgets are separate from Yonkers' municipal budget and are managed by the City's Board of Education. Savings from the competition can potentially be targeted toward educational objectives and goals.

Another benefit for implementing the challenge at schools is the involvement of students in the process. The competition will serve as a unique opportunity to educate and empower the future generation by ingraining vital sustainable values that will alter student's way of life. The competition will function as a priceless teaching tool that will produce a generation aware of their resource use and planet. Equally advantageous is the acquired knowledge that will then be transported to students' homes, making them effective agents of change within their families and households.

It is apparent, that the scope and the execution of the competition must be adapted to be more suited for school environments. For example, the amount of paper used in the school districts (63 million sheets of paper per year) should be evaluated and additional measures should be taken to reduce usage. Students make up the majority of the users within school buildings. The challenge and its implementation must be altered to accommodate the various aspects of the school environment, specifically the age and understanding of its youngest participants.

Board of Education Buildings	
	Annual Energy Costs
1 Yonkers Middle High School	\$ 620,064
2 Yonkers Montessori Academy	\$ 457,012
3 Early College High School	\$ 411,093
4 Riverside High / Museum School 25	\$ 396,744
5 Saunders High School	\$ 370,050
6 Lincoln High School	\$ 336,713
7 Gorton High School	\$ 300,565
8 PEARLS Hawthorne School	\$ 291,675
9 Enrico Fermi School	\$ 283,752
10 Robert C. Dodson School	\$ 258,753
11 Cross Hill Academy	\$ 245,467
12 Cedar Place School	\$ 226,076
13 Westchester Hills School 29	\$ 201,743
14 Palisade Preparatory School	\$ 176,783
15 Paideia School 15	\$ 165,034
16 School 13	\$ 158,584
17 Martin Luther King, Jr. Academy	\$ 156,838
18 Rosemarie Ann Siragusa School	\$ 140,293
19 Scholastic Academy	\$ 138,201
20 Hostos School	\$ 105,523
	annual total \$ 5,440,963
	10 yr total \$ 54,409,630

²⁵Ibid

²⁶Yonkers Public Schools, (2012, July), Yonkers Public Schools P3 Named Among World's Most Innovative Urban Infrastructure Programs, from <http://yonkerspublicschools.org/1213news-3P-Honor-070312.php>

Privately Owned Commercial and Industrial Buildings

Traditionally, a business's success is measured by its financial profitability. However, in the past few decades the focus has shifted from solely financial to triple bottom line where a profitable business is measured by its financial, environmental and social impact. Businesses, large and small are feeling the social obligation and the desire to become more sustainable. Larger companies and organizations voluntarily release yearly corporate social responsibility and sustainability reports to their stakeholders, consumers, and equity investors. Companies are using various measures to reduce greenhouse gas emissions by implementing energy efficiency initiatives that may have longer payback period. For example, Domino Sugar, one of the largest industries in Yonkers, consumed nine percent of the City's overall water consumption. As part of their commitment to the environment, the company installed a new water management system in 2014, saving 13 million gallons of water. Water savings are expected to rise to 26 million gallons in 2015.²⁷

With the successful implementation of BotB Phases One and Two, the anticipation is for the business community to welcome the competition. Business owners are invested in their businesses and should welcome measures to reduce expenses. A voluntary competition will be more widely accepted than an imposed governmental policy. Campaigning through social media platforms announcing the success of Phases One and Two of the program should draw awareness and interest within the business community to inspire business owners and companies to participate in the competition.

As with the school buildings, the competition should be adjusted to accommodate different scales and building types. Corporate office buildings with various businesses are operated differently than buildings housing just one business. Furthermore, the types of users and their operations must be considered when tailoring the competition for implementation within the business sector.

²⁷Mayor Mike Spano (2015), State of The City 2015, Retrieved April 15, 2015, from <http://www.cityofyonkers.com/government/mayor-s-office/speeches/state-of-the-city-2015/state-of-the-city-2015>

IMPLEMENTATION

Methodology

The true measure of savings in the competition requires accurate benchmarking of the targeted resources such as energy, water and paper consumption, waste generation and amount of recyclables collected. Energy consumption data was provided by the City of Yonkers' Office of Sustainability; however, the balance of the data was unavailable. Alternative calculation methods were used to create estimated data for benchmarking. For example, to obtain a building's water consumption, a calculator in Kohler's website was used to calculate water usage by inputting various data such as the number of employees and the number of bathrooms in a given building. These extrapolated benchmarking measurements were utilized along with the lessons learned, from good practices (described above) and the feedback from employees, facility managers and their superiors to customize and create an approach most suitable for Yonkers' Battle of the Buildings Challenge.

Future Road Map

•Planning and Approval

The first step toward the implementation of the challenge is obtaining the approval from the Yonkers' Office of Sustainability (YOoS) and Mayor Mike Spano on all proposed actions. Once approved, a work plan and timeline should be generated by YOoS. Part of the timeline is the selection of a date to launch the competition for Phase One buildings. Strategically, launching to coincide with a significant day, such as Earth Day, could help generate more buzz.

•Launching

Our recommendation is that Phase One be launched before the end of 2015. At the intended launch day, the City should ensure adequate media coverage from all local news outlets and social media to generate publicity and exposure. The next step is to form the buildings' Green Teams with volunteers from each targeted building.

The Green Teams are then responsible to initiate different learning forums. Forums are a series of outreach programs that are held to educate and inform building occupants while gathering feedback from participants. Other responsibilities of the Green Teams can be determined through a series of meetings with the YOoS.

•Measuring, Monitoring, and Motivating

YOoS should also focus on choosing proper benchmarking techniques to acquire the essential data lacking from the scoring rubric. Accurate measurement of water consumption, waste generation and paper use is required for launching and success of the competition.

•Phase Two

As the competition proves successful in Phase One buildings, planning for Phase Two, encompassing schools and educational buildings, should commence. The competition should be evaluated to determine the best method of its in the school system. We suggest targeting to launch on the first day of school 2016. Marketing should be evaluated and adapted to target both teachers and students. Sustainable actions specified in the competition should be integrated into the curriculum.

•Phase Three

Earth Day 2017 should be the targeted for Battle of the Buildings Competition to launch for private industry and commercial buildings interested in participating. The goal is that media generated and success stories shared during Phase One and Two of the competition will encourage private businesses to voluntarily participate.

•Preparing for Yonkers 2020

The Battle of the Buildings Competition in Yonkers will create awareness and educate citizens on resource conservation. Yonkers citizens will carry sustainable practices established from the Battle of the Buildings Competition to their homes, community centers and congregations. A competition designed to conserve energy at the workplace will positively impact conservation in the City of Yonkers. The sustainable behaviors of citizens in conjunction with the sustainable initiatives being implemented by Mayor Mike Spano and Mr. Tito within the City of Yonkers' Office of Sustainability will solidify Yonkers' position as a leader of sustainability and "shape the city for generations to come".²⁸



²⁸ City of Yonkers, 2015. Retrieved on April 28, 2015 from <http://www.cityofyonkers.com/work/yonkers-green-city>

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APPENDIX

Process: distribution of tasks into Blue and Yellow Teams, and their deliverables (description and results from Research, Strategy and Data Analysis)

In the process of creating the best Battle of the Buildings challenges for Yonkers, our team researched existing competitions, psychology of behavior modification, and best practices for project implementation.

We divided the project into two phases each phase having subteams. Phase one consisted of the format team, the data analysis team, the research team and the strategy plus interview team. These were our blue teams, that during the six weeks of phase one completed foundational research necessary to build a well thought out competition.

The Format Team designed the look and feel of all material produced for this project including font selection and layouts.

The Data Analysis Team gathered samples of existing challenges. They identified rating systems utilized in such competitions. The team also conducted research on the practices Yonkers currently has in place, and state and local laws that affect the city's built environment. Extensive gathering and review of indicators in similar challenges were conducted and presented to the team. The whole team reviewed and voted on indicators that appeared most applicable for this project.

The Research Team examined the buildings that are to participate in each tier of the challenge's roll out. Then the team researched existing challenges and examined how they are scored as successful. Benefits including economic, social and environmental were considered. This team worked closely with the data analysis team to provide data and feedback. Valuable information to formulate the foundation of the project was provided from this research.

The Strategy/Interview Team looked at the benefits of implementing such a challenge and the long term benefits that can be realized from successful adoption. This team completed interview questions and identified key personnel of tier 1 buildings whose input would be beneficial. The team researched the psychology required to effectively modify user behavior, afterwards potential strategies for marketing the project to users was presented.

In Phase Two of the project, we reorganized into new subgroups that consisted of the battle challenge team, the presentation team, and the report team. These were our yellow teams that worked with the research developed from phase one to craft a comprehensive challenge, report and presentation. These documents are created for the City of Yonkers to use in the implementation of their Battle of the Buildings Challenge as well as for Columbia University to illustrate the practical skills acquired during the Sustainability Management program.

The Challenge Team identified ways to effect behavior and identify the short-term and long-term benefits that behavior change would have on the social, economic and environmental elements relating to the users building. This team compiled and completed the checklist and rubric that would be utilized by the building's operation team and users to identify successes of the challenge.

The Presentation Team designed graphics and presentation to convey the findings of our work. This team executed presentations both at Columbia University and to The City of Yonkers.

The Report Team compiled information from the project research and all teams then composed this report.